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Developing digital competence of secondary school teachers through training sessions

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Abstract. This paper explores using training sessions as an effective approach to developing digital competence among secondary school teachers. Technology-focused training sessions were conducted with teachers across disciplines, demonstrating tools like Kahoot, LearningApps, Mentimeter, and more. Pre- and post-training surveys measured self-reported digital competence, with most teachers moving from "sufficient" to "high" competence after participating. The training sessions allowed teachers to learn new skills hands-on while experiencing tools from a student perspective. This method shows promise for continuously improving teachers' ability to leverage technology for engaged learning, which is especially vital in the age of remote instruction. More research is warranted on training impacts and optimal session design.

Keywords: digital competence, teacher training, secondary education, online tools, distance learning

1. Introduction

The rapid development of information and communication technologies (ICT) has transformed education systems worldwide. As concepts like digital literacy and e-learning gain prominence, teachers play a pivotal role in developing students' technology skills and leveraging ICT to enhance learning. However, many teachers lack the digital competence to integrate technology into their practice effectively. This "digital divide" between students and teachers continues to widen as technology relentlessly evolves.

As stated in the Concept of the New Ukrainian School, one of the tools to ensure success is the end-to-end application of information and communication technologies in the educational process. In particular, it is emphasized that "the introduction of ICT in education should move from one-time projects to a systemic process that covers all activities. ICT will significantly expand the teacher's capabilities and optimize management processes, thus forming important for our

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century technological competencies in the student" [7]. All this indicates that modern society needs a teacher with relevant knowledge and can qualitatively meet the educational needs of consumers of educational services using advanced pedagogical information and communication technologies.

However, it should be noted that this is possible only if the teacher is constantly updating his/her knowledge and skills development to teach qualitatively, but at the same time, as noted in the National Report on State and Prospects of Education Development in Ukraine, to learn continuously when "education becomes a means to the aim of human development, which allows to establish its leading role, the purpose of which is to form the skills necessary to perform various functions – self-expression, self-realization, development of social relations and ability to act" [14].

The active use of information and communication technologies by the subjects of the educational process contributes not only to the informatization of the education system [8] but also to the growth of professional competencies of teachers [3]. One of the professional competencies that should be formed in the teacher of secondary education institutions is competence in the field of information technology, the development of which is carried out through the use of integrated didactic systems, computers, Internet resources and distance learning [5, 10, 17, 19].

The Law of Ukraine "On Education" defines *competence* as "a dynamic combination of knowledge, skills, thinking, attitudes, values, other personal qualities that determine a person's ability to socialize successfully, conduct professional and/or further educational activities" [31].

Regarding the definition of competence in information technology, there was no unambiguous approach until recently. Scientists often use a variety of terminology: "information competence", "informational competence", "information-digital competence", "digital competence", "information-communication competence", etc. The term "digital competence" has recently become more widely used by scholars. It first appeared in international documents and is widely used in foreign countries.

The issues of digital competence were covered by Berezhna, Zaiets and Shybirina [1], Bondarchuk et al. [4], Ferrari [9], Ovcharuk [20], Pinchuk and Prokopenko [23], Prokhorov et al. [24], Prokhorova [25], Riezina, Puzikova and Kotyak [26], Scott [27], Vakaliuk, Spirin and Kontsedailo [29], Vuorikari et al. [32]. In particular, the issues of development of digital competence of a teacher were dealt with by Hamad, Ndibalema and Matalu [10], Ivanytsky [11], Kartashova, Bakhmat and Plish [12], Martyniuk, Martyniuk and Muzyka [15], Moiseienko [16], Moiseienko, Moiseienko and Kiv [17], Moiseienko et al. [18], Oliynyk et al. [19], Ovcharuk and Ivaniuk [21], Spirin [28].

There are many definitions of digital competence, among them:

- confident and thorough use of information and communication technologies in such areas as work (employment opportunities), education, leisure, involvement and activities in society, which are vital for everyday socio-economic life [12];
- ability to use digital resources and information technologies, understand and be able to evaluate digital resources and content critically, communicate effectively [27];
- a set of knowledge skills required to use information technology and digital media to perform tasks; problem-solving; information management; cooperation; communication; creation and distribution of content; joint activities and meeting needs [9];

- the quality of the specialist indicates the level of qualification from basic visual perception and practical skills to more critical, evaluative and conceptual approaches to the use of ICT, as well as includes attitude and awareness in the field of ICT [28].

