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Development of digital competence of school teachers

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Abstract

The article is devoted to the problem of solving the problems of forming and improving the digital competence of teachers. In determining the essence of the concepts of competence, quantitative competence of the teacher, the conclusions of scientists-researchers are given. Upon writing this article, the authors used the sociological method and conducted a survey among teachers. The survey involved 2.840 teachers from districts and cities of the Turkestan region of the Republic of Kazakhstan. The results of a survey of secondary school teachers on the implementation of methods based on digital technologies in education and the development of multimedia content for educational purposes are presented. It was concluded that in the Turkestan region there is an urgent need to consider operational measures to form digital competencies of teachers.

Keywords: digitalization, educational content, knowledge, educational process, information.

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1. Introduction

1.1. Conceptual Framework

Today, our society is at the very beginning of a revolution in which our ordinary life skills are radically changing, and the world is entering a stage of profound and intense changes in the technological, economic and social spheres. The development of new digital teaching tools by teachers is the focus of both the professional community responsible for the development of the national education system and the institutions of the European Union.

At the end of 2017, the Education Committee of the European Union developed the profile “Digital competence of teachers” (DigCompEdu). The state program “Digital Kazakhstan”, adopted in our country, provides for increasing and increasing the level of digital literacy of the population by 2022 by 83%, providing training of teachers on a permanent basis on new digital technologies for mastering new knowledge. This is due to an increase in the pedagogical potential of digital technologies and the general availability of digital technical means. This indicates the need for sufficient formation of digital competence of teachers for quality education, making creative professional decisions in professional growth.

1.2. Related Research

According to K. Schwab (2018): “The ability to anticipate future employment trends and needs in terms of knowledge and skills that require adaptation is of exceptional importance for all stakeholders is an essential component of human capital that directly depends on the availability and quality of education”. This scientist calls investments in human capital “not only direct costs for education in secondary and higher educational institutions, but also capital investments for self-education, improving work experience, as well as in the field of education, science and health” (Schwab, 2018). The Incheon Declaration “Education 2030” (2015) is based on the fourth UN sustainable development goal “Ensuring inclusive and equitable quality education and lifelong learning for all” (Sustainable Development Goals, 2016).

“We should not direct those who do not try to achieve education to the right path. You cannot help those who have not experienced difficulties in expressing their thoughts” (Palmer, 2019), “... as a result of joint implementation of learning-interaction of the student with access to knowledge, we will achieve success in education” (Palmer, 2020), “... we must transfer the traditions of thinking to the new generation, teach them independent thinking and a critical approach to these traditions” (Tomas, 2016). The importance of self-education of students, continuing since the time of Confucius, shows the relevance in terms of digitalization, digital modification of education. The digital transformation of education is a response to global information challenges occurring in the world (Bakeyeva et al., 2020). If the education system meets the requirements and opportunities of a digital society, then the digital transformation of education will lead to a digital economy of society. The modern stage of digitalization of education consists in the immersion of all its subjects in the digital educational environment (Iatsyshyn et al., 2020; Leshchenko et al., 2021).

The content of digital education is currently under scrutiny in all developed countries. Such concepts as “digital pedagogy”, “digital literacy”, “digital competence”, “digital culture”, and “digitalization of education” are widely discussed in the professional environment (Bortvik & Hansen, 2017; Kroksmark, 2015; McKnight et al., 2016). Digital literacy includes the ability to read and interpret digital media, reproduce data and images using electronic devices, and evaluate and apply new knowledge obtained from the electronic environment. The teacher’s digital literacy is a system of basic knowledge, skills and positions in the field of everyday use of digital technologies (Aymaletdinov et al., 2019).

1.3. Purpose of the Study

In the process of digitalization, there is a radical change in the structure of training and the organization of the educational process. In this regard, one of the urgent problems is to update the

methods of creating and providing educational content to students using digital technologies. In this regard, the purpose of the study is to determine the level of use of digital educational content and methods of teaching focused on digital technologies by secondary school teachers in education. The main objectives of the research are justification and solution of the problem of creating a digital educational environment with the professional participation of teachers, the formation of skills for the integrated use of cloud technologies in education, the development of digital competencies, training in information law and information security.

