



DEGREE OF READINESS OF TEACHERS IN UKRAINE TO USE ICT IN THEIR PROFESSIONAL ACTIVITIES: 2019–2022

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Abstract: *The article presents a comparative analysis of Ukrainian teachers' readiness to incorporate ICT into their professional activities. It presents the results of a longitudinal study that began before the Covid-19 pandemic, continued during the pandemic and after it, including a series of teacher surveys. The article explores changes in teachers' attitudes toward digital tools during this period; shows the dynamics of the expansion of tools and assesses changes in teachers' self-assessed ICT competence. Additionally, it identifies the digital resources for the implementation of professional functions, most favoured by Ukrainian teachers. Statistical analysis revealed that, following the implementation of distance learning, 1.4% of teachers reported high-level ICT competence, while 2.1% reported sufficient competence. However, a considerable 14.6% rated their ICT competence as inadequate. This period of distance learning unveiled gaps in teachers' ICT proficiency, prompting a more accurate assessment of their ICT competence. The study demonstrates that, based on the needs of full-time, distance and blended learning, teachers increasingly rely on ICT tools for lesson preparation, interactive content development, and student progress monitoring, facilitated by digital services offering virtual classrooms and electronic journals. Obviously, the demand for ICT tools is greatest in the context of distance learning. However, even during onsite education, Ukrainian teachers widely use digital resources.*

Keywords: ICT competence of teachers, digital content in education, face-to-face, distance and blended learning

INTRODUCTION

From 2020 to 2023, the integration of ICT tools into the Ukrainian education process evolved significantly. Over several consecutive years, Ukrainian schools implemented face-to-face, distance and blended learning approaches. It is evident that distance learning cannot be achieved without teachers possessing ICT skills. Therefore, for the successful execution of professional activities, teachers must be familiar with ICT tools and possess information and digital competence. When referring to ICT (information and digital) competence of a teacher, we understand their ability to solve standard and problematic tasks that arise in professional activities using ICT tools. The basis of ICT competence is the teacher's awareness of the existence of digital resources for performing work functions, their knowledge, skills and competences in specific online services and platforms.

The purpose of the article is to analyze the results of a longitudinal study of the readiness of primary school teachers to use ICT in their professional activities during the period preceding before the Covid-19 pandemic, and after the pandemic but before the start of the war in Ukraine.

The research questions addressed in this study include:

1. to compare the level of ICT competence among primary teachers before the pandemic period (hereinafter referred to as BPP) and the post-pandemic period (hereinafter referred to as PPP);
2. to compare the list of services that teachers worked with during the BPP and PPP;
3. to find out and compare the difficulties encountered by teachers in using these services during the BPP and PPP.

Research hypothesis: the transition to distance education has led to an increase in the level of ICT competence among primary school teachers.

Research methods: general scientific logical methods (including analysis, synthesis, comparison, generalisation), empirical methods (involving literature study, pedagogical observation, surveys using Google Forms), and mathematical processing techniques (for determining percentages and arithmetic means).

1. STATUS OF READINESS OF PRIMARY SCHOOL TEACHERS FOR THE APPLICATION OF ICT IN FACE-TO-FACE EDUCATION (BPP)

Research by Ukrainian and foreign scientists convincingly proves that ICT is widely implemented by teachers in professional activity. Analyzing changes in the use of ICT in Bulgarian schools over the decades, scientists have identified various digital tools that were employed in the educational process until 2018. These include interactive whiteboards, computers, educational games, and even augmented and virtual reality (Terzieva, Paunova- Hubenova, Dimitrov, & Dobrinkova, 2018). Further-

more, scientists emphasize the appropriate use of interactive whiteboards, tablets, digital educational materials, advanced audiovisual technologies, electronic learning systems, webinars and multimedia presentations in the educational process. Czech researchers found that teachers, although aware of the need for further integration of ICT into the educational process, use ICT without the necessary training (Klement, & Klementova, 2016). Romanian teachers also recognize the advantages of using ICT in educational activities, but they rank ICT competence as one of the least important competences they wish to improve (Popa, & Bucur, 2015).

