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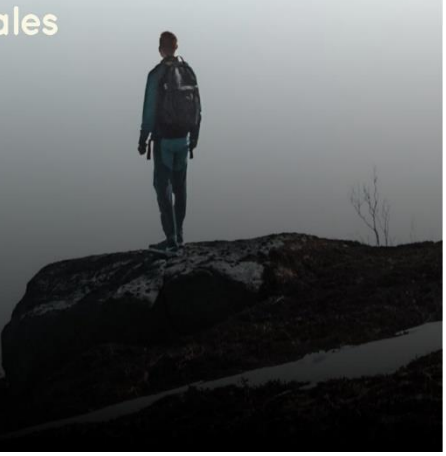

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MODERN DIGITAL DISTANCE LEARNING TECHNOLOGIES: CHALLENGES OF FUTURE TEACHER TRAINING

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Abstract

The article deals with the problem of using digital distance learning technologies, intensified in the current situation because of the coronavirus pandemic. Today's societal challenges require teachers with innovative thinking, the ability to adapt to different professional conditions, the ability to respond to innovations and use them in digital communication with students online. There is a necessity to train future teachers to use digital technologies and tools in the educational process. The article presents the results of an empirical study of this problem. The survey method revealed the state of the outlined problem in educational practice, secondary school teachers' and university educators' understanding of problems and challenges regarding the usage of digital resources and distance learning tools. The sample included different age categories of respondents: Boomer Generation, Generation X and Millenials (Generation Y). It was found that respondents have difficulties in using didactic knowledge in distance learning (36.4%), creation of moral and psychological comfort (36.4%), organization and stimulation of activity (25.5%) and effective online communication (21.8%). It was

revealed that in the conditions of the pandemic a significant part of practitioner-teachers (53.8%) faced the problem of insufficient technical support of the educational institution; 17.3% of respondents are dissatisfied with the level of their digital literacy and are looking for ways to increase professional competence in this area. The authors of the article propose digital tools and applications for distance learning, as well as outline ways to prepare teachers for the effective use of digital learning technologies. Organizational forms of distance learning are presented, such as: online courses, online counseling, hackathons, webinars, online trainings, interactive educational platforms, virtual / remote laboratories, as well as visits to international science museums and virtual technology parks, creation of communication platforms taking into account scientific interests, etc.

Keywords

Distance education – Future Teachers – Pedagogical Activity – Digital technologies

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Introduction

In modern conditions of digitalization of all spheres of public life the problem of using information and communication technologies in the educational process of different types of educational institutions, introduction of digital resources and tools to ensure innovative progress in student education, improving the quality of educational services are actualized[1]. The problem of using modern digital technologies in various specialist training, including future teachers, is especially relevant today, when leading universities have been improving different forms of distance learning due to the rapid spread of Covid-19.

An important public challenge and vital necessity today is the active introduction of e-learning technologies[2], based on the principles of open education, are the most modern promising technologies of its organization and have a decisive influence on the nature and pace of informatization of the education system.

So, there is a problem of purposeful teacher training for the safe and effective use of digital technologies, because the imperfect protection of young people from digital content can harm their physical, mental or social health and development. The lack of mechanisms for effective self-regulation of the information market is also evidenced by the Proposal for a Council Recommendation on Key Competences for Lifelong Learning[3], which deals with the development of digital competence of teachers and students. Digital competence is a key competence that modern man needs "for personal realization and development, employment, social inclusion and active citizenship". These issues are also reflected in the regulations of many countries. For example, in the "Concept of implementation of media education in Ukraine" the main tasks are: "promoting the formation of media literacy, media immunity, reflection and critical thinking, the ability to create media" [4].

Methodology of Research

The *subject-target method* was used for analysis and synthesis of psychological and pedagogical literature on the problem of future teacher professional training, as well as substantiation of the problem of using modern digital distance learning technologies at pedagogical educational institutions.

Psychodiagnostic methods (empirical: surveys, comparisons) – to research the state of the problem in educational practice, secondary school teachers' and university educators' understanding of problems and challenges of the use of digital resources and tools in distance learning.

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[1] O. Budnyk, "Innovative Competence of a Teacher: best European Practices", Journal of Vasyl Stefanyk Precarpathian National University, Vol: 6 num 1 (2019): 76-89. DOI: 10.15330/jpnu.6.1.76-89.

