

A self-assessment tool of the level of digital competence of Ukrainian teachers in the context of lifelong learning: the results of an online survey 2021

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Abstract. Reforms in education today are due to many factors, including globalization, the transition to a digital economy and citizenship, the formation of a knowledge society. That is why human digital competencies are becoming increasingly important in the development of education and affect the quality of life of every person. Modern teachers must not only possess his professional knowledge and skills but must also be able to learn throughout life. And in this context, their digital competencies play a crucial role. An important role in clarifying the state of possession of strong digital skills of teachers is played by the need for distance learning, which took place during the COVID-19 pandemic around the world, as well as in Ukraine. In order to clarify the level of digital competence of teachers in Ukraine, the Comparative Studies Department for Information and Education Innovations of the Institute of Information Technologies and Learning Tools of the National Academy of Educational Sciences of Ukraine conducted an all-Ukrainian online survey in January 2021 [1]. 1463 educators took part in the online survey, they answered five blocks of questions about their competence in the use of digital tools and instruments for distance learning and self-education: information and digital literacy, communication and cooperation, digital content creation, security and problem solving. The purpose of the article is to present the survey results and provide proposals regarding the development of teachers' digital competence and professional development.

Keywords: digital competence, teacher, professional development, ICT, online survey, COVID-19 pandemic, distance teaching and learning, lifelong learning.

1 Introduction

Today, Ukrainian teachers and schools are in a situation where distance learning has become a necessity. These circumstances are closely related to the introduction of quarantine measures in all countries of the world

in connection with the COVID-19 pandemic. That is why the digital competencies of teachers and school administrators are on the agenda in the education system. What matters today is how teachers and schools develop digital learning environments, what tools they use, what digital skills they can apply for these purposes. The education system, for its part, should support teachers, provide them with lifelong learning, quality training and retraining given a person-centered approach. To determine the prospects for such support, it is important to find out what level of digital competence teachers have, how they assess it, and whether they can develop their digital skills on their own.

An online survey was aimed at implementing the following tasks: identifying public opinion of general secondary school teachers and school administrators about the problems, needs, and challenges that arise during distance and blended learning in quarantine; determining the degree of readiness of teachers to use online tools and online resources during distance and blended learning in quarantine; comparison of the results of the 2021 survey on the use of online tools and online resources with the results of the first survey in the spring of 2020 [2]; determining the level of digital competence of teachers through self-assessment based on the DigComp 2.0, 2.1 [2] and the international practice [5]; providing appropriate recommendations to stakeholders based on an assessment of the situation during the quarantine. An online survey revealed the level of development of teachers' digital competence, their ability to carry out self-assessment. The obtained results of the research allowed formulating recommendations for institutions that conduct trainings for teachers and their professional development, as well as for school principals on the use of ICT for the organization of distance learning.

2 Literature review

The problems of using ICT for distance learning by teachers in educational institutions are covered in the works of researchers V. Yu. Bykov, O. Yu. Burov, O. M. Spirin, V. I. Lugovy, V. V. Oliynyk, N. P. Morse, M. P. Shyshkina, S. H. Lytvynova and others [6, 7, 12]. These researchers raise questions about the methodology of using digital tools, creating a digital environment for teachers and students. The main issue, researchers consider the creation of the necessary educational and methodological support of the process of creating a digital environment of the educational institution, determining the structure of such an environment and its main components. Issues of formation of digital

competence of teachers are covered in the works of M.P. Leshchenko, I.V. Ivaniuk, O.O. Gritsenchuk, N.V. Soroko, O.V. Ovcharuk and others [1, 2, 4, 6, 8–10]. The focus of researchers is on international approaches, as well as on the components of the teacher's digital competence. In their works, scientists emphasize the need to harmonize the framework for the development of digital competence of students and teachers with international approaches and the need to create effective mechanisms for assessing the level of digital literacy of educators in Ukraine.