In 2019, Bulgarian scientists conducted a study on the integration of ICT tools in the process of face-to-face learning. It was established that only 56% of teachers had the necessary technical equipment, 53% had access to special software, 50% had e-learning resources, 55% had access to fast Internet. The teachers mostly used computers, projectors, educational websites and e-textbooks. In terms of using educational content created with the help of ICT, the majority of teachers preferred presentations, educational videos, electronic textbooks, specialized software, additional electronic resources. Difficulties arose when using electronic tests, educational games, virtual laboratories and simulations. Teachers attributed their low level of ICT competence to the absence or insufficient number of relevant ICT courses. They also noted that the available courses and internships in the field of ICT are characterized by insufficient practical orientation of the material (Terzieva, Paunova-Hubenova, Dimitrov, & Boneva, 2020).

Slovak researchers encountered similar issues and emphasized that most accredited courses are aimed at obtaining elementary or advanced skills in working with digital technologies, mainly addressing technological aspects (Zahorec, Haskova, & Munk, 2019). Czech researchers also emphasized that teachers need courses aimed at providing not technological, but methodical guidance for ICT implementation, offering methodical recommendations and specific examples of using ICT in specific lessons, etc. (Neumajer, 2012). In conclusion, there are studies by foreign scientists regarding the expediency and state of ICT use by teachers in the educational process even before the Covid-19 pandemic, particularly in the context of face-to-face education. These studies indicate that teachers understand the importance of introducing ICT in the educational process, but they need professional guidance to enhance their ICT competence. Obviously, the question of how the results of the survey of European teachers align with the results of the survey of Ukrainian teachers regarding the use of ICT in professional activities up to March 2020, before the pandemic, is of great interest.

In the spring of 2019, we conducted a survey of primary school teachers (Skvortsova, Britskan, 2019). Based on the obtained results, we can state the following:

1. regarding the availability of experience in using ICT in professional activities: it was found that 100% of respondents possessed computer skills and experience in using ICT in their professional activities.
2. as for teachers' self-assessment of ICT proficiency, 15.5% of respondents considered themselves highly competent, 26.3% – good, 15.5% – average, 20.0% – insufficient, and 22.7% as having no ICT competence. It should be noted that these levels are based on self-assessments encompassing skills such as working with the file system, text editing, creating presentations, perform-

ing calculations using Excel, processing graphic images, installing necessary software, working with e-mail, working with the Internet, creating websites, blogging and working in professional online services (Skvortsova, Britskan, 2019). In general, these results generally correlate with the results of the study (Terzieva, Paunova-Hubenova, Dimitrov, & Boneva, 2020) regarding the self-assessment of ICT competences among Bulgarian teachers.

3. in terms of how teachers acquired ICT competence, 10% of respondents reported gaining it during their higher education; 50% – through participation in seminars, methodical meetings and training; and 40% – independently.
4. most teachers recognized the need for ICT in the education of modern junior high school students: most teachers agree that it is necessary to implement ICT in the education of modern schoolchildren. In particular, 90% of respondents believed that it is appropriate to use educational games, 70% preferred multimedia presentations, 80% saw value in interactive exercises, 70% in educational videos and audio recordings, 80% in educational programs, 60% in tests and quizzes. Comparing the results of our study with those of Bulgarian scientists (Terzieva, Paunova-Hubenova, Dimitrov, & Boneva, 2020), we observed that teachers prioritize the use of ICT in preparing presentations for lessons and educational videos. Bulgarian teachers also reported difficulties in using electronic tests, educational games, virtual laboratories and simulations, while 60% of Ukrainian teachers preferred tests and 80% favoured interactive games.

It should also be noted that Ukrainian respondents' recognition of the advantages of using ICT in educational activities correlate with the results of a survey of Romanian and Czech teachers (Popa, & Bucur, 2015; Klement, & Klementova, 2016), which revealed that teachers were well aware of the need for further implementation of ICT in the educational process.

