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The teacher's digital competence self-assessment tool in the context of professional development: the Ukrainian perspective

Narzędzie samooceny kompetencji cyfrowych nauczyciela w kontekście doskonalenia zawodowego: perspektywa ukraińska

Słowa kluczowe: technologie cyfrowe, narzędzie do samooceny, kompetencje cyfrowe, nauczyciel, rozwój zawodowy.

Streszczenie: Współczesne, zaawansowane technologicznie społeczeństwo sprawia, że wykorzystywanie technologii cyfrowych przez nauczycieli staje się nieodzownym elementem ich codziennej pracy. W ostatnich latach zapotrzebowanie na kompetencje cyfrowe znacząco wpłynęło na zdolność nauczycieli do organizacji kształcenia na odległość, szczególnie w okresie kwarantanny związanej z pandemią COVID-19 oraz po wprowadzeniu stanu wojennego w Ukrainie od lutego 2022 roku. Obecnie większość materiałów dydaktycznych i metodycznych dla nauczycieli i uczniów dostępna jest w formacie cyfrowym, co wymaga odpowiedzialnego i świadomego ich wykorzystywania zarówno przez nauczycieli, jak i uczniów. Doświadczenia ukraińskich nauczycieli zdobyte w ciągu ostatnich pięciu lat stały się przedmiotem analiz i dyskusji w środowisku pedagogicznym. Szczególny nacisk kładziony jest na narzędzia służące ocenie biegłości nauczycieli w zakresie technologii cyfrowych, identyfikacji istniejących wyzwań oraz określenia ich gotowości do realizacji kształcenia na odległość. Opracowanie narzędzia do samooceny kompetencji cyfrowych nauczycieli stanowi istotny element wspierający ich rozwój zawodowy. Rozwój takiego narzędzia wymaga czasu i systematycznego doskonalenia. Przedstawione w niniejszym opracowaniu doświadczenia stanowią unikalne studium przypadku, które wzbudza duże zainteresowanie wśród nauczycieli, poszukujących skutecznych form rozwoju zawodowego w zakresie stosowania technologii cyfrowych w edukacji.

Key words: digital technologies, self-assessment tool, digital competence, teacher, professional development.

Abstract: The article outlines the development and implementation of a self-assessment tool for evaluating teachers' digital competence, drawing on the experiences of domestic specialists from 2020 to 2023. It includes an analysis of various approaches used in the international educational community to create such tools. The rationale for constructing a survey questionnaire based on the Digital Competence Framework for Educators (DigComp 2.1) is provided. The stages involved in developing a self-assessment tool for teachers' digital competence are outlined, including the phases of development, enhancement, and implementation. The process for surveying over four years is also described. A block diagram illustrating the creation and implementation of the

teacher's digital competence self-assessment tool is provided. The principles that ensure the reliability of the data obtained during the self-assessment of teachers' digital competence are explained. It is demonstrated that the self-assessment tool must include elements that identify the degree of teachers' and educational institutions' readiness to use ICT. This information contributes to the development of recommendations and the identification of solutions to existing challenges. Furthermore, the concept of teachers' readiness to utilise the tools of the information and educational environment for carrying out educational activities during quarantine conditions is defined. The main indicators from the all-Ukrainian survey of teachers in the general secondary education system were analysed, revealing the dynamics of teachers' digital competence development. This study presents the core content of methodological recommendations for postgraduate education, developed based on the evaluation of a self-assessment tool. The scientific novelty of this research lies in the identification of new approaches and the development of principles and methods for assessing teachers' digital competence, particularly in light of the challenges posed by prolonged quarantine and wartime conditions in the country. Conclusions are drawn regarding the continued use of the self-assessment tool for teachers' digital competence within the postgraduate pedagogical education system. Additionally, the prospects for further research are outlined.