In particular, the digital competence of a teacher is interpreted as:

- knowledge, skills and abilities in the field of ICT and the ability to apply them in professional activities [17];
- the ability of the teacher to effectively and efficiently use ICT in teaching and for professional development [25];
- the skill of the teacher to apply information technology in professional activities [32], etc.

However, the features and ways of developing the digital competence of practising teachers have yet to be studied and require additional research.

The *purpose* of the article is to reveal the possibilities of developing teachers' digital competence by using educational training as an optional form of organization of teachers' educational process and professional development.

2. Results

The problem of continuing education of teacher practitioners, whose professional activity occupies one of the leading places in the development of society due to modern paradigms of social development, the novelty of personal and social requirements to the system of professional education of teachers and their readiness to improve professional development.

Particular attention should be paid to identifying ways to develop teachers' digital competence in the context of continuing education. Thus, Dryden and Vos [6] see the main task of modernity in "preparing all educators so that they know how to combine the best available information technologies in the world with the most advanced teaching methods available in the world and teaching".

One of the active forms of acquiring knowledge in the system of continuing education of teachers is educational training sessions. Training comes from the "to train", which means "teach, train, instruct". At the same time, training is an interesting communication and an exciting process of learning about yourself and others and an effective form of learning, expanding experience and a way to develop skills and abilities [22].

Unlike traditional, training forms of learning fully cover the full potential of a student: the level and scope of his/her competence (social, emotional and intellectual), independence, ability to make decisions, interaction, etc.

The effectiveness of this form of education is because [2]:

- the point of view and knowledge of each participant is valued;
- there is an opportunity to share your experience and analyze it in a comfortable atmosphere without coercion;
- there is an opportunity to learn by performing practical actions;
- mistakes can be made that will not lead to punishment or negative consequences;

- there are no assessments and other "punitive" means of assessing new knowledge".

In the framework of the international project "Modernization of Pedagogical Higher Education Using Innovative Teaching Tools" (MoPED) of the EU program Erasmus+ KA2 – The Development of Higher Education Potential, No 586098-EPP-1-2017-1-EN-EPPKA2-CBHE-JP participants of Uman State Pedagogical University conducted a series of training sessions for teachers of secondary education, regardless of their professional orientation.

According to statistics, the following distribution of teachers who participated in the training sessions was obtained. Of the total number of training participants who received feedback, 10% teach in primary school, 54% – in secondary school, and 36% – in high school. Among those who teach in primary or secondary school, depending on the subject they teach, we have the following distribution: humanities – 12.5%; social sciences – 2.1%; economic sciences – 4.2%; technical sciences (computer) – 25%; technical sciences (non-computer) – 27.1%; other fields (mathematics, chemistry, teacher-organizer) – 29.1%.

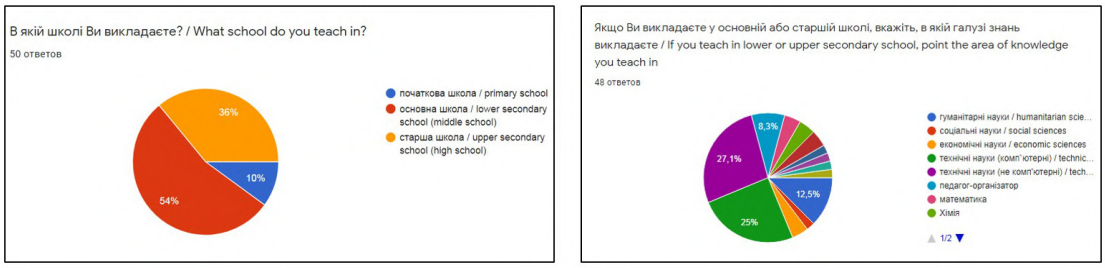

Figure 1: Distribution of teachers who participated in the training sessions.