2.1 Research method

A phenomenon study of the development of teachers' digital competence; a systematic approach to information retrieval; the data gathering about the readiness of teachers towards the use of ICT tools and their problems were applied. An online questionnaire was based on European documents, including the DigComp 2.0 and 2.1 (2017) [2]. Importance was given to the analysis, synthesis of information based on common scientific methods of analysis and synthesis. In addition, computational methods of information processing were applied during the data processing online survey.

2.1.1 Research results

The study was conducted in the period from 10.01.2021 to 10.03.2021. The empirical data of the online survey was collected from 12.01.2021 to 28.02.2021. Teachers from the following regions took part in the online survey: Vinnytsia, Volyn, Dnipropetrovsk, Donetsk, Zakarpattia, Zaporizhia, Zhytomyr, Ivano-Frankivsk, Kyiv, Kirovohrad, Luhansk, Lviv, Mykolaiv, Odesa, Poltava, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytsky, Cherkasy, Chernivtsi, and Kyiv. Thus, geographically the online survey covered East, West, South, North and Center of Ukraine. The study covers a non-representative sample of the target group. A random type of sample was used to conduct an online survey of teachers. The number of respondents is 1463 people, including 1298 women and 149 men. The survey identified three main age categories: 40–55 years — 42.6%; 26–40 years — 32.9%; 55 and older — 20.5%. By type of educational institutions among the respondents - the most representatives of such institutions are secondary school — 67.2%, lyceum — 13.9%; educational complex — 10.3%; gymnasium — 3.4%. Distribution of respondents by type of settlements is the following: 46.8% — city; 36.7% — village; 16.5% is an urban-type settlement.

The form of the online questionnaire was filled in only at one's own request. The survey was anonymous. The questionnaire was published on

the websites of the IITLT of the NAES of Ukraine, the website of the Presidium of the National Academy of Educational Sciences of Ukraine, the in-service teacher training institutes mailing list, and through the Facebook social network. All study participants were informed about the objectives of the study.

The analysis and interpretation of quantitative data was carried out using the methods of descriptive and mathematical statistics, the results are presented in the form of diagrams and their interpretations, which are arranged in the relevant thematic blocks. The general scientific approaches to the analysis of the results are outlined in the “Regulations on the Procedure for Forming, Conducting and Controlling the Performance of Scientific Research and Scientific and Technical (Experimental) Developments at the National Academy of Pedagogical Sciences of Ukraine” from December 20, 2018). These approaches are the followings: novelty and relevance; compliance with the priorities of state policy and thematic areas of research and scientific and technical development; practical usefulness, possibility of implementation of the given recommendations and conclusions; availability of previous experience and achievements of scientists in performing scientific research.

As was stated above, all questions are based on international approaches, including the Digital Competence Framework for Citizens: Eight Skills with Examples of Use (DigComp 2.1: Digital Competence Framework for Citizens) [2], and adapted to the current version of the online questionnaire [1]. The DigComp 2.1 includes the following levels: basic user, independent user, professional user. It outlines five areas of this competence: information and digital literacy, communication and collaboration, digital content creation, security, and problem solving. The study was constructed according to these areas and levels.

In the area of *“Information and digital literacy”* when asked about the ability to search for information, 33.9% of respondents said that they can search for information in the Internet using a search engine that corresponds to the basic level of the user; 44.6% of respondents said that they can use different search engines to find information that corresponds to the level of an independent user; 21.5% of respondents said that they can use advanced search strategies to find reliable information in the Internet, for example, using web channels that corresponds to the level of a professional user (see Fig. 1).

When asked about the ability to assess the accuracy of information during a search 30.5% of respondents stated that they know that not all information on the network is reliable, which corresponds to the basic level

of the user; 22.3% of respondents stated that they use some filters when searching to compare and evaluate the reliability of information they find that corresponds to the level of an independent user; 47.1% of respondents said they could assess the accuracy of the information using a number of criteria that meet the level of a professional user.