Introduction

The use of digital technologies by teachers has become essential in today's technologically advanced society. In recent years, the need for digital competence has greatly influenced teachers' ability to organize distance learning, especially during the COVID-19 quarantine and the onset of martial law in Ukraine. Most educational and methodological materials for teachers and students are now available in a digital format, which requires responsible and appropriate usage by both educators and learners. The experience that Ukrainian teachers have gained over the past five years has become a topic of study and sharing within the pedagogical community. Special emphasis is placed on tools that help assess a teacher's proficiency with digital tools, identify existing challenges, and evaluate their readiness to implement distance learning. Creating a self-assessment tool for evaluating a teacher's digital competence is a crucial aspect of enhancing their professional capabilities and expanding opportunities for self-improvement in digital skills. The development of such a tool requires time and ongoing refinement. The experience showcased in this work represents a unique case study that has garnered interest among many teachers regarding professional development in the use of digital technologies for education. The integration of digital technologies by educators has become imperative in a contemporary, technologically advanced society. Recently, the demand for digital competence has significantly influenced educators' capacity to facilitate distance learning, particularly during the COVID-19 quarantine and the introduction of martial law in Ukraine starting from February 2022. The majority of educational and methodological resources for both teachers and students are now accessible in a digital format, necessitating responsible and appropriate utilisation by educators and learners alike. The insights gained by Ukrainian teachers over the

past five years have emerged as a focal point for study and dissemination within the educational community. There is a particular emphasis on tools designed to assess a teacher's proficiency with digital technologies, identify existing challenges, and evaluate their preparedness to implement distance education effectively. The development of a self-assessment tool for measuring a teacher's digital competencies is a critical component in enhancing their professional development and expanding opportunities for self-improvement in digital skills. The experiences documented in this work serve as a unique case study, attracting considerable attention from educators concerning professional growth in the application of digital technologies for teaching and learning.

Problem statement

The digital competence of teachers is an essential aspect of advanced training both in Ukraine and internationally. Important guidance documents emphasise the need to achieve the required level of digital literacy. Notably, the UNESCO recommendations titled "Structure of ICT Competence of Teachers" serve as a guide for the professional and advanced training of educators in utilising ICT in the educational process. This framework was developed in collaboration with key partners in the digital technology sector, including corporations such as CISCO, Intel, ISTE, and UNESCO [11]. The document contains eight components structured according to six aspects of professional teaching activity at three levels of ICT use for pedagogical purposes. These six aspects include: understanding ICT in educational policy; curriculum and assessment; pedagogy; application of digital skills; organisation and administration; and professional learning (growth) of teachers. Important recommendation documents that are important for developers of requirements for digital competence of teachers to pay attention to are the Digital Competence Framework for Citizens and the Digital Competence Framework for Educators (DigComp 2.1: Digital Competence Framework for Citizens [14], DigCompEdu) [8]. Another framework for defining a teacher's technological (digital) competencies is the three components of the so-called TPACK core, proposed by P. Mishra and M. Keller, which are effectively used in the Netherlands [9]. This framework contains three main components of technological knowledge, pedagogical knowledge and content knowledge, as well as four cross-cutting components, namely technological content knowledge, pedagogical content knowledge, technological pedagogical knowledge and technological pedagogical content knowledge. The above documents, which were taken into account by educators in the European Union, elaborate on the levels and structure of digital competence in detail, as well as provide guidelines on areas of application. It should be emphasized that such international guidelines have responded to the needs of teachers to improve their professional level in the use of digital technologies, and have contributed to the development of standards and requirements for teachers in recent years. Domestic education also needs approaches to determining the level of digital competence of teachers, and, as a result, guidelines for professional development. The presented

case study is a proposal to apply a tool for self-assessment of teacher digital competence based on international framework guidelines for further professional development. The purpose of the article is to present the stages of implementing domestic online research and justify approaches to organising the process of self-assessment of a teacher's digital competence in the context of further professional development.