Participants' digital competence level at the beginning of the training sessions was mainly sufficient (38%) and average (62%).

These training sessions aimed to increase teachers' digital competence and acquaint them with modern, innovative tools and learning technologies. The topics of the training sessions were as follows: "Go-Lab Ecosystem", "Research Learning Technologies", "Computational Thinking", "Development of Digital Competence through Mobile Technologies", "From Classical Lesson to Research Learning", "Research Learning: Creating ILS on the Go-Lab Platform", "Mobile learning technology: the use of Classroom in school practice", "Technology of development of critical thinking in students", "STEM-education: robotics, the use of sensors of mobile devices for physical experiment", "Introduction of Flipped Classroom Technology in educational process", "Technology "Six Hats": the development of critical thinking of students", "Technology "Scribing": a vivid presentation of educational material", "Mentimeter.com – online survey in real time", "Formation of soft skills in students during implementation of the educational process", "The use of multimedia board as one of the requirements of modern educational process in the information society", "Virtual interactive whiteboards as a modern means of educational material", "Distance learning platforms and services" and others.

During the training sessions, participants learned how to organize educational activities more effectively, store and create files in cloud storage, automatically evaluate student tasks, and organize work in groups. The team of trainers demonstrated various free online tools for

offline and online classes, for a vivid presentation of educational material, control of students' knowledge, etc. Here are examples of online tools that were demonstrated during the training sessions and contributed to developing the digital competence of teachers and students.

One of the modern online tools that fascinates students regardless of age is Kahoot! This is an educational service that allows the conduct of interactive educational games: quizzes, discussions, surveys, etc. One can access it through a web browser or the Kahoot app! in Google Play or App Store.

During the training sessions, participants had the opportunity to get acquainted with four options for registration on this service: free Basic, Plus, Professional, and Premium, which are paid. However, even basic (free) access to the platform gives the teacher quite a lot of opportunities:

- allows to involve up to 50 students in testing;
- you can create questions yourself or use ready-made questions from the bank;
- you can enable the function for automatic mixing of answers to the question;
- to visualize the question, you can use a bank of images, add them to questions or use them as answers;
- it is possible to limit the time given to the student to answer questions;
- you can determine the number of points for each correct answer;
- allows you to find out how each student answered the questions or build success charts of the academic group.

Free access allows you to create only two types of questions: quiz, namely a question with "multiple choice", when the student is offered several answers, and he chooses one or more correct and "true or false" when the student is offered two mutually exclusive answers (figure 2).

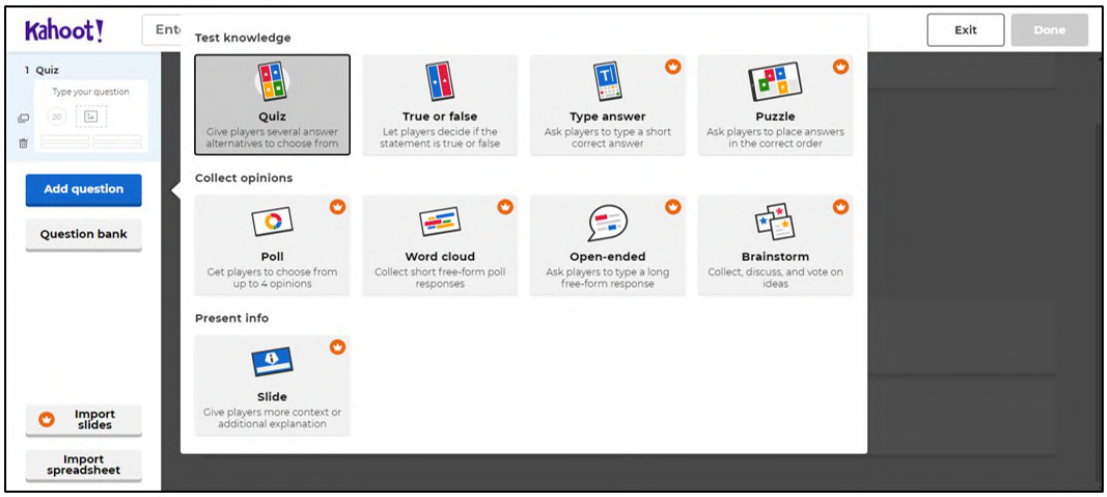

Figure 2: Types of questions in Kahoot!