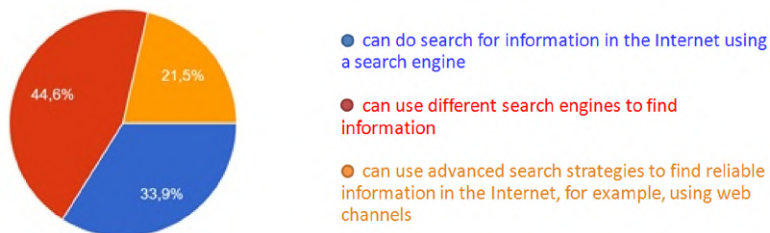


Fig. 1. The sample of the answers of the respondents about the area of “Information and digital literacy”

When asked about the ability to store the information found, 23.7% of respondents said that they can save files or content and receive them after saving, which corresponds to the basic level of the user; 28% of respondents stated that they classify information methodically using folders; back up information or files that store that corresponds to the level of the independent user; 48.3% of respondents stated that they can store information found on the Internet in various formats; can use cloud storage services that correspond to the level of a professional user.

In the field of “*Communication and Cooperation*” on the question of the ability to communicate using various means of communication 21.8% of respondents said that they can communicate with other users via Skype or chat - using basic functions (eg, voice messages, SMS, text exchange), which corresponds to the basic level of the user; 11.5% of respondents said that they could use the advanced features of several means of communication (for example, using Skype and file sharing), which corresponds to the level of an independent user; 66.7% of respondents said that they actively use a wide range of means of communication (e-mail, chat, SMS, instant messaging, blogs, micro-blogs, social networks) for online communication, which corresponds to the level of a professional user (see Fig. 2).

When asked about the ability to create and manage content using collaboration tools, 27.1% of respondents said that they can share files and content using simple tools that correspond to the basic level of the user; 50.1% of respondents indicated that they could use collaboration tools and distribute, for example, shared documents/files created by other people,

which corresponds to the level of an independent user; 22.8% of respondents said that they can create and manage content using tools for collaboration (eg, project management systems, spreadsheets on the Internet), which corresponds to the level of a professional user.

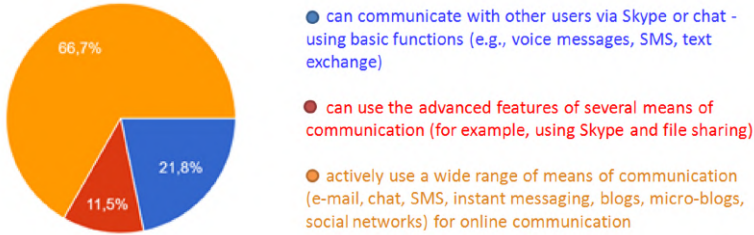


Fig. 2. The sample of the answers of the respondents about the area of “Communication and Cooperation”

When asked about the ability to use online services 22.1% of respondents stated that they can use online services (e.g. e-banks, e-governments, e-hospitals, etc.), which corresponds to the basic level of the user; 44% of respondents stated that they use the functions of online services (e.g., public services, e-banking, online stores, etc.), which corresponds to the level of an independent user; 34% of respondents said that they take an active part in online spaces and use several online services (eg, public services, e-banking, online store, etc.), which corresponds to the level of a professional user.

When asked about the available knowledge and ability to use online tools for collaboration 30.3% of respondents stated that they know social networking sites and online collaboration tools, which corresponds to the basic level of the user; 23% of respondents stated that they pass on knowledge to other users on the Internet (for example, through social networking tools or in online communities), which corresponds to the level of an independent user; 46.7% of respondents stated that they can use additional functions of communication means (e.g. video conferencing, data exchange, sharing), which corresponds to the level of a professional user.

In the field of “*Digital content creation*” when asked about the ability to create multimedia content in different formats using various digital tools and environments, 55.6% of respondents said that they can create simple digital content (eg text, tables, images, audio files) in at least one format using digital tools that corresponds to the basic level of the user; 38.1% of respondents said that they can create complex digital content in various formats (eg text, tables, images, audio files) and use tools to create web pages or blogs that correspond to the level of an independent user; 6.3%

of respondents said that they can produce complex multimedia content in different formats, using a variety of digital tools and environments, can create a website using a programming language that corresponds to the level of a professional user (see Fig. 3).