2. Methods

2.1. Research Method

The scientific article is methodologically based on the system analysis method. To determine the level of use of digital technologies in education using the method of questionnaires and interviews, as well as general sociological methods, a survey of teachers of secondary schools was conducted. The data obtained in the research were evaluated through descriptive analysis.

2.2. Participants

With the support of the human development Department of the Turkestan region, the survey of secondary school teachers was conducted in the period from 28.05.2020-30.05.2020 to determine the level of use the digital technologies in education. 2840 teachers from districts and cities of the Turkestan region of the Republic of Kazakhstan took part in the survey (Figures 1, 2).

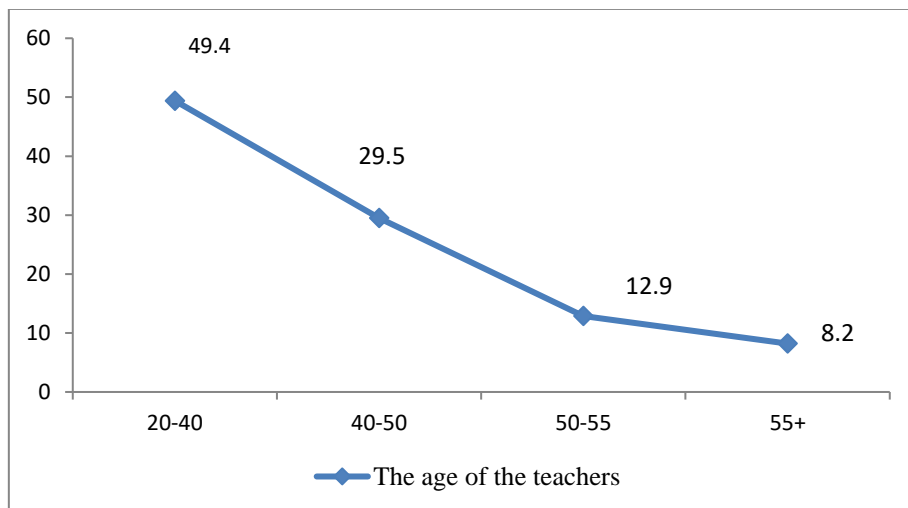


Figure 1. The ages of the teachers (%)

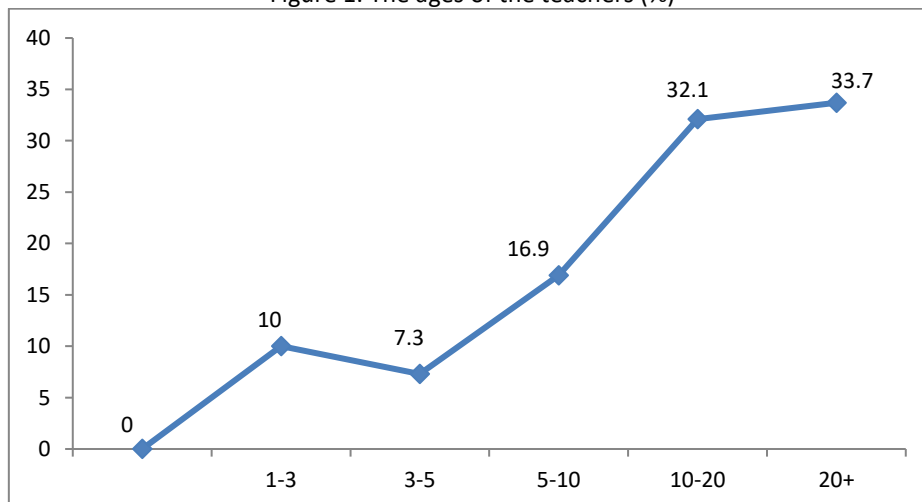


Figure 2. Work experience (%)

2.3. Data Collection Tools

Research data were collected using a survey created by the researchers. The research participants were asked the following questions:

- When do you use information and communication technologies?
- How often do you use information and computer technologies?
- What software tools of information and computer technologies do you use?
- What educational online resources do you use in your work?
- What kind of digital educational resources can you develop and process yourself?
- What technology is often used in education?
- Do you use online platforms to create and develop digital teaching tools?
- What works do you often use the information and computer technologies for?
- Do you follow the security rules when using information and computer technologies?