5. regarding teachers' understanding of the feasibility of using devices in the education of younger schoolchildren, in particular in the process of learning mathematics: 70% of respondents considered it necessary to use devices for interactive tasks via online services. However, many respondents noted a lack of information about the peculiarities of teaching mathematics to junior high school students using modern devices.

Therefore, the survey results indicate that primary school teachers have a certain level of ICT competence. But most teachers need methodical help to improve it. This is confirmed by the fact that 100% of the surveyed teachers are ready to work on improving their ICT competence, particularly in creating educational interactive content.

In March 2020, we conducted the following survey of primary school teachers regarding the use of ICT in professional activities (Skvortsova, Ishchenko, Britskan, 2020).

Comparing the results of the 2019 teacher survey, we noted an increase in the number of respondents who acquired ICT competence while studying at a higher education institution, from 10% to 22%. At the same time, the percentage of teachers who improved the relevant skills and abilities through seminars decreased, from 50% to 44%.

Regarding the reasons inhibiting the introduction of ICT in professional activity, 66% of teachers cited issues with indicated that they have problems with the material support of the class; 24% mentioned the excessive saturation of educational material; 18% felt psychologically unprepared for ICT integration; 64% lacked sufficient time for ICT implementation, and 70% indicated insufficient knowledge about ICT.

Regarding the ways of using ICT in professional activities, 93% of respondents reported printing materials for classes on a computer; 96% – searched for educational information on the Internet; 98% conducted lessons using computer equipment; 62% used ICT in project activities; and only 24% of respondents created educational and gaming content using Internet resources. So, in the pre-pandemic period, we had a small percentage of teachers who saw online services as opportunities to create interactive exercises for students.

It should be noted that the obtained results correlate with the findings of a questionnaire survey of Bulgarian teachers. The vast majority of them used computers, projectors, educational websites and e-textbooks, while a minority of teachers used multimedia tools, e-references, e-resources and educational games (Terzieva, Paunova-Hubenova, Dimitrov, & Boneva, 2020).

In 2020, before the Covid-19 pandemic, our data indicated that 98% of teachers already worked with scientific and methodical literature available on the Internet, and 73% of teachers attended Internet webinars; (Skvortsova, Britskan, & Haievets, 2020). Therefore, even before the introduction of distance learning, Ukrainian teachers were widely using ICT quite widely in their professional activities.

6. regarding digital resources used by teachers in their professional activities, 20% of teachers were introduced to platforms for creating electronic journals and diaries; 73% participated in Internet webinars; 24% were familiar with online services for creating educational and game content; 33% used social networks in their professional activities, or created their own sites and blogs. In 2019, while 90% of teachers considered it appropriate to use educational games, 70% opted for multimedia presentations, 80% preferred interactive exercises, 70% found value in educational videos and audio recordings, 80% in educational programs, 60% in tests and quizzes. It is important to highlight that, despite their lower ICT competence, Ukrainian teachers still valued interactive games, but had mainly low level of ICT competence (Skvortsova, Britskan, 2019), then in February 2020, 84% of teachers indicated that they independently work on improving their ICT skills, and even before the introduction of distance learning, 20% of respondents used platforms for creating electronic magazines and diaries, only 24% – had experience of independent creation of educational and game content using Internet resources, and the most popular among teachers were online services LearningApps and Google Forms (Skvortsova, & Britskan, 2021). It is important that 98% of primary school teachers in Ukraine used ICT to conduct lessons even before the Covid-19 pandemic. In conclusion, the results of surveys conducted in the pre-pandemic period – until March 2020, indicate that primary school teachers in Ukraine possess

basic ICT knowledge and skills. However, many teachers lack the skills to work with online services for creating educational and game content (Skvortsova, Ishchenko, Britskan, 2020). Nevertheless, there is a clear understanding among these teachers of the role of ICT in improving the effectiveness of the educational process (Skvortsova, Britskan, 2019; Skvortsova, Ishchenko, Britskan, 2020; Skvortsova, Britskan, & Haievets, 2020).