Fig. 3. The sample of the answers of the respondents about the area of “Communication and Cooperation”

When asked about the ability to use the formatting features of content and various tools, 27.6% of respondents said that they can make basic editing of content created by other users (for example, add and remove), which corresponds to the basic level of the user; 63.4% of respondents stated that they can apply basic formatting (for example, insert links, charts, tables) to content created by themselves or other users that corresponds to the level of an independent user; 8.8% of respondents said that they can use the functions of advanced formatting of various tools (eg, merging e-mail, merging documents of different formats, using advanced formulas, macros), which corresponds to the level of a professional user.

When asked about the knowledge regarding the rules of using content in accordance with copyright protection, 44.7% of respondents said that they know that content can be protected by copyright, which corresponds to the basic level of the user; 42.9% of respondents stated that they know how to refer to and use copyrighted content that corresponds to the level of an independent user; 12.4% of respondents said that they know how and when to apply for licenses and copyrights, which corresponds to the level of a professional user.

When asked about programming skills 67.7% of respondents said that they can change simple software functions by changing the default settings, which corresponds to the basic level of the user; 25.3% of respondents stated that they know the basics — the principles of one programming language, which corresponds to the level of an independent user; 7% of respondents said that they can use several programming languages. I know how to design, create and modify databases with a computer tool that

matches the level of a professional user.

In the area of *Safety*, when asked about the ability to protect the system of devices and programs, 54.7% of respondents said that they can take basic steps to protect their devices (eg, use of antivirus and password), which corresponds to the basic level of the user; 32.5% of respondents stated that they can install security programs on devices that use to access the Internet (eg, antivirus, firewall), which corresponds to the level of an independent user; 12.8% of respondents said that they often check the security configuration and systems of devices and/or programs that they regularly use to access the Internet, which corresponds to the level of a professional user (see Fig. 4).

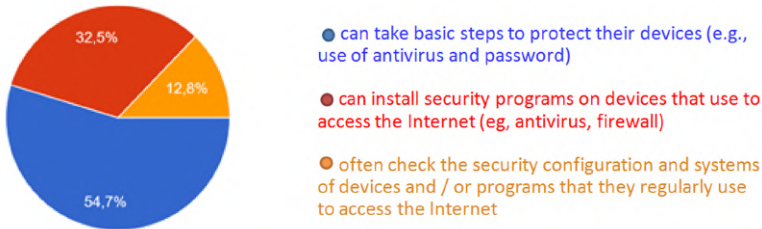


Fig. 4. The sample of the answers of the respondents about the area of “Safety”

When asked about the ability to protect personal information on their digital devices, 47.3% of respondents said they knew that credentials (username and password) could be stolen and that they should not disclose personal information on the Internet, which corresponds to the basic user level; 34.9% of respondents stated that they use different passwords to access equipment, devices and digital services, periodically changing them to match the level of the independent user; 17.9% of respondents said they know how to react if a computer is infected with a virus, can configure or change the antivirus and configure the security of their digital devices, which corresponds to the level of a professional user.

When asked about the ability to use ICT safely for their own health, 22.1% of respondents said that they know that the use of digital technologies has too much impact on their health, which corresponds to the basic level of the user; 34% of respondents stated that they understand the health risks associated with the use of digital technologies (for example, the risk of dependence), which corresponds to the level of the independent user; 43.9% of respondents said that they can use ICT in such a way as to avoid health problems (physical and psychological), which corresponds to the

level of a professional user.

When asked about knowledge about the impact of digital technologies on everyday life and the environment, 12.5% of respondents said that they take basic measures to save energy, which corresponds to the basic level of the user; 44% of respondents said that they understand the positive and negative impact of technology on the environment, which corresponds to the level of the independent user; 43.5% of respondents stated that they have an informed view on the impact of digital technologies on everyday life and the environment, which corresponds to the level of a professional user.