The offered service allows to carry out testing in two ways:

- virtual classroom – testing can be taken with students during offline lessons. In this case, the questions and answer options appear on the projector or computer screen of the teacher, and students answer from their mobile phones or computers;
- for self-placed learning – students take tests independently, and questions and answer options appear on their computers or smartphones. By choosing this method, the teacher can set the date and time during which the test will be open.

During the conversation at the training, all educators unanimously stated that it is quite challenging to keep students' attention when explaining the material during online lessons. Therefore, the trainers showed that students can try not just to tell the topic with the presentation but to prepare the Kahoot test! and activate students with short pauses and exciting questions. Students can take quizzes individually, and it is possible to create competitions where participants receive points for speed and correctness of answers. A small competition will always help make the lesson more interesting.

Since the training was attended by teachers from different subjects, to acquaint them with this platform, our team was offered to pass Kahoot! on "What do I know about Ukraine?" (figure 3). The work with this service was as follows: first, teachers took the role of students and passed the quiz, and then, after registration, independently created their own Kahoots following the subjects taught.

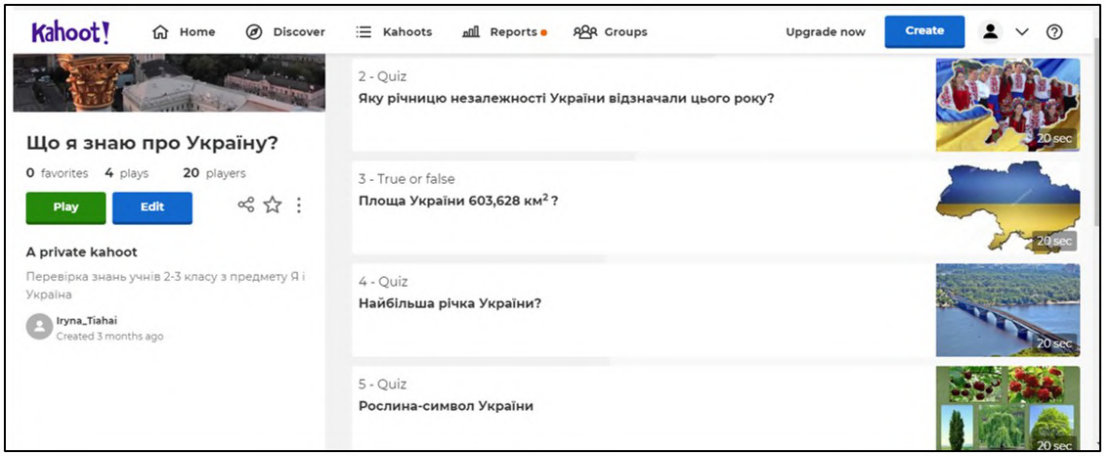

Figure 3: An example of Kahoot! for teachers.

After working with this service, teachers concluded that Kahoot! is a convenient tool for creating tests that can be used for current and thematic control of students' knowledge, self-study and self-control, preparation for tests and independent work, survey of students' opinions, etc. The "virtual classroom" survey method can be used not only for classroom classes or distance learning. It can also be used during student conferences, research groups or other events where students need to be involved in discussing scientific or educational issues.

The service allows the download to Google Drive or a PC file (figure 4) with the named results in Excel format (figure 5).