2. STATE OF READINESS OF PRIMARY SCHOOL TEACHERS TO USE ICT IN THE DISTANCE EDUCATION PROCESS

The relevance of ICT utilization in the teacher's professional activity emerged in March 2020, in connection with the transition of educational institutions to distance learning, due to the initial outbreak of the Covid-19 pandemic, and subsequently, the full-scale war in Ukraine.

Distance learning, whether in synchronous or in asynchronous modes, cannot be implemented without ICT-based means. It is evident that teachers must increasingly integrate ICT into their professional duties. Let us explore how teachers' readiness to use ICT in their professional activities has evolved based on data from Ukrainian and foreign researchers.

The analysis of the results of an all-Ukrainian survey conducted by the National Academy of Pedagogical Sciences of Ukraine provides ample evidence that when selecting tools for organizing distance learning in educational institutions, 88.2% of respondents favoured Viber, 62.7% preferred the website of the educational institution, 45.5% chose Google Classroom, 42.7% picked "Na Urok", 37.7% used Skype, 28.5% opted for Zoom, 20.9% utilized Telegram, 2.4% selected ClassDojo, 18.5% went with "My Class", 16.2% used Google Disk, 13.3% employed WhatsApp, 10.3% depended on Electronic diary, 6.2% relied on Classtime, 4.7% used Microsoft Teams, 3.4% chose Moodle, 2.9% preferred Google Meet. Notably, researchers have observed that teachers have begun to explore new online tools and look for user-friendly educational platforms to facilitate group distance learning. Among the main obstacles to the implementation of ICT, limited access to the Internet was identified – 35.2%; a lack of experience – 58.7%; unfamiliarity with online tools – 20.2%; unclear guidance from school administration – 10%; and insufficient motivation – 7.8%. Respondents have also identified constraints unrelated to the education system, such as network congestion, students' limited internet access, unprepared parents, and inadequate technical support and equipment at home, etc. (Ovcharuk, & Ivaniuk, 2020). The results of a study conducted by Spanish scientists (Panos-Castro, Arruti, & Korres, 2022) investigating ICT usage in primary schools during the pandemic indicate an insufficient level of teacher preparedness for the use of ICT, despite educational policies aimed at introducing ICT in schools. Survey findings show that the majority of respondents independently acquired the skills they needed to use ICT. These surveyed teachers expressed interest in lifelong learning programs featuring tools like Google Classroom, Google Sites and Google Meet, among others.

Portuguese primary and secondary school teacher training, along with the challenges faced during the pandemic were the focal points of research by Henriques, Correia and Dias-Trindade (2021). Their survey results indicate that already 67.7% of teachers have received adequate training in using digital resources and learning environments. Anishchenko et al. (2021, p. 130) reported that during the pandemic, Ukrainian teachers mainly used such resources as “Na Urok” (74.4%) and original lessons on YouTube channel (75.8%) for lesson preparation and delivery. Additionally, “Universal Education” (64.6%), “All-Ukrainian School Online” (38.7%), EdEra (33.3%), materials from teachers’ blogs (28.4%), open online lessons (27.2%), Learning.ua (24.7%), Prometheus (19.85%) were commonly used. In summary, the results of the study in 2021 align with the results of the all-Ukrainian online survey conducted in 2020 (Ovcharuk, & Ivaniuk, 2020).

In general, the research results on platform choices for the organization of distance education in mathematics, as conducted by M. Burda and D. Vasylieva (Burda, & Vasylieva, 2021, p. 4), also correlated with these data. Thus, in 2020, digital resources preferences among mathematics teachers were as follows: “Na Urok” (63.6%), “Vseosvita” (44.3%), “My Class” (35.5%), LearningApps (25.1%), GIOS (21.3%), Classtime (19.8%), EdEra (12.9%), Prometheus (9.9%), Khan academy (4.4%), ILearn (3.9%), Matific (2.8%), Mozaik (2%), Notably, 9% of the surveyed teachers reported not using any platforms.