In the area of “*Problem Solving*”, when asked about the ability to solve problems that arise when using digital technologies, 56.5% of respondents said that they find support when a technical problem arises or when a new program is used that meets the basic level of the user; 37.3% of respondents said that they can solve most of the problems that most often arise when using digital technology, which corresponds to the level of independent user; 6.2% of respondents said that they can solve almost all the problems that arise when using digital technologies, which corresponds to the level of a professional user (see Fig. 5). When asked about the ability to choose and use an appropriate digital tool or service to solve non-technical problems, 42.6% of respondents know that digital tools can help solve problems that correspond to the basic level of the user; 36.9% of respondents stated that they can use digital technologies to solve non-technical problems, which corresponds to the level of an independent user; 20.6% of respondents said that they can often choose the right tool, device, application, software or service to solve non-technical problems that corresponds to the level of a professional user.

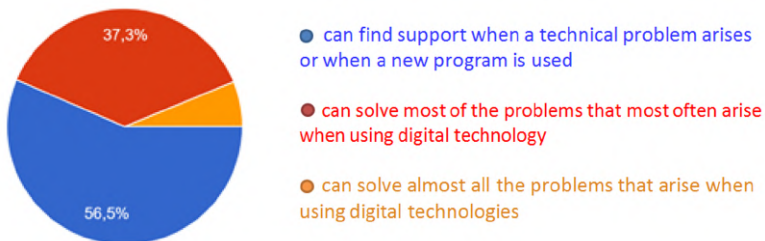


Fig. 5. The sample of the answers of the respondents about the area of “Problem solving”

When asked about the ability to choose and use an appropriate digital

tool to solve technological problems, 54.7% of respondents said that they can use familiar tools to solve a technological problem that corresponds to the basic level of the user; 38.6% of respondents said that they can solve technological problems by studying the settings of programs or tools that correspond to the level of an independent user; 6.7% of respondents said that they know about new technological developments and understand how new tools work, which corresponds to the level of a professional user.

On the question of awareness of the need to update skills in the field of digital technologies 36.6% of respondents said that they are aware of the need to regularly update their skills in the field of digital technology, which corresponds to the basic level of the user; 47.5% of respondents said that they regularly update their skills in the field of digital technology, know their limitations and try to fill the gaps that correspond to the level of an independent user; 15.9% of respondents said that they often update their skills in the field of digital technology to reduce their limitations and increase knowledge in this area, which corresponds to the level of a professional user.

The results obtained by teachers' self-assessment of the level of digital competence indicate the following.

A positive trend is observed in the field of "Information and digital literacy". The vast majority of teachers are able to search for information at the level of independent (44.6%) and professional (21.5%) users; assess the reliability of information at the level of professional (47.1%) and independent (22.3%) user; store the found information at the level of professional (48.3%) and independent (28%) user. Approximately 29% of respondents have a basic user level and need advanced training.

In the field of "Communication and Cooperation" teachers also have high levels. The vast majority of respondents are able to communicate using various means of communication at the level of professional (66.7%) and independent (11.5%) user; create and manage content at the level of independent (50.1%) and professional (22.8%) users; use online services at the level of independent (44%) and professional (34%) users; know and are able to use online tools for cooperation at the level of professional (46.7%) and independent (23%) user. Approximately 25% of respondents have a basic user level and need advanced training.

In the field of "Digital Content Creation" the situation with the existing levels of digital competence of teachers is changing. The vast majority of respondents are able to create multimedia content in different formats, using a variety of digital tools and environments at the level of basic (55.6%) and independent (38.1%) user; use the formatting functions of content

and various tools at the level of independent (63.4%) and basic (27.6%) user, know the rules of using content in accordance with the protection of copyright legal levels of basic (44.7%) and independent (42.9%) user; have programming skills at the level of basic (67.7%) and independent (25.3%) users. On average, only 8% of respondents have the level of a professional user. It is in this area that problems arise that affect the formation of a culture of academic integrity in society.