[2] T. Kashora; H. M. van der Poll & J. A. van der Poll, "E-learning and technologies for open distance learning in Management Accounting", Africa Education Review, Vol: 13 num 1 (2016). https://doi.org/10.1080/18146627.2016.1186863

[3] European Commission. Proposal for a Council Recommendation on Key Competences for Lifelong Learning. Brussels. 17.1.2018. https://ec.europa.eu/education/sites/education/files/recommendation-key-competences-lifelong-learning.pdf (12-07-2020).

[4] The Concept of introducing Media Education in Ukraine. 2016. https://ms.detector.media/mediaosvita/post/16501/2016-04-27-kontseptsiya-vprovadzhennya-mediaosviti-v-ukraini-nova-redaktsiya/ (22-06-2020).

Methods of mathematical statistics – for quantitative and qualitative analysis of empirical data.

Instruments and Procedures

The article presents the results of an empirical study on the use of information and communication technologies (ICT) in the educational process. For this purpose, a survey for educators working in various educational institutions (school and preschool teachers, college and university teachers) was conducted. Some of the respondents were students who study at the university getting the profession of teachers. The study was conducted in different regions of Ukraine. The anonymous survey involved 52 people representing different age groups.

Results of Research

Theoretical analysis of the scientific literature shows that the digitalization of education helps to improve its quality, because today there is a tendency to increase the number of virtual educational platforms, digital tools and electronic resources for online and offline learning. They significantly facilitates teachers' work in the context of distance education, but at the same time create certain challenges. Digital technologies allow this category of professionals to develop their abilities and talents, acquire a profession, communicate with like-minded people, and so on[5]. Thanks to ICT, they overcome socio-psychological barriers in the process of learning, gain access to a variety of didactic materials in an accessible acceptable format, and have the opportunity to demonstrate their academic achievements[6]. Personal computers, SMART-boards, the Internet today serve as necessary tools in professional activities in order to create an appropriate educational environment at educational institutions, and thus – in preparing teachers to use digital innovations working with students.

The digital environment is a context or "place" where conditions are created for the use of technologies and digital devices that are often transmitted over the Internet and other digital tools, such as the mobile telephone network.

The term "digital environment" is usually used in a general sense (as a specific background for digital activities) without the name of a specific technology or tool[7].

To identify the attitude of teacher-practitioners and future teachers (students of pedagogical universities) of different levels of education (preschool education, primary school, higher education, etc.), we conducted an empirical study. Among the respondents, 76.9% were women and 23.1% were men. This gender ratio is explained by the dominance of women in the teaching profession, at least it is typical for European countries, including Ukraine, Poland, Slovakia, France and others.

[5] W. E. Lyons; S. A. Thompson & V. Timmons, "'We are inclusive. We are a team. Let's just do it': commitment, collective efficacy, and agency in four inclusive schools", International Journal of Inclusive Education, Vol: 20 num 8 (2016): 889-907, doi.org/10.1080/13603116.2015.1122841.

[6] Yu. G. Zaporozhchenko, "Using of ICT tools to improve the quality of inclusive education", Information technology in education, Vol: 15 (2013): 115-130.

[7] R. Vuorikari; Y. Punie; S. Carretero Gomez & G. van den Brande, DigComp 2.0: The Digital Competence Framework for Citizens, Publications Office of the European Union. 2016. DOI 10.2760/38842. https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework (15-05-2020).

According to the International Study on Teaching and Learning (TALIS), which is regularly conducted by the Organization for Economic Co-operation and Development (OECD) and collects information from teachers and school principals in OECD countries, "gender equality remains a significant problem in the education sector. 68% of all teachers in OECD countries are women, with only 47% of school principals being women."[8].

It is no coincidence that in the survey we identified the age period when the respondents were born. For this purpose, the generally accepted classification of generations that now work as teachers was proposed: Generations of boomers or baby boomers (born in 1943-1962) – 13.5%; Generation X (born in 1963-1982) – 51.9%; Millenials or Generation Y (from 1983 to 2003) – 34.6%.

Thus, more than half of the respondents grew up in an era of change, they are flexible, individualistic, independent and mostly workaholics. Therefore, such teachers are fully committed to professional activities and are willing to sacrifice. Global consciousness, pragmatism and individualism help them to improve throughout life.

One third of respondents are Digital immigrants, i.e. people who grew up in the age of digital technologies and the Internet. They have virtual friends and communicate with the whole world. Therefore, teachers of this generation are usually confident and focused, they are ready to implement innovations and digital technologies working with students.