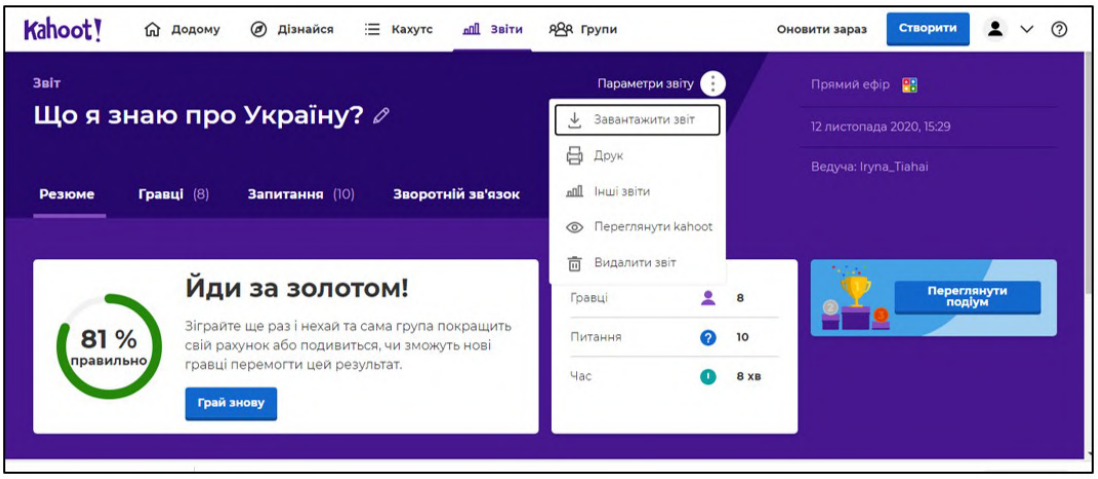

Figure 4: View and download the report.

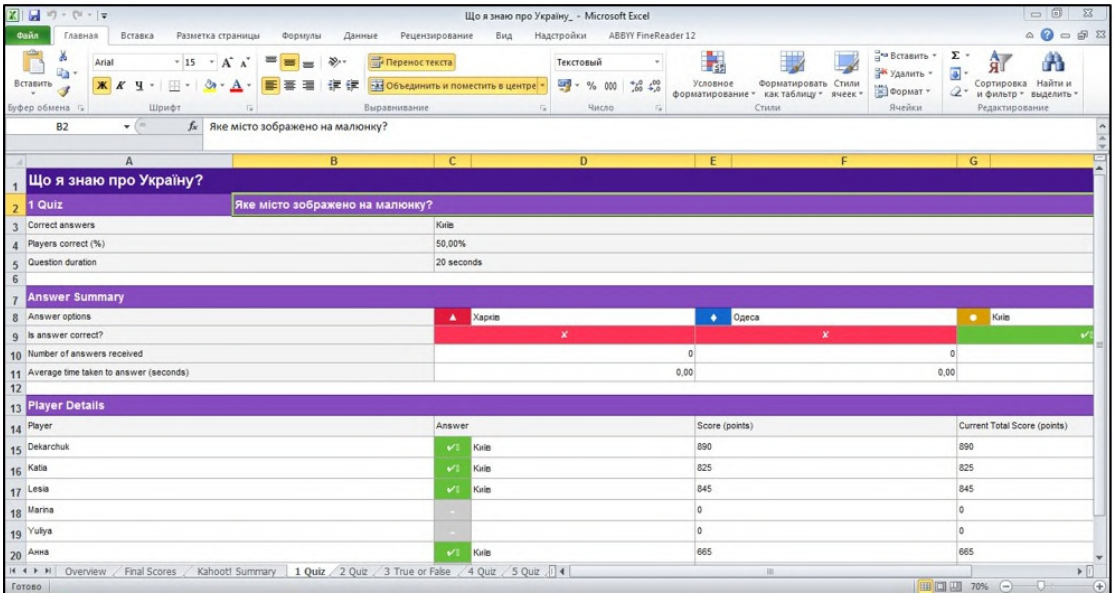

Figure 5: Kahoot! results report in Excel.

Another online service that allows the creation of interactive exercises is LearningApps.org [13, 30]. This service is a designer for developing various tasks in various subject areas for use in the classroom in extracurricular activities and for kids and high school students.

LearningApps service is a Web 2.0 application to support educational processes of various types in educational institutions. Designer LearningApps is designed to develop and store interactive tasks in various subject disciplines, through which students can test and consolidate their knowledge in the form of games, contributing to their cognitive interest (figure 6).