In the area of “Safety”, the issues concerned two areas (ensuring the safety of their digital devices and safety related to their own health and the environment) and each of them has different indicators on the levels of digital competence of teachers. The first direction involved the ability to protect the system of devices and programs (baseline — 54.7%, independent level — 32.55%) and protect personal information on their digital devices (baseline — 47.3%, independent level — 34.9%). The second area included the ability to use ICT safely for one’s own health (professional level — 43.9%, independent level — 34%) and knowledge about the impact of digital technologies on everyday life and the environment (independent level — 44%, professional level — on average, 15% of respondents have the level of a professional user to ensure the security of their digital devices and personal data, so this issue should be given more attention.

In the field of “Problem Solving”, the professional level of the user is on average 12% of respondents, which indicates certain gaps in the system of professional development of teachers in need of refinement. Half of the respondents have a basic level of user in this area, as evidenced by the following data: the ability to solve problems arising from the use of digital technologies (basic level — 56.5%, independent level — 37.3%); ability to choose and use an appropriate digital tool or service to solve non-technical problems (basic level — 42.6%, independent level — 36.9%); ability to choose and use the appropriate digital tool to solve technological problems (basic level — 54.7%, independent level — 38.6%); awareness of the need to update skills in the field of digital technologies (independent level — 47.5%, basic level — 47.5%).

3 Conclusions and recommendations

The conducted survey allowed the authors to use the tool of self-assessment of digital competence of teachers based on the Digital Competence Framework for Citizens (DigComp 2.0 and 2.1) and the Digital Competence Framework for educators (DigCompEdu) for the first time in Ukrainian context. Based on the results of the assessment of the current

state of the level of teachers' digital competence, the recommendations were developed and presented to stakeholders, in particular, for the network of the in-service teacher training institutions [8, 11]. For these institutions we recommend to introduce the already tested self-assessment tool as a part of the regular and voluntary instruments to help teachers to identify needs and gaps into their level of digital competence. This instrument can be used also as a source of the information about possible topics and modules for the in-service teacher training programs and future trainings.

Researchers expect that by the end of the 2020/2021 school year, regional ITTIs will assess the level of digital competence of teachers, using the proposed tool for self-assessment, which will determine the real situation in each area. By the beginning of the 2021/2022 school year, each regional in-service teacher training institute will be informed on how to develop appropriate in-service training programs for teachers in the region based on the results of the current study. A group of researchers plans to conduct an All-Ukrainian online survey at the end of the 2021/2022 school year and compare how much the situation has changed regarding the development of digital competence levels of teachers.

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Інструмент самооцінювання рівня цифрової компетентності українських вчителів у контексті неперервного навчання: результати онлайн-опитування 2021 р.

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Анотація. Реформи в освіті сьогодні зумовлені багатьма факторами, а саме: глобалізація, перехід до цифрової економіки та громадянства, формування суспільства знань. Тому цифрові компетентності людини набувають усе більшого значення в розвитку освіти та впливають на якість життя кожної людини. Сучасні вчителі повинні не тільки володіти своїми професійними знаннями та навичками, але й уміти навчатися протягом усього життя. І в цьому контексті їх цифрові компетентності відіграють вирішальну роль. Важливого значення у з'ясуванні стану володіння сильними цифровими навичками вчителів набуває необхідність дистанційного навчання, яке відбувалося під час пандемії COVID-19 у всьому світі, а також в Україні. З метою з'ясування рівня цифрової компетентності вчителів в Україні відділом порівняльного дослідження інформаційно-освітніх інновацій Інституту інформаційних технологій та засобів навчання НАН України в січні провели всеукраїнське онлайн-опитування 2021 [1]. У ньому взяли участь 1463 освітян, які відповіли на п'ять блоків запитань про свою компетентність у використанні цифрових інструментів та інструментів для дистанційного навчання й самоосвіти: інформаційна та цифрова грамотність, комунікація та співпраця, створення цифрового контенту, безпека та проблеми розв'язування. Метою статті є представлення результатів опитування та надання пропозицій щодо розвитку цифрової компетентності та підвищення кваліфікації вчителів.

Ключові слова: цифрова компетентність, учитель, професійний розвиток, ІКТ, онлайн-опитування, пандемія COVID-19, дистанційне викладання й навчання, навчання протягом усього життя.