Analysis of recent research and publications

The issues of assessing teachers' professional competencies among foreign researchers are considered in the works of S. Babu, R. Mendro [12]. In particular, K. Tsafilkou, M. Perifanou, and A. Economides [13] consider the issue of assessing a teacher's digital competence and offer their own case studies, using a tool for assessing teachers' digital competence in their pedagogical and professional activities in the context of a digital school and digital education. P. Mishra and M. Köhler propose to use the so-called TRASK core for assessment, which consists of three components [9]. Authors E. Perez-Navio, M. Osana-Moral, and M. Martinez-Serano argue that recent studies indicate the absence or ineffectiveness of digital competence of teachers, as well as the lack of teacher training in digital teaching [10]. Among Ukrainian researchers, the issue of assessing a teacher's digital competence is considered in their works by N. Morse, O. Spirin, O. Pinchuk, I. Ivanyuk, M. Shyshkina, Yu. Zaporozhchenko, etc. [1]; [2]. The use of digital tools by teachers in the context of comparative studies in Ukraine and abroad is studied by O. Hrytsenchuk, I. Ivanyuk, O. Ovcharuk, N. Soroko, I. Malytska, O. Kravchyna, etc. [3]. The processes of using ICT for distance learning and for improving the qualifications of teaching staff are considered in the works of scientists V. Bykov, V. Oliynyk, V. Kukharenko, E. Polat, N. Syrotenko, etc. Based on previous research and the need to develop and implement a tool for self-assessment of teacher digital competence in the context of quarantine and martial law introduced in the country, the content of such a tool was gradually developed and tested, and approaches to its use were identified.

Main findings

Teacher professional development is an ongoing learning process that enhances both teaching practices and student outcomes. When teachers utilize digital tools, this not only impacts their teaching but also helps students learn to use these tools for completing tasks, communicating, and collaborating. Moreover, teachers can gauge their understanding of digital technologies effectively by incorporating them into their classroom practice. It is the teacher's responsibility to ensure that the tools and technologies are used appropriately and correctly, while also applying suitable teaching methods. In developing a self-assessment tool for evaluating teacher digital competence, the creators recognized that teachers can best assess their skills by responding to a series of questions and articulating their vision for using technology in their classroom practice.

The development of a self-assessment tool for teacher digital competence was carried out by specialists of the Institute for Digitalization of Education of the National Academy of Sciences of Ukraine together with the State National University "Institute for Modernization of Educational Content" during 2020-2023 in several stages: development, improvement, implementation.

Stage 1 (development) – determination of the components of teacher digital competence, their reflection in the questionnaire following international standards and domestic requirements, study of existing experience in assessing teacher digital competence in Ukraine and abroad; determination of principles and approaches to compiling a questionnaire; creation of a questionnaire (questionnaire), piloting (March 27 – April 4, 2020), processing of results. 607 people were interviewed.

This work took place during the COVID-19 quarantine period, when all schools switched to distance learning, and teachers were forced to use digital tools to organise learning. Therefore, when organising the survey, the Resolution of the Cabinet of Ministers of Ukraine No. 211 of March 11, 2020, "On preventing the spread of COVID-19 coronavirus in Ukraine" was taken into account [4]. At this stage, international approaches were studied and recommendations of international organisations on the development of digital competence were analysed: materials from UNESCO, MICROSOFT, European Commission. They state that effective integration of ICT in schools and classroom learning can change pedagogy and expand students' opportunities. At the same time, teachers should have digital competence to ensure justice and equal access of children to education in order to guide students to develop skills of the knowledge society, such as critical and innovative thinking, solving complex problems, the ability to cooperate and socio-emotional skills.

The questionnaire offered to teachers included questions about their readiness and needs for using digital tools, as well as issues related to organising distance learning in practice. Teachers pointed to existing problems in organising distance learning, including: lack of clear instructions on using online tools (especially for practical psychologists, social workers, teacher assistants); low level of readiness of teachers and educational institutions for online communication in quarantine conditions; low ability to share experience among colleagues. Teachers included limited access to the Internet, lack of experience, lack of information about online tools, unclear instructions from the administration of educational institutions, lack of motivation [1], [3], [5]. Based on a survey of teachers conducted in 2020, the concept of teachers' readiness to use information and educational environment tools to carry out educational activities in quarantine conditions was defined – the attitude, motivation and awareness of pedagogical workers (teachers, heads of general secondary education institutions regarding the implementation of the educational process in general secondary education institutions with the help and through the use of digital tools in the environment created by the institution to conduct distance learning, implementing pedagogical influences on students and

performing other types of professional activities, as well as to constantly improve their professional level in this area [3].