The generation of boomers, which are characterized by optimism, are ready to achieve pedagogical goals and be the best (winners) in their field. They prefer to work in a team and be successful, but do not always approve of innovation. These are respectable and serious people, usually older. According to our statistics, they do not always show a desire to be innovative and professionally improve, as they are guided by previous experience of pedagogical work.

According to the OECD Teaching and Learning International Survey the average age of teachers in OECD countries is 44, and 34% of the teaching staff are over 50. The average retirement age is 64.3 years for men and 63.7 years for women, which "means that education systems will have to renew at least a third of the teaching staff in the next 15 years"[9]. Our random sample of educators participating in professional training showed a similar trend. Therefore, it is no coincidence that the problem of training Generation X teachers in digital educational innovations is relevant, as well as inviting more young teachers, university graduates, who are more likely to master innovations in science and technology. This requires the development of a strategy and a flexible procedure for mastering the teaching profession. However, care should be taken not to risk lowering professional standards.

Regarding the field of professional employment, the survey involved: 34.6% of school and lyceum teachers, the same number of university (institute) educators, 13.5% – college and vocational school teachers, 11.5% of future teachers who study at universities; 5.8% are kindergarten teachers. In fact, the main group for the study are representatives of

[8] Survey results "Are teachers and school principals valued in Europe?", https://pon.org.ua/novyny/7762-rezultati-opituvannya-chi-cnuyut-vchitelv-ta-direktorv-shkl-v-yevrop.html

[9] Survey results "Are teachers and school principals valued in Europe?", https://pon.org.ua/novyny/7762-rezultati-opituvannya-chi-cnuyut-vchitelv-ta-direktorv-shkl-v-yevrop.html

secondary schools and universities. Among the respondents, 17.3% admitted that they have difficulties using digital technologies in distance learning; 44.2% – partially have some problems with the use of digital tools in professional activities and more than a third of respondents (38.5%) – have no problems working with students online (Figure 1).

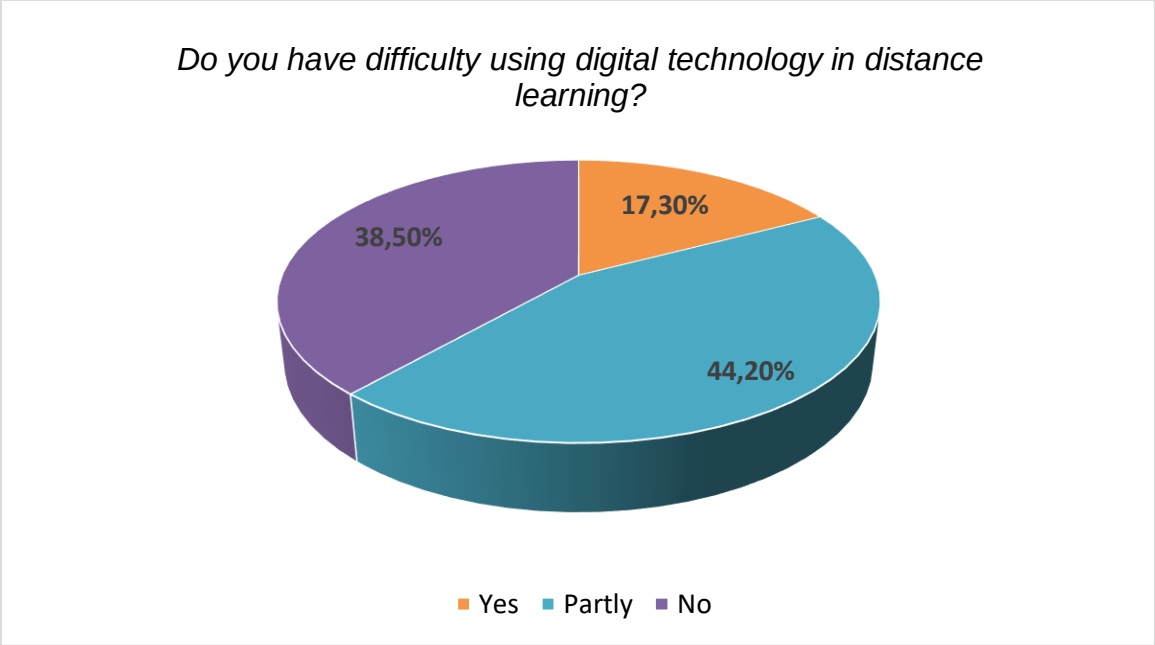

Figure 1
Teachers' attitude to the use of digital technologies in distance learning

In the context of the pandemic, a significant number of teachers face objective challenges in their professional activities, as 53.8% of respondents admitted that they faced the problem of insufficient technical support of the educational institution. This fact significantly reduced the effectiveness of the educational process in the context of the use of innovative resources in distance learning (Figure 2). These include digital technologies such as personal computers and devices (desktops, laptops, netbooks, tablets, smartphones, game consoles, media players, e-book readers, etc.), digital television, and robots.