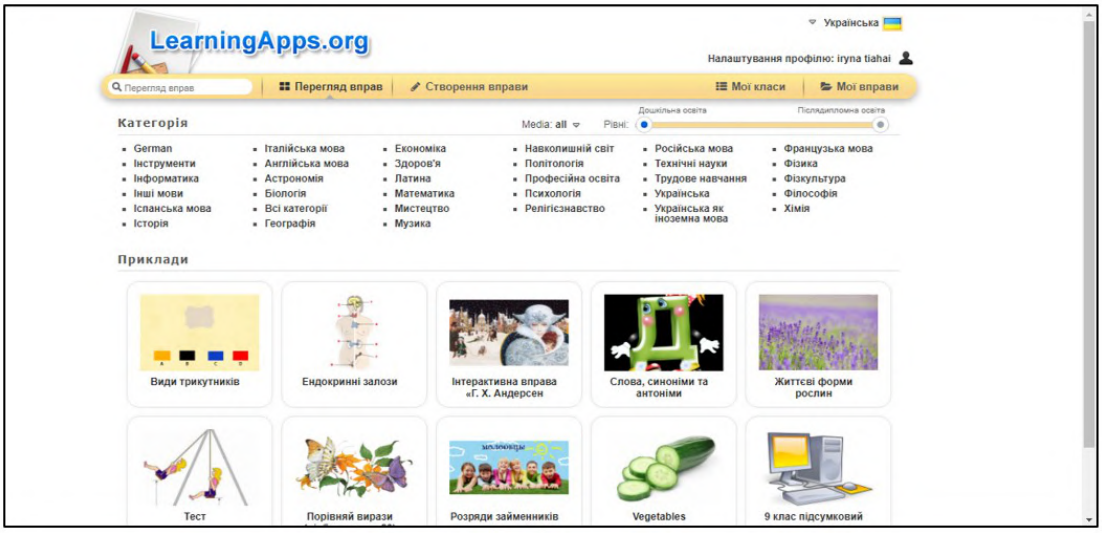

Figure 6: Service LearningApps.

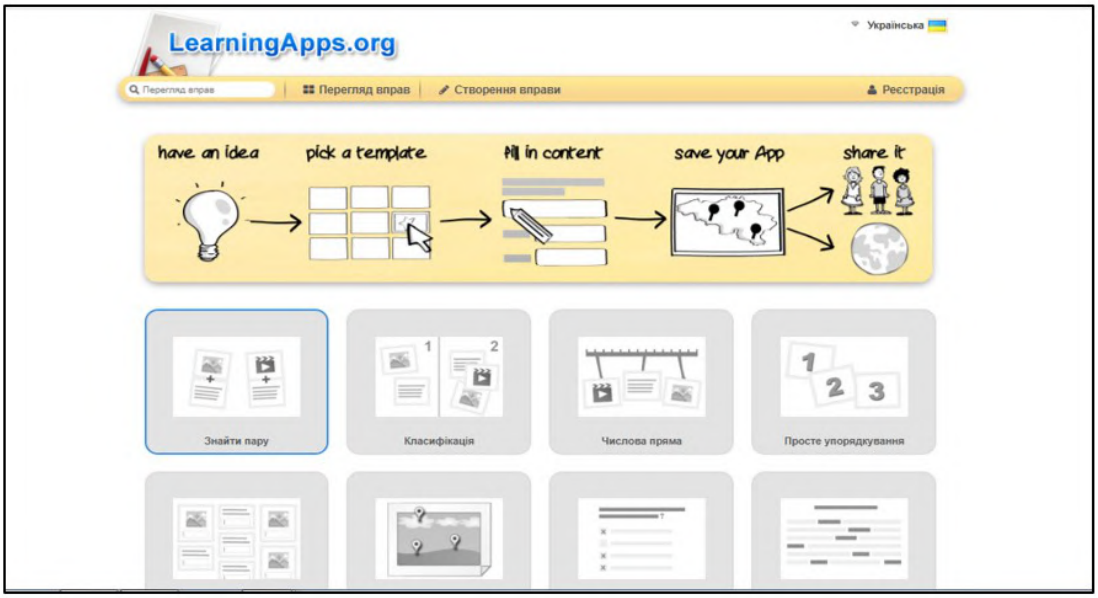

Figure 7: Types of interactive exercises in LearningApps.