Stage 2 (improvement) – improving the survey tool, revising its blocks, conducting the survey, identifying recommendations, and disseminating results to institutions developing educational policy (January 12 – February 28, 2021).

At this stage, the questionnaire was expanded with a block of questions on self-assessment of the teacher's digital competence level. The digital competence self-assessment tool for teachers was based on the Digital Competence Framework for Citizens (DigComp 2.1) for the first time in Ukraine [14]. Five areas of this competence were adapted from the specified framework: information and digital literacy, communication and collaboration, digital content creation, security, and problem solving. Competence assessment was carried out following the levels defined by the Digital Competence Framework for Citizens: basic user, independent user, and professional user. 1463 respondents were interviewed. Respondents noted the insufficient level of digital competence of teachers, which is manifested in the imperfect mastery of digital tools, the ability to use online platforms, etc. In open-ended responses, teachers noted the following: lack of skills for video editing and creating their educational content, imperfect mastery of online tools, low IT competence of colleagues and management, fear of new tools, low level of ICT proficiency among teachers, little practice working with digital platforms, the need to train teachers to work with different platforms, the need for master classes for teachers on conducting video lessons (technical component), etc.

Respondents' self-assessment of their digital competence level showed, in particular, that the majority can search for information at the level of an independent (44.6%) and professional (21.5%) user; assess its reliability at the level of a professional (47.1%) and independent (22.3%) user; store the information found. In the area of «Communication and Collaboration», the majority of respondents communicate using various means of communication at the level of a professional (66.7%) and independent (11.5%) user; create and manage content at the level of an independent (50.1%) and professional (22.8%) user; use online services at the level of an independent (44%) and professional (34%) user; use online collaboration tools at the level of a professional (46.7%) and independent (23%) user. 25% of respondents have a basic user level and need advanced training. Most respondents are able to create multimedia content in different formats, use various digital tools and environments at the level of basic (55.6%) and independent (38.1%) users. In the area of «Problem Solving», 12% of respondents have a professional user level, which indicates gaps in the system of advanced training of pedagogical workers that need to be improved [3].

Stage 3 (implementation) – lasted two years, during which the content and format of the teacher self-assessment tool for digital competence were adapted to war conditions, taking into account existing limitations; recommendations were

identified and results were disseminated to stakeholders (2022-2023). At this stage, methodological recommendations were developed and presented to the educational community on the use of the teacher self-assessment tool for digital competence [6]. In 2022, 54,254 people were surveyed. In 2023, 42,708 people were surveyed. In 2023, the questions were improved and adjusted in accordance with the modern needs of the educational process and changes in digital technologies. A separate block of questions was added to the questionnaire, which concerned the peculiarities of organising distance learning during the war in Ukraine. The flowchart for creating and implementing a teacher's digital competence self-assessment tool is presented in Fig. 1.

In the course of improving and implementing the self-assessment tool, a procedure was developed because preparatory measures are important for organising the use of the tool, among which informing the target audience plays a significant role [6]. The following measures can be included in informing the target audience:

- conducting consultations with representatives of educational circles, in particular, representatives of state authorities, general secondary education institutions, postgraduate pedagogical education institutions, on the place and role of procedures and format for obtaining independent and unbiased opinions of target groups (teachers, heads of institutions, pedagogical workers) on the specified topic;
- preparing and sending information messages and letters at various levels by the selected geography and target audience;
- posting the questionnaire in an accessible format, with open access to the opportunity to provide answers (for example, via Google Forms);
- publishing information about the purpose, goals and objectives of the survey in the media and electronic social networks, as well as publishing the questionnaire;
- involving the general public and stakeholders in the process of informing about the survey;
- post-publication (if necessary) of the survey results with the recommendations provided.