The second rank got the insufficient level of their preparation for the use of digital technologies and tools. 17.3% of respondents admitted this.

At the same time, a significant part of educational institutions still work without high-speed Internet, and there are no clear guidelines for working in the digital educational environment. After all, Generation X educators still have some difficulties applying innovations, including digital technologies in their professional activities.

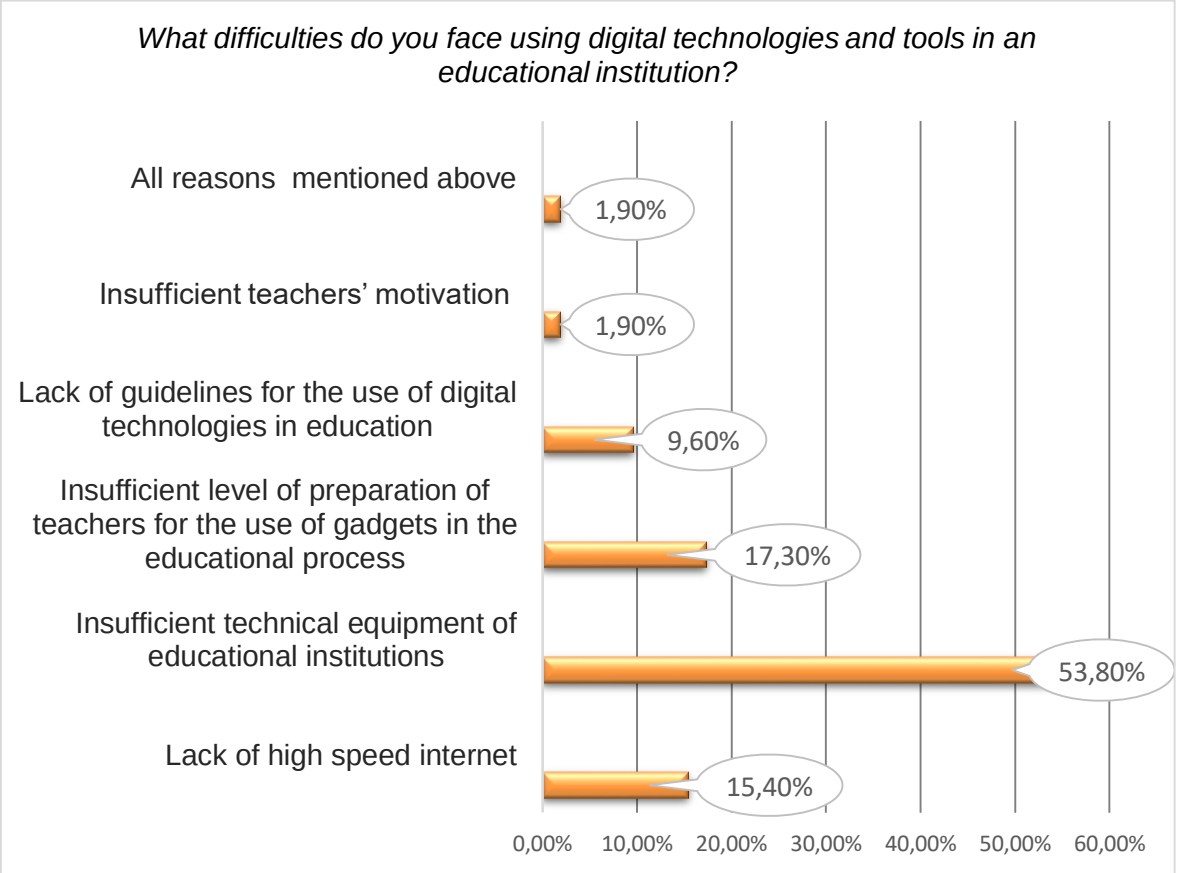

Figure 2
The nature of difficulties using digital technologies and tools at schools (according to teachers)

A survey of students acquiring the teacher profession showed that they also have some difficulties in distance learning and use of digital tools teaching students (during teaching practice at school).