2.4. Data Collection Process

The survey, prepared for the research, was conducted among secondary school teachers who wanted to participate in the research voluntarily. Participants were asked to answer all questions.

2.5. Data Analysis

The answers given by the participants were analyzed on the basis of reliability. The obtained data were analyzed separately by researchers. In the analysis of the data, the research findings are presented in figures and tables using percentages. Based on the survey, the authors of the study identified tasks for solving the problem of forming the digital competence of school teachers.

3. Results

To solve the problems of forming digital competence of school teachers, it is necessary to solve the following tasks:

Task 1. Scientific and methodological definition of the essence and content of the concepts “Digital literacy”, “Digital competence”, “Digital competence of teachers” and their components, creation of a structural and content model for the formation of digital competence of teachers.

Task 2. Creation and implementation of an information system for methodological support of teachers on the use of digital technologies in education.

Task 3. Development and implementation of software for determining the level of formation of digital competence of teachers.

Task 4. Organization and implementation of advanced training courses for the formation of digital competence of teachers.

Task 5. Implementation the set of scientific and methodological measures to promote digital education and increase the motivation of teachers to use digital technologies in education.

The results of the survey are shown below (Tables 1-4, Figures 3-9).

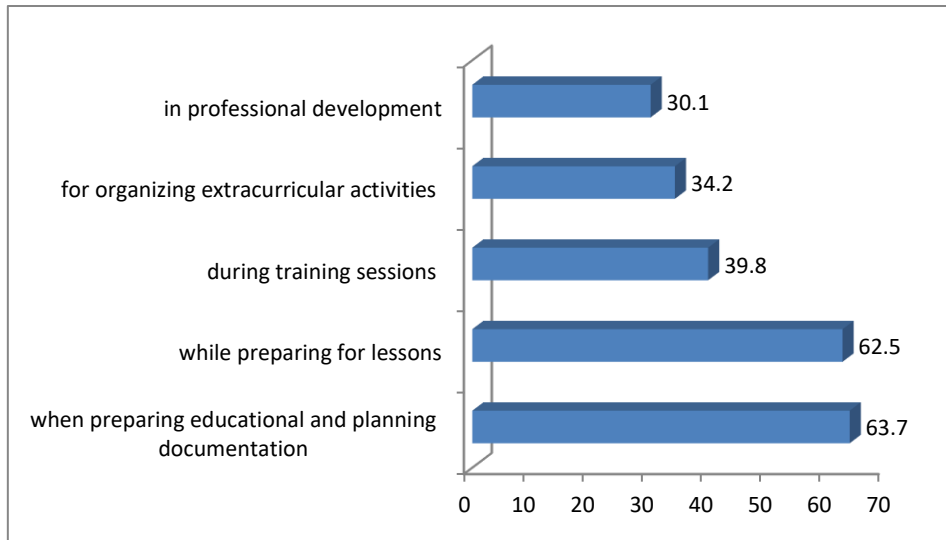


Figure 3. Question: When Do you use information and communication technologies (personal computer, laptop, netbook, tablet, etc.)? (you can choose several answers) (%)