Obtaining reliable answers to questionnaire questions is important when conducting such surveys. Therefore, the survey was organised following developed principles that contributed to obtaining reliable data.

- voluntariness;
- anonymity and confidentiality;
- absence of administrative influence;
- openness and accessibility for teachers (distribution through online communities, pages of postgraduate education institutions and professional development centers);
- responsibility for providing answers;
- focus on the urgent needs and problems of respondents;

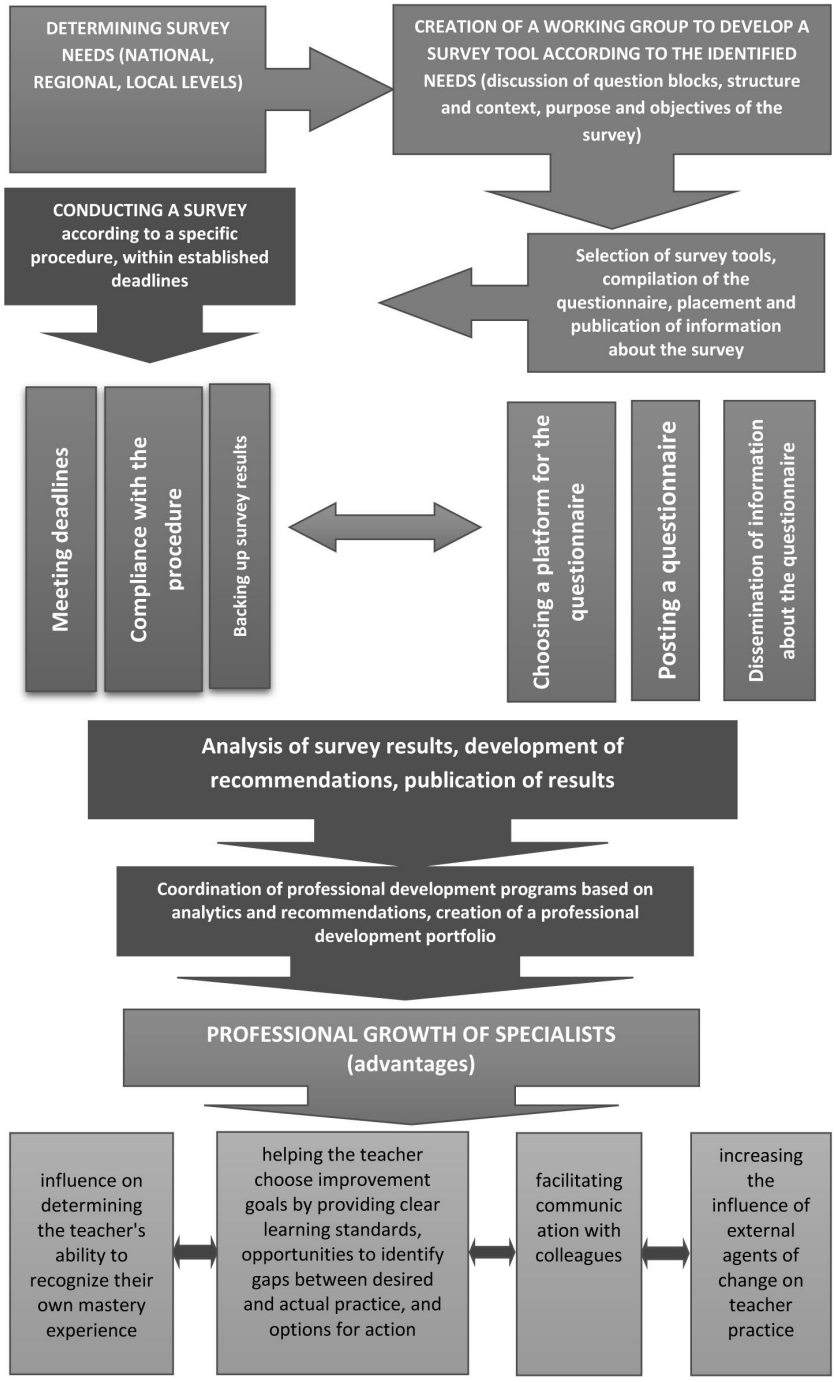

Fig. 1. Flowchart for creating and implementing a teacher's digital competence self-assessment tool (source: developed by the author)