Among the predicted difficulties, we identified the following:

1) difficulties of didactic nature (management of students' cognitive activity, creating a situation of novelty, creativity, independence, etc.) – 36.4%;
2) difficulties of a psychological nature (creation of moral comfort, display of tolerance, self-control, etc.) – 36.4%;
3) organizational difficulties (stimulation of active digital educational communication, various forms of online learning) – 25.5%;
4) difficulties of communicative nature (ability to conduct a productive educational dialogue with students, pedagogical etiquette) – 21.8%;
5) difficulties of interpersonal-reflexive orientation (adequate perception of the situation, understanding of students, etc.) – 18.2%.

When asked about the most important components of a teacher professional competence in distance learning, educators were asked to grade the following important areas: info-media literacy; digital communication and cooperation; use of ICT; digital content creation skills; pedagogical creativity (Figure 3).

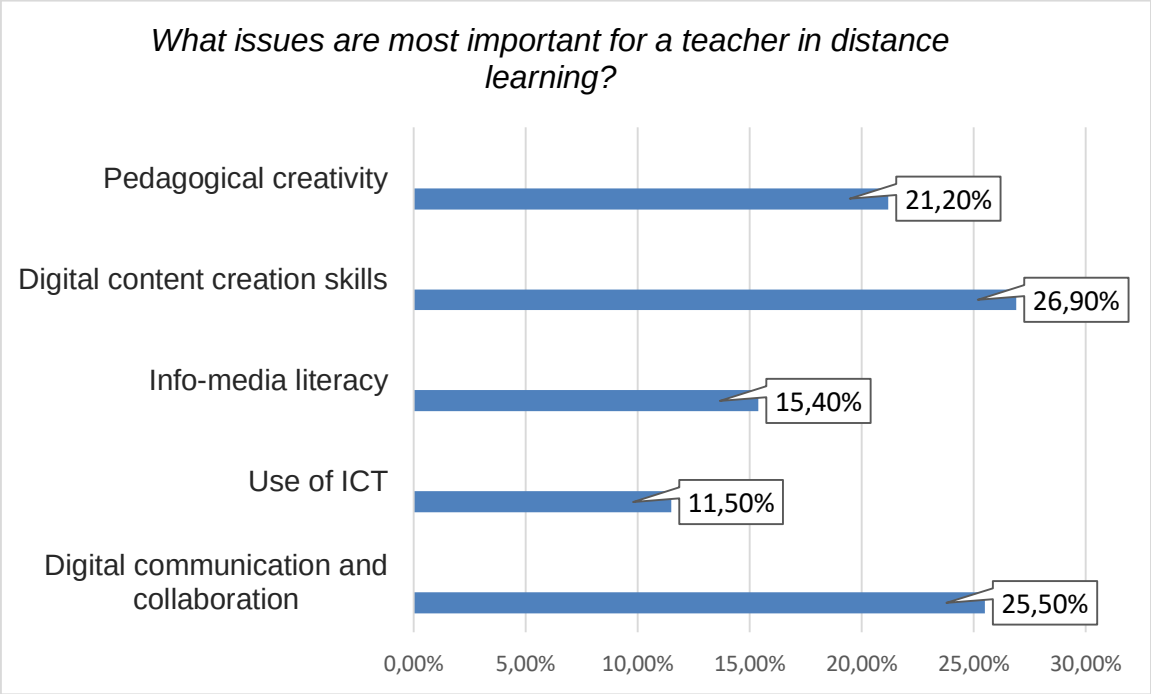

Figure 3
Components of pedagogical competence in distance learning

Thus, according to the study, almost a third of respondents have difficulty in creating their own educational content in digital format (26.9%), 25% – consider digital communication and cooperation a priority in distance teaching. The third rank got teachers' pedagogical creativity (21.2%), which requires flexibility and innovative approach to work in specific circumstances of the organization of education, rejection of standardized education models. The modern teacher must promptly resolve contradictions, problem situations, be able to establish constructive interaction with all participants of the educational process. This primarily concerns the digitalization of the educational process, its focus on the modern development of science and technology. Today much attention is paid to media literacy and personal culture. It is no coincidence that 15.4% of respondents admitted its importance, because the skills to recognize and critically perceive information, to analyze its value in the context of education in today's digital environment are extremely important. Info-media literacy will help to prevent the consumer from a substandard product or socially harmful information influences. For a partial solution to the problem of accessibility to education for certain categories of persons, improving the quality of education, incl. in distant format, it is advisable to use ICT. For this purpose, according to Yu. Nosenko, it is time to introduce open access repositories with educational and scientific content, which will allow alternative ways of obtaining knowledge despite time or space constraints. ICT can be a significant driver of positive changes, as their application makes it possible to attract more education participants at a lower cost, to meet the demands of social justice for all populations, it opens wide prospects for improving the quality of education and its accessibility for persons with disabilities, promoting equal access to information and educational services, full and fruitful social integration[10].