The service presents many interactive exercises developed for various forms of educational process. During the training, teachers were shown how these exercises can be used in working with an interactive whiteboard and individual exercises for students when doing independent work.

The LearningApps service provides the ability to obtain code so that interactive tasks can

be posted on the pages of websites or blogs of teachers and students. The trainers emphasized to the participants that each resource can be used in their class, changed for their own needs, and developed a similar or completely different training module; it can be stored in their own "office", creating an account in this online environment.

During the training, participants had the opportunity to get acquainted with the types of tasks offered by this service (figure 7), to play the role of a student, having already completed the exercise and to create their interactive task under the guidance of trainers. Several exercise templates are available in each group, the description and samples of which can be previewed before creating their learning resource.

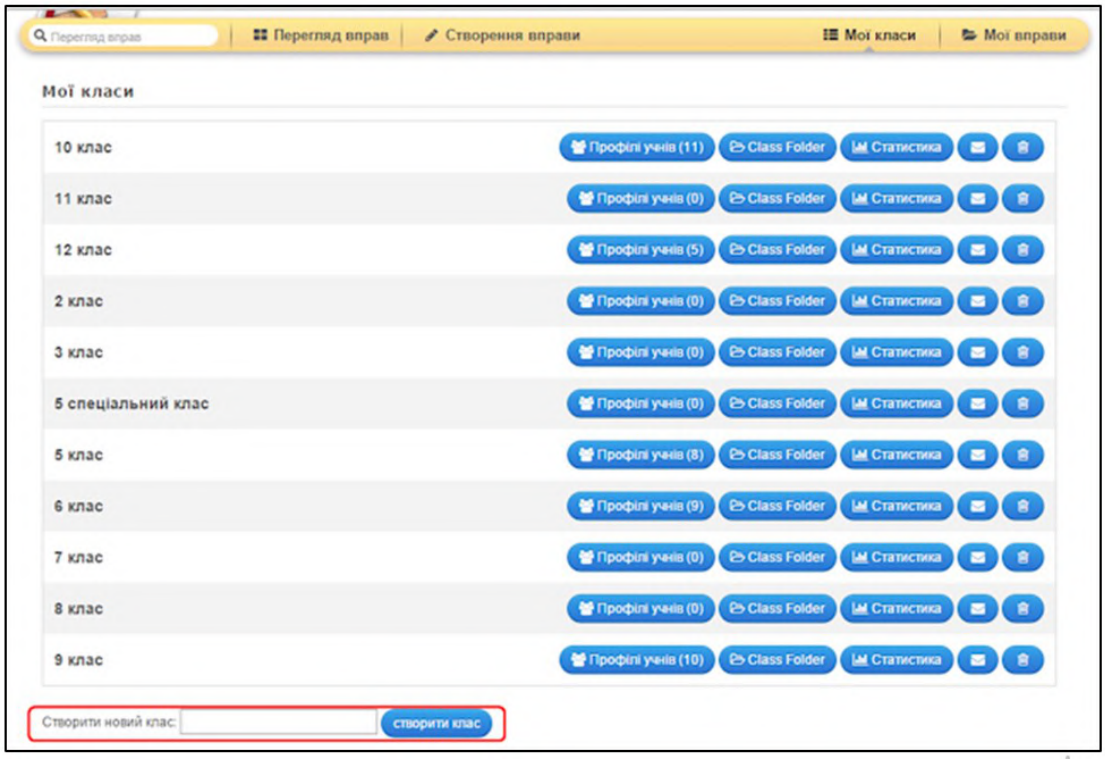

Figure 8: Creating a Class in LearningApps.

The participants of the training sessions were shown the possibility of creating a Class in the teacher's account (figure 8), entering data about students, creating a profile for each student, setting a password to log in, etc.

This feature of the proposed service will be helpful in connection with the current situation in the country and the world, as the teacher will be able to provide students with tasks remotely and monitor their implementation.