- availability of open questions for expressing personal attitudes to the problems under study;
- consideration of the conditions in which respondents find themselves;
- adherence to professional ethics, etc.[5]

The survey took into account the limited access of respondents to online tools. It was also taken into account that during the period of quarantine restrictions and martial law in the country, a significant number of resources for teachers were developed and made publicly available. The emergence of new requirements and instructions for conducting distance learning, the development of methodological recommendations for teachers, led to the reorganisation of the activities of educational institutions and the emergence of new distance learning plans and development strategies for schools and other educational institutions, including postgraduate pedagogical education institutions. A significant number of advanced training courses on the use of digital teaching tools in lessons have appeared in the postgraduate pedagogical education system.

Despite this, the overall dynamics of increasing the level of digital competence of teachers remains quite moderate, teachers continue to use a limited range of ICT tools and resources. As was the case in 2022, in 2023, teachers are not actively creating their own digital resources, remain passive in most measures for the safe use of digital resources, do not have the skills to protect devices and personal information, etc.[5]The issue of building teachers' capacity and supporting them in mastering new methods of using ICT remains insufficiently resolved. Teachers continue to express their own expectations regarding their support from educational institutions and the state, especially during the war, where not the least is the lack of time to prepare for online lessons and for self-education, and insufficient material and technical support for the educational process in a distance format.

It should be noted that it was during this period that the Ministry of Digital Transformation introduced its "Digigram" tool for citizens and teachers (https://osvita.diia.gov.ua/digigram), which is also based on the use of the DigComp 2.1 Digital Competence Framework for Citizens, which indicates the commonality of approaches to developing similar tools for assessing/monitoring digital competence. At the same time, the SELFIE self-assessment tool for digitalisation of educational institutions (https://education.ec.europa.eu/selfie) was piloted in Ukraine, organised with the support of the European Research Center of the European Commission (JRC). It should be noted that the SELFIE tool does not aim to measure and assess the knowledge and skills of users, nor is it a tool for certifying educational institutions, and therefore, it should be used only for self-analysis and planning further areas of self-improvement and advanced training. The above-mentioned initiatives confirm the relevance of creating and using tools to determine the level of awareness of the educational community in digital technologies.

Conclusions

Summing up the results of the testing and implementation of the teacher's digital competence self-assessment tool, which took place thanks to the efforts of specialists from the Institute for Digitalization of Education of the National Academy of Sciences of Ukraine and the State National University "Institute for Modernization of Educational Content" in 2020-2023, it should be noted that modern Ukrainian teachers devote a significant part of their time to studying and using digital tools to organize the educational process. During 2020-2023, the developers of the self-assessment tool identified approaches to assessing teacher digital competence, developed a questionnaire, conducted four online surveys, and developed recommendations for the development of teachers' digital literacy, taking into account quarantine restrictions and wartime. The results of the surveys revealed some progress in the development of teachers' digital competence, as well as gaps and problems that schools and the domestic education system in general are currently facing.

The study took into account the existence of other tools for analysing the use of ICT by teachers, including "Digital", "Selfie", etc. However, the experience presented is distinguished by its nature of self-assessment of one's digital competence with the prospect of its further improvement. Also, during the study, methodological recommendations were developed, published and disseminated on the use of a tool for self-assessment of a teacher's digital competence in the system of postgraduate pedagogical education. Having considered the experience existing in foreign educational systems, it is worth noting the variety of tools for assessing and analysing the processes of using ICT in educational institutions, which are built on the basis of the best global, in particular European, framework recommendation documents. That is why the prospects for further research are seen as studying the best practices for developing teachers' digital competence, finding effective solutions, as well as issues of integrating digital technologies into the system of professional training of teachers in the context of lifelong learning.

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