[10] Yu. Nosenko, "Electronic Inclusion as an Effective Strategy for Ensuring Accessibility and Openness of Education", Pedagogical Innovations: Ideas, Realities, Perspectives, Vol: 2 num 17 (2016): 116-123.

According to our research, most educators consider the use of ICT in inclusive education to be: children's with special educational needs access to learning resources through ICT as a compensatory tool at a convenient time and place for individual learning at home (32.7%) and completing educational tasks taking into account peculiarities of their development, i.e. at their own pace (25.0%). At the same time, the digital educational environment also contributes to the creation of conditions for personal self-realization, development of digital competence, online communication culture for students with special needs. This is the opinion of 23.1% of respondents who took part in the survey (Figure 4). It is important that the use of ICT provides increased motivation for learning, students' entry into the information environment for learning, information exchange and more.

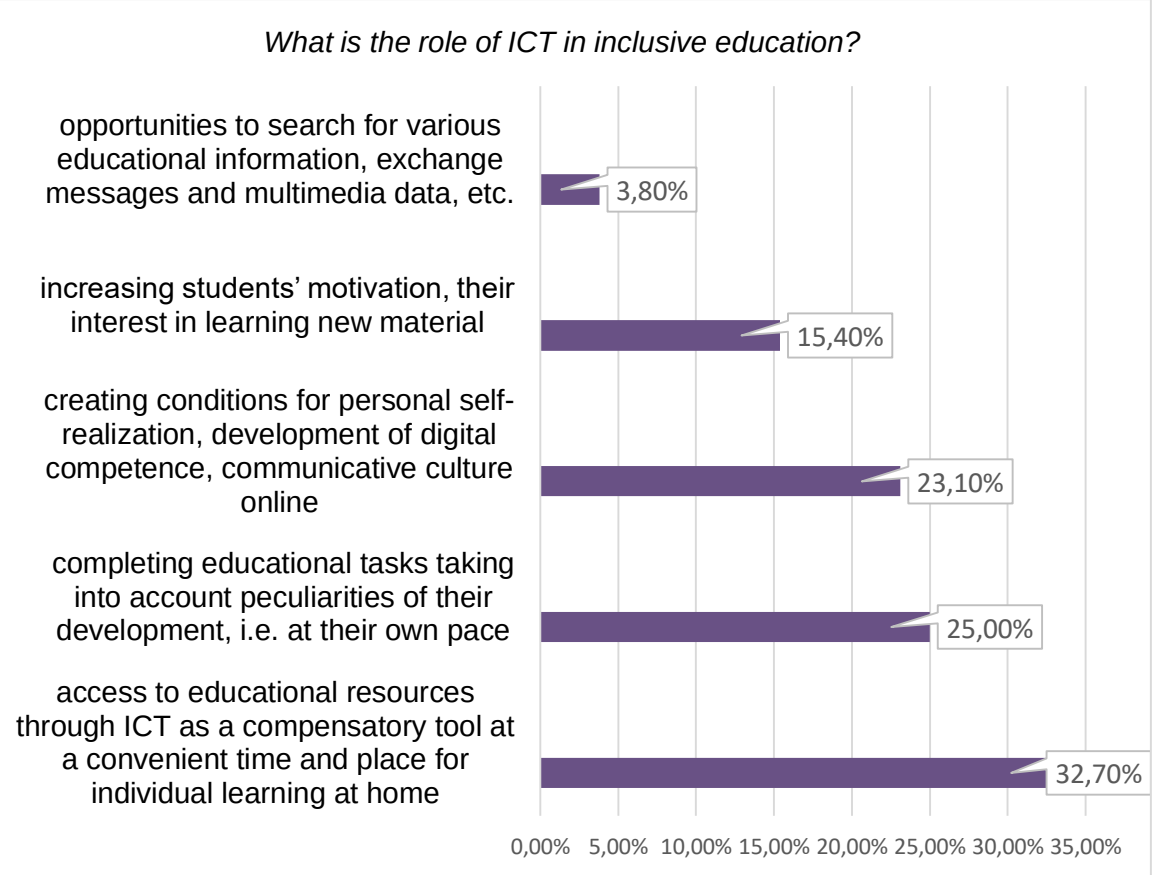

Figure 4

Directions for the use of ICT in the inclusive process

Thus, digital technologies in online or offline learning contribute to the intensification of the educational process. However, it is extremely important that they are used as intended and accompanied by proper teachers' didactic support. To improve teacher professional skills and digital literacy in the context of distance learning, we offer to use and promote among educators the Graasp platform (https://graasp.eu/), which allows you to create virtual research and learning spaces (ILSs), structured according to phases (stages) of educational process[11].

[11] M. Papaevripidou, M. Irakleous & Z. Zacharia, "Using Teachers' Inquiry-oriented Curriculum Materials as a Means to Examine their Pedagogical Design Capacity and Pedagogical Content Knowledge for Inquiry-based Learning", Science Education International, Vol: 28 num 4 (2017): 271-292.

Educators can provide links to these ILSs to their students, which will allow them to learn independently both individually and in groups. The platform is extremely useful for studying STEAM subjects[12].

At the same time, we also recommend the use of the following digital tools for distance learning:

Tools for formative and summative assessment of learning outcomes:

Kahoot (https://kahoot.it/)
Plickers (https://get.plickers.com/)
Triventy (http://www.triventy.com/)
Mentimeter (https://www.mentimeter.com/)
Wordwall (https://wordwall.net/)
Socrative (https://www.socrative.com/)
GoofleForm (https://www.google.com/forms)

Online collaboration tools:

Google Docs (https://www.google.com/intl/uk_ua/docs/about/)