After working with this service, the training participants agreed that the Learning Apps service and its electronic versions of tasks are especially attractive because they allow them to get results almost immediately after the test. Interactive learning tasks help increase the level of digital competence of teachers and students, as well as aimed at solving the most

Figure 9: The results of the survey of training participants.

Figure 10: The results of the survey of training participants.

important task of education – to teach school leavers to work productively in the world of global informatization and in connection with global quarantine and the transition of all educational institutions to distance learning which is very important.

In addition to these online services, participants were also introduced to such services as Mentimeter, Classtime, Plickers, ClassTools, etc, during the training. The method of conducting training sessions on using these services in the educational process will be described in more detail in the following publications.

At the end of the training session, the participants were interviewed about their general impression of the training session, the methodology of their conduct, and the technical and

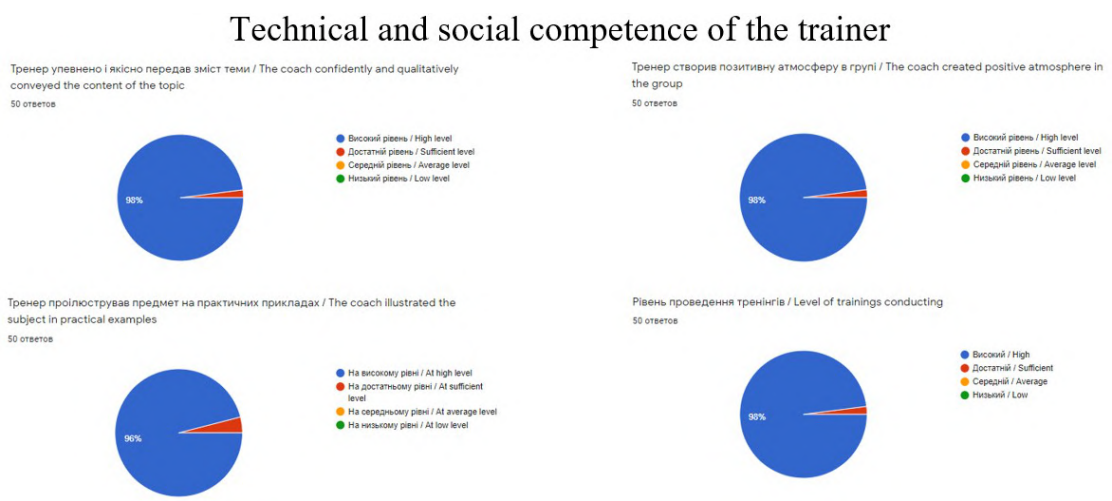

Figure 11: The results of the survey of training participants.

social competence of the trainers. Fifty respondents took part in the survey. The results of the survey are presented in the form of diagrams (figures 9–11).

3. Conclusions

This study demonstrates that intensive training sessions can significantly improve digital competence among secondary school teachers across subjects and grade levels. Participating in hands-on workshops exposes teachers to new technologies and integration strategies while allowing them to gain proficiency through active use.

The training resulted in 38% of teachers improving from “sufficient” to “high” self-reported competence, with the remaining 62% increasing competence within the “sufficient” range. This quantitative evidence reinforces training as an impactful approach to developing digital literacy.

Effective training techniques include modelling student-centred technology applications, providing opportunities for collaborative practice, and allowing teachers to experience tools from a learner perspective. These methods enable teachers to gain skills while envisioning implementing ICT in their classrooms.

Ongoing training is essential as new technologies continuously emerge in education. The tools explored in this study, like Kahoot and LearningApps, will eventually be replaced by more advanced applications. However, the hands-on training approach can adapt to any future technologies.

Further research should expand on these findings by evaluating competence improvements longitudinally after teachers have applied skills in their classrooms. Studies should also refine training best practices by comparing the impacts of various techniques and delivery formats.

Enhancing teacher digital competence requires a systemic approach, including training, communities of practice, school technology leadership and a supportive culture. However, this study reinforces intensive training as one promising puzzle in developing teachers’ digital

literacy. Ongoing participation in active learning workshops equips educators to take advantage of emerging technologies, enhancing instruction and preparing students for the digital world.

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