Encouragingly, positive trends were observed in 2021. For example, “Na Urok” was selected by 80.7% compared to 63.6% in the previous year, “Vseosvita” by 60.5% compared to 44.3%, LearningApps by 41% compared to 25.1%, Matific by 5.5% (up from 2.8%), ILern by 4.6% (up from 3.9%). However, there was a decrease in the popularity of some resources, including “My Class” (26.5% compared to 35.5%), GIOS (12.5% from 21.3%), Classtime (16.9% from 19.8%), EdEra (10.3% from 12.9%), Khan academy (3.2% from 4.4%), Mozaik (1.8% from 2%). The percentage of teachers who did not use any platforms decreased from 9% to 7.4% (Burda, & Vasylieva, 2021). In the context of our research, it is noteworthy that teachers’ responses regarding how mathematics is taught in elementary, basic and specialized education in Ukraine during the 2020-2021 academic year are of particular interest. Researchers found that 16.9% of teachers always create interactive tasks using various online services, while 70.9% do so occasionally. However, 11.9% do not independently develop educational content using software tools. This suggests that these teachers may not have yet mastered the necessary digital skills (Skvortsova, Ishchenko, Halitsan, & Haievets, 2022). In the same academic year, in the fall of 2020, we conducted an online survey of primary school teachers regarding their use of online services (Skvortsova, & Britskan, 2021). Summarizing the results, we reached the following conclusions:

1. the LearningApps service is the most popular for creating interactive exercises, with 82% of teachers being aware of it. However, only 21% of teachers use it in their work. In contrast, only 16% of teachers are aware of Liveworksheets services, with a mere 4% using them. Likewise, 9% of teachers know about Wizer.me, but only 0.8% use it.

It should be noted that in the study conducted by Skvortsova, Ishchenko, Halitsan and Haievets (2022), 74.7% of elementary school and mathematics

teachers used the LearningApps service to create interactive exercises. This aligns with the percentage of elementary school teachers aware of the service. However, in the fall of 2020, only 21% of elementary school teachers used it.

2. A mere 6% of teachers are aware of services for creating educational videos, in particular H5P, and only 0.8% of teachers use H5P.

Our data indicates that services for creating educational videos are not widely adopted among primary school teachers. However, a slight improvement was observed in a subsequent survey by Skvortsova, Ishchenko, Halitsan and Haievets (2022), in which 14.9% of mathematics and primary school teachers use the Learnis service.

Furthermore, mathematics and elementary school teachers also use programs for preparing and editing video tasks: Movavi (46.7%), iMovie (21.8%), Learnis (16.9%), Camtasia (9.6%), Thinglink (6.1%), and 18.4% of teachers are not familiar with the listed software.

3. as to presenting educational content on a virtual whiteboard, 50% of primary school teachers know that they can use the Padlet service, while 4% of teachers preferred Lino.it. Nevertheless, only 16% of teachers among the 50% who are aware of this service use the Padlet virtual whiteboard in their work, and only 2% of teachers among the 4% use Lino.it (Skvortsova, & Britskan, 2021). The percentage of primary school teachers aware of the Padlet virtual board is notably lower in our survey than in a study by Skvortsova, Ishchenko, Halitsan and Haievets (2022), which reported 55.2% awareness among mathematics and primary school teachers, compared to 16% in our survey. This discrepancy may be attributed to the time gap between the surveys (approximately one year) and the likelihood that mathematics teachers are possess a higher level of ICT competence compared to elementary school teachers.

In summary, the analysis of the 2020 research results indicates an insufficient level of online service use by Ukrainian primary school teachers, even with the transition to distance learning. These findings, however, do not directly reflect their ICT competence. However, the majority of primary school teachers are eager to acquire and develop ICT competence, recognizing the additional effort it will require.

Our experimental data align with the research conducted by Manzano-Sánchez, Valenzuela and Hortiguera-Alcala (2021), who studied educational systems and actions in pandemic conditions. They emphasized the need for support not only for teachers but also for parents in setting up digital devices to facilitate effective distance learning. In order to enhance the ICT competence of primary school teachers, with an emphasis on online services in mathematics teaching, we developed and conducted two electronic courses on the Zmist.ua website.

Between November and December 2021, we conducted an online survey of primary school teachers in Ukraine who were aware of these electronic courses. The results of this research (Skvortsova, Britskan, Symonenko, Haievets, 2022) show the following:

1. 77.3% of respondents completed the electronic course in its entirety or covered separate topics, while 22.7% of respondents did not participate in any webinar;
2. to create interactive exercises in mathematics, respondents preferred LearningApps, Liveworksheets, Wizer.me, H5P, Kahoot, Mozabook, Wordwall,

Google Forms, Miksike, and the online platforms “Vseosvita” and “Na Urok”. However, 17.7% of respondents indicated that they do not create interactive exercises prior to lessons.

Regarding the selection of services for creating interactive sheets, the survey results for the 2021-2022 academic year indicate positive trends, compared to the 2020-2021 survey. For instance, 44.6% of teachers now opt for the Liveworksheets service, whereas only 4% did so in the previous survey. Additionally, 8.8% have chosen Wizer.me, up from 0.8% in the previous survey. We can conclude that the percentage of teachers who choose these online services is growing. These findings affirm the value of introducing future teachers to the creation of interactive exercises using Liveworksheets and Wizer.me.

Regarding the creation of educational videos, the data show the following results: 62.4% chose MS Power Point; 46.8% preferred Zoom; 26.3% opted for screen recording programs; 4.9% utilized Skype, 5.4% chose other services, indicating Google Meet, Screencastify, Vegaspro and Kinemaster; 11.2% pointed out that they do not create an educational videos. Additionally, teachers self-assessed their competence in using selected services for creating educational videos, with results indicating 0 points (5%); 1 point (2.5%); 2 points (5.9%); 3 points (22.3%); 4 points (42.1%); 5 points (22.3%). Results for the selection of online services for creating interactive videos differed slightly: 20.2% chose Learnis; 6.1% selected Edpuzzle; 4% preferred H5P, 33.3% opted for other services and 50% reported not creating interactive videos. Similarly, teachers self-assessed their competence in using selected services for creating interactive videos, resulting in 0 points (26.3%); 1 point (7.5%); 2 points (6.5%); 3 points (28.5%); 4 points (22.6%), and 5 points (8.6%).

In comparison to the previous survey, the range of online services for creating educational and interactive videos has expanded. There has also been a positive shift in the use of the Learnis service, increasing from 2% to 20.2%, and H5P, rising from 0.8% to 4%. Consequently, the range of services used by primary school teachers for video content creation is broadening.

Regarding the selection of online services for presenting educational material on a virtual whiteboard, during the 2021–2022 academic year, 66.8% of respondents chose the Padlet service, compared to 16% of teachers who used this service in the 2020–2021 academic year. Moreover, there is a positive trend regarding the Lino. it service, which is now being used by 8.3%, compared to 4% of teachers who were only aware of its existence in the 2020–2021 academic year. It should be noted that 5.9% of respondents chose other services, indicating Notebook, Wordwall and Jamboard, and 4.4% mentioned WikiWall; 26.3% indicated that they do not create virtual boards. Teachers self-assessed their competence in using these selected services, revealing 0 points (14.6%); 1 point (3.5%); 2 points (7.5%); 3 points (22.1%); 4 points (32.2); 5 points (20.1%) (Skvortsova, Britskan, Symonenko, Haievets, 2022).

In summary, the analysis of the survey results in Table 1 confirms that Ukrainian primary school teachers are committed to integrating ICT into their professional activities and have a desire for further development of acquired competencies in using online services.