Office Online (https://www.office.com/)
Wiki (https://www.wikipedia.org/)
Quip (https://quip.com/)

Shared visualization tools:

Padlet (https://uk.padlet.com)
RealtimeBoard (https://realtimeboard.com)
Mural (https://mural.co/)
Flipgrid (https://admin.flipgrid.com/manage/dashboard)
MindMaps (https://mindmup.com)

Tools for group communication:

Flowdock (https://www.flowdock.com/)
Slack (https://slack.com/)
GoToMeeting (https://www.gotomeeting.com/)
WebEx (https://www.webex.com/)
Zoom (https://zoom.us)
Appear.in (https://appear.in/)
Yammer (https://www.yammer.com/)
Skype (https://www.skype.com/uk/)
Hipchat (https://www.stride.com/)

[12] O. Dziabenko & O. Budnyk. Go-Lab Ecosystem: using Online Laboratories in a Primary School. 11th annual International Conference on Education and New Learning Technologies (Palma de Mallorca, Spain. 1st - 3rd of July, 2019. EDULEARN19 Proceedings). https://iated.org/edulearn/publications.

One of the digital learning tools is QR-cod, which is used working with students to individualize and differentiate the learning process, quickly provide links to Internet resources, as well as for search work in the classroom. According to the results of our survey, 90.4% of respondents-teachers said that they consider it appropriate to use QR-codes in various forms of educational activities; respectively 9.6% – partially agree with this statement.

To the question: "What do you think is most appropriate to encode working with students?" we received the following answers: links to quizzes, interactive exercises, tests, questionnaires – 42.3% of respondents (22 persons), a too long link to an Internet resource (video from YouTube, location on Google maps, file from the cloud (Google, Microsoft, Dropbox, etc.), profile (group or page) on social networks, phone number or e-mail) – 28.8% (15 persons), a hidden tip for those students who find it difficult to complete the exercise, to solve the task (definitions, rules and algorithms, samples of completed tasks, etc.) – 9.6% (5 persons). Teachers also answered that they recommend using QR-code to create links to quizzes, interactive exercises, tests and questionnaires (there are a number of Internet resources that automatically generate QR-codes-links: https://learningapps.org/, https://www.plickers.com/, https://www.mentimeter.com/) answers to teacher's tasks (students create text messages, answers to tasks or riddles), tips for quests, placing them in the right places of the school; announcements and instructions on stands, contact information on teachers' cards, the administration of the educational institution, on the badges of the participants of conferences (seminars); identification of students in the virtual office of the library or distance learning course, etc. (Figure 5).