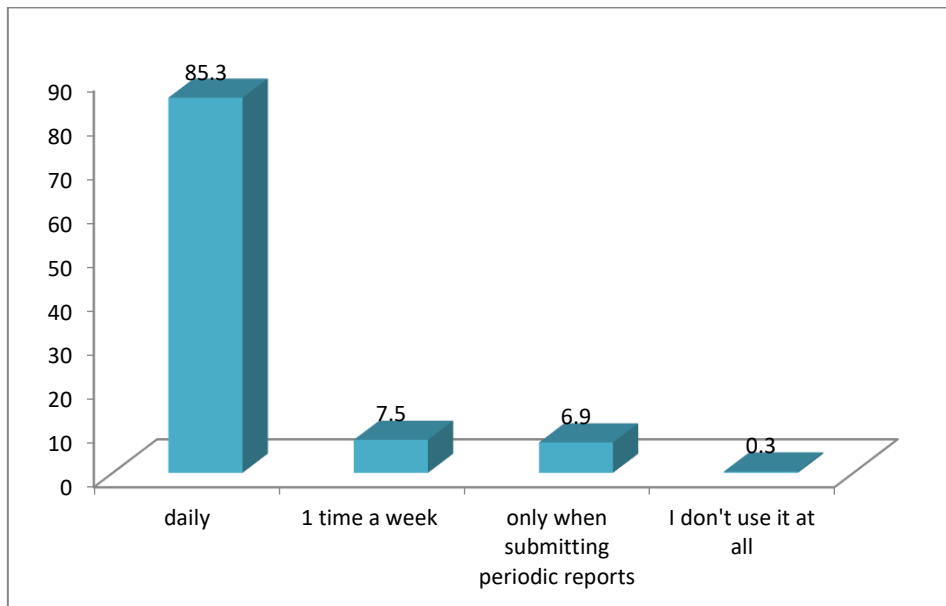


Figure 4. Question: How often do you use information and computer technologies (%)?

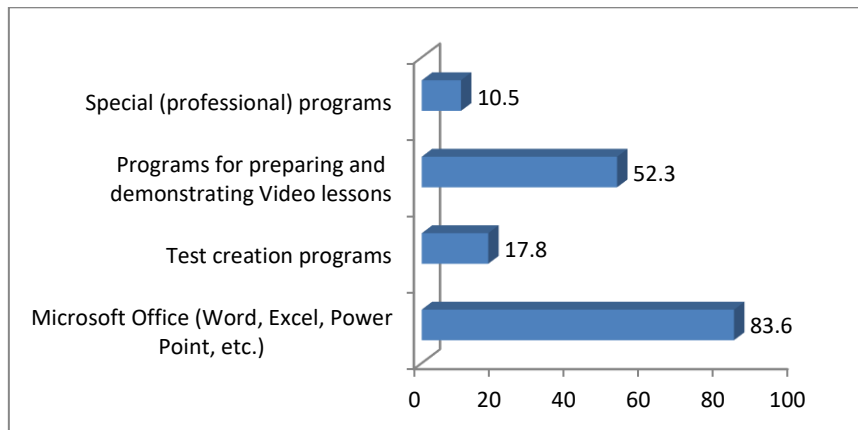


Figure 5. Question: What software tools of information and computer technologies do you use? (you can choose several answers) (%)?

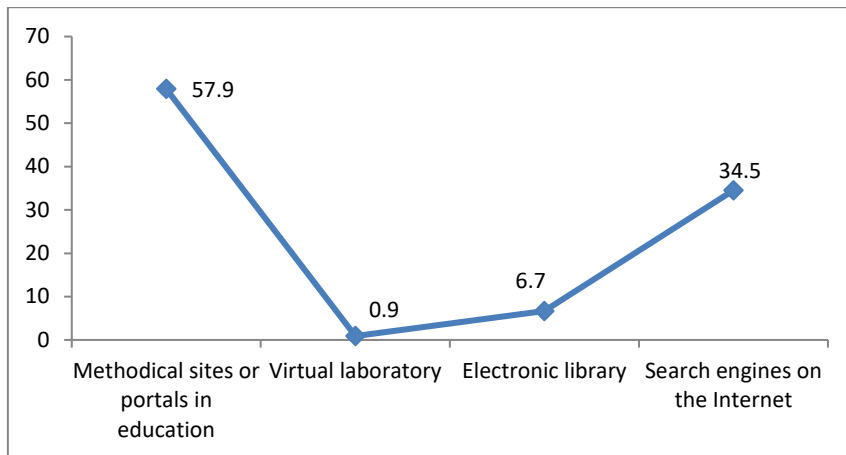


Figure 6. Question: What educational online resources do you use in your work (you can choose several answers) (%)?