Table 1. Teachers' choice of digital resources in the pandemic period

Digital resources	Research by scientists					
	Ovcharuk, & Ivaniuk, 2020	Burda, & Vasylieva, 2021	Anishchenko et al., 2021	Skvortsova, & Britskan, 2021	Skvortsova, Ishchenko, Halitsan, & Haievets, 2022	Skvortsova, Britskan, Symonenko, Haievets, 2022
„Na Urok”	42.7%	63.3%	74.4%	–	–	–
„Vseosvita”	–	44.3%	64.6%	–	–	–
„My Class”	18.5%	35.5%	–	–	–	–
LearningApps	–	25.1%	–	21%	74.7%	78.1%
GIOS	–	21.3%	–	–	–	–
Classtime	6.2%	19.8%	–	5%	–	–
EdEra	–	12.9%	33.3%	–	–	–
Prometheus	–	9.9%	19.85%	–	–	–
Khan academy	–	4.4%	–	–	–	–
Ilearn	–	3.9%	–	–	–	–
Matific	–	2.8%	–	3%	–	–
Mozaik	–	2%	–	–	–	–
Author's lessons on YouTube	–	–	75.8%	–	–	–
„All-Ukrainian School Online”	–	–	38.7%	–	–	–
Materials from teachers' blogs	–	–	28.4%	–	–	–
Open online lessons	–	–	27.2%	–	–	–
Learning.ua	–	–	24.7%	4%	–	–
Google Classroom	45.5%	–	–	37%	–	–
Skype	37.7%	–	–	6%	–	–
Zoom	28.5%	–	–	91%	–	–
ClassDojo	2.4%	–	–	9%	–	–
Microsoft Teams	4.7%	–	–	0.8%	–	–
Google Meet	2.9%	–	–	13%	–	–
Moodle	3.4%	–	–	–	–	–
Liveworksheets	–	–	–	4%	–	44.6%
Wizer.me	–	–	–	0.8%	–	8.8%
H5P	–	–	–	0.8%	0.8%	4%
Padlet	–	–	–	16%	55.2%	66.8%
Lino.it	–	–	–	2%	–	8.3%
Learnis	–	–	–	2%	14.9%	20.2%

Source: Own work.

3. RESULT AND DISCUSSION

The solution of the research question, comparing the results of research on the use of ICT by primary school teachers in professional activities during BPP and PPP, leads to the following conclusions:

1. The development of ICT competence in both BPP and PPP has shown significant changes. Our research results are presented in Table 2, illustrating the dynamics of self-assessment by elementary school teachers. Our data analysis shows that in the BPP teachers who self-assessed their ICT competence with the highest scores showed overconfidence, whereas in the PPP, teachers were able to objectively assess their ICT skills and recognized the lack of knowledge in the field of ICT. The number of teachers assessing their own ICT competence at a good level increased by 2.1% and at an average level by 6.6%. At the same time, the number of teachers who assessed their ICT competence as insufficient decreased by 10.2%, and the number of teachers with zero ICT competence increased by 4.6%. These findings indicate that it was during the PPP that primary school teachers, implementing distance learning, identified their ICT skill gaps and objectively assessed the level of their ICT competence formation.

Table 2. Dynamics of formation ICT competences of teachers of Ukraine in the BPP and PPP

ICT Competence level	BPP	PPP	Augmentation
High	15.5	12.4	-3.1
Good	26.3	28.4	+2.1
Average	15.5	22.1	+6.6
Insufficient	20.0	9.8	-10.2
Absent	22.7	27.3	+4.6

Source: Own work.

2. In the PPP, Ukrainian teachers will expand the range of services for creating interactive exercises, mastering those with which they were familiar, as well as new services. If in BPP only 24% of teachers in private schools created interactive tasks in LearningApps and Google Forms services, then in PPP 82.3% of teachers mastered services for creating interactive exercises, namely: LearningApps, Liveworksheets, Wizer.me, H5P, Kahoot, Mozabook, Wordwall, Google Forms, Miksike, and the online platforms “Vseovista”, “Na Urok”.
3. If primary school teachers in Ukraine encountered certain difficulties in creating and using electronic tests, educational games, virtual laboratories and simulations during BPP, then in the PPP they mastered services for creating tests (in particular, Google Forms, Classtime, Plickers).

Consequently, the transition to distance learning due to Covid-19 had a positive effect on the development of ICT competence among primary school teachers in Ukraine. They particularly excelled in mastering new services for creating educational inter-

active content, often by participating in courses focused on the use of ICT in professional activities.

If we compare the results we obtained with the results of a study by Mexican researchers (Leon-Valdez, Garcia-Lopez, & Cuevas-Salazar, 2021), which explored related aspects we find that we have obtained slightly worse results regarding the completion of courses on the use of ICT in professional activities and regarding the ICT competence of Mexican primary school teachers in 2021 year, namely:

1. 40.7% of Mexican primary school teachers had never attended any ICT courses, whereas 44.7% had completed one or two courses, 12.7% – three or four, 2% – five or more (Leon-Valdez, Garcia-Lopez, & Cuevas-Salazar, 2021). 49% of Indonesian mathematics teachers indicated that they knew about the specifics of ICT use through attending trainings and reading specialised literature (Fathurrohman, Nindiasari, Anriani & Pamungkas, 2021). In contrast, 77.3% of Ukrainian primary school teachers had completed at least one electronic course on the use of ICT in educational activities (Skvortsova, Britskan, Symonenko, Haievets, 2022).
2. in terms of conditions for working with ICT, 40.1% of Mexican teachers noted that the institution always had computer equipment (Leon-Valdez, Garcia-Lopez, & Cuevas-Salazar, 2021). As can be seen, material and technical support in Mexican schools in the private sector is worse than that of private schools in Bulgaria, 56% of respondents noted (Terzieva, Paunova-Hubenova, Dimitrov, & Boneva, 2020). The situation with material and technical support for the educational process is also better in Ukraine (Anishchenko et al., 2021).
3. as for the use of ICT, 70.41% of Mexican teachers indicated that they always used a computer for school-related tasks, such as planning, activities, presentations, etc. (Leon-Valdez, Garcia-Lopez, & Cuevas-Salazar, 2021) compared to 78% of Ukrainian teachers, who constantly used ICT in their professional activities, while 22% used it periodically. Notably, Italian researchers studying distance education, including primary school teachers, highlighted the use of technology for creating educational content, primarily among primary school teachers and those taking advanced training courses. In contrast, secondary school teachers, mainly in the humanities, attach more importance to factors related to assessment and lesson quality (Menabò, Skrzypiec, Sansavini et al., 2022).

CONCLUSION

The analysis of both domestic and foreign studies shows that the forced transition to distance, online and blended learning compelled teachers to enhance their ICT competence. Consequently, the research hypothesis is confirmed. Teachers mastered ICT tools either independently, including by watching specialized webinars, participating in master classes, and enrolling in relevant courses.

Moreover, teachers' self-improvement in the field of ICT was primarily aimed at mastering basic tools, programs, and services crucial for facilitating distance learning (Google Meet, Zoom, Google Classroom, ClassDojo, etc.). Therefore, most teachers

stopped at this stage, where they secured a fundamental toolkit for their ICT skills. However, there are also teachers who went beyond the basics, enriching their repertoire of services with platforms enabling the creation of interactive content in various formats. Mastering such services requires advanced knowledge in the field of ICT and relevant technical and methodological skills. As a result, there is a pressing need for higher education institutions to prepare teachers for the use of ICT during their professional training.

Therefore, it becomes evident that primary school teachers are primarily directing their attention towards the effective organization of the learning process (face-to-face, distance, blended) using ICT tools and enriching lessons with videos and interactive content.

The potential for further research lies in studying changes in the selection of online services by primary school teachers.

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