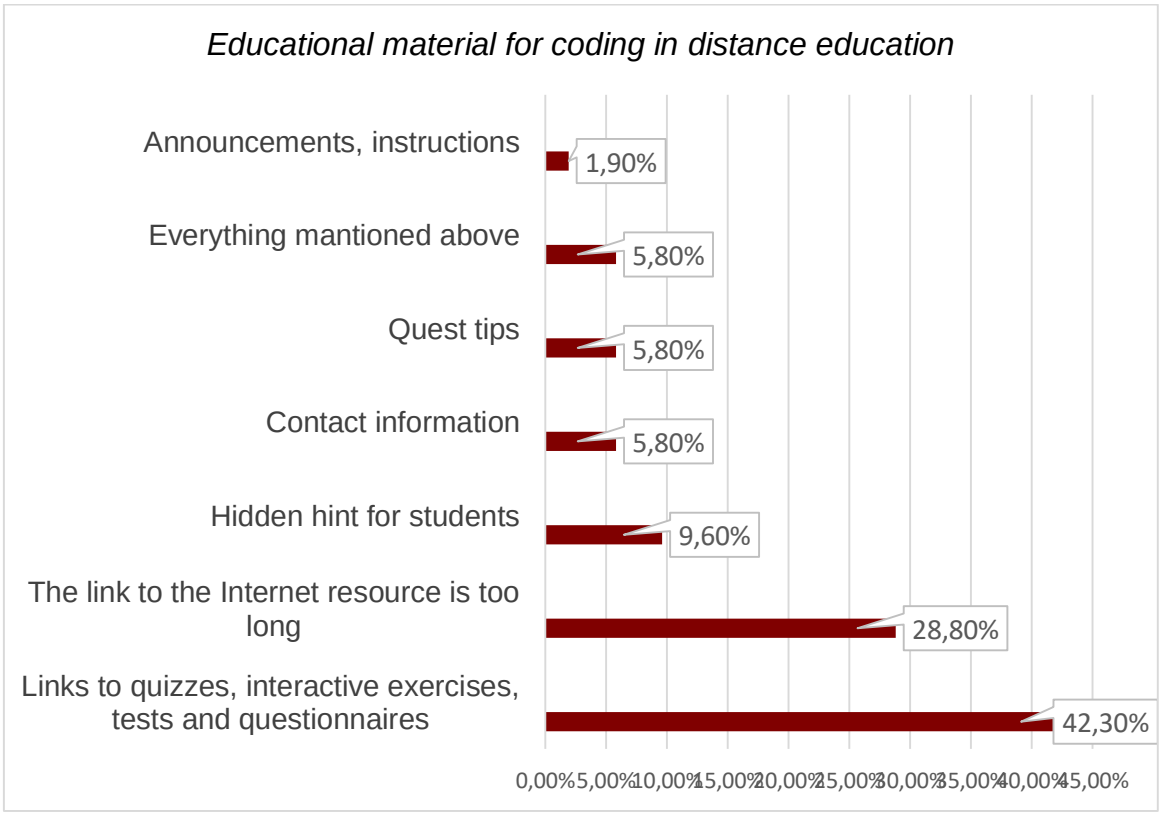

Figure 5
The use of QR-codes in educational activities (according to the survey)

The use of ICT in education can take various organizational forms: online courses, online counseling, online training, hackathons, webinars, the use of interactive handbooks, electronic virtual laboratories, electronic social networks, visiting interactive science museums, creating presentations, communication platforms according to scientific interests, international competitions for solving scientific and technical tasks, virtual technology parks and others. Electronic educational content includes: library and information-resource support of teaching, education, management, teaching and research; resources of library information centers; collections of electronic educational resources, content of educational institutions' websites[13].

Conclusions

The results of the study made it possible to reveal the attitude of teachers of different types of educational institutions to the problem of using digital technologies working with students, difficulties in organizing distance learning, the organization of digital communication online. It is proved that the XXI century teacher's necessary digital skills are as follows: the use of technical tools, digital tools and resources for the development of critical thinking, creativity; establishing communication, organization of students' educational activities; use of software for data visualization; use of digital educational resources for the sharing educational information; use of ICT for creating educational content; organization of distance learning, instant feedback using digital technologies to assess learning outcomes, etc. Therefore, it is time to intensify the process of professional training of future teachers to work in the digital educational space, their mastery of the latest technologies for innovation in online and offline learning. This requires continuous professional self-improvement using a wide range of digital tools, which are proposed in this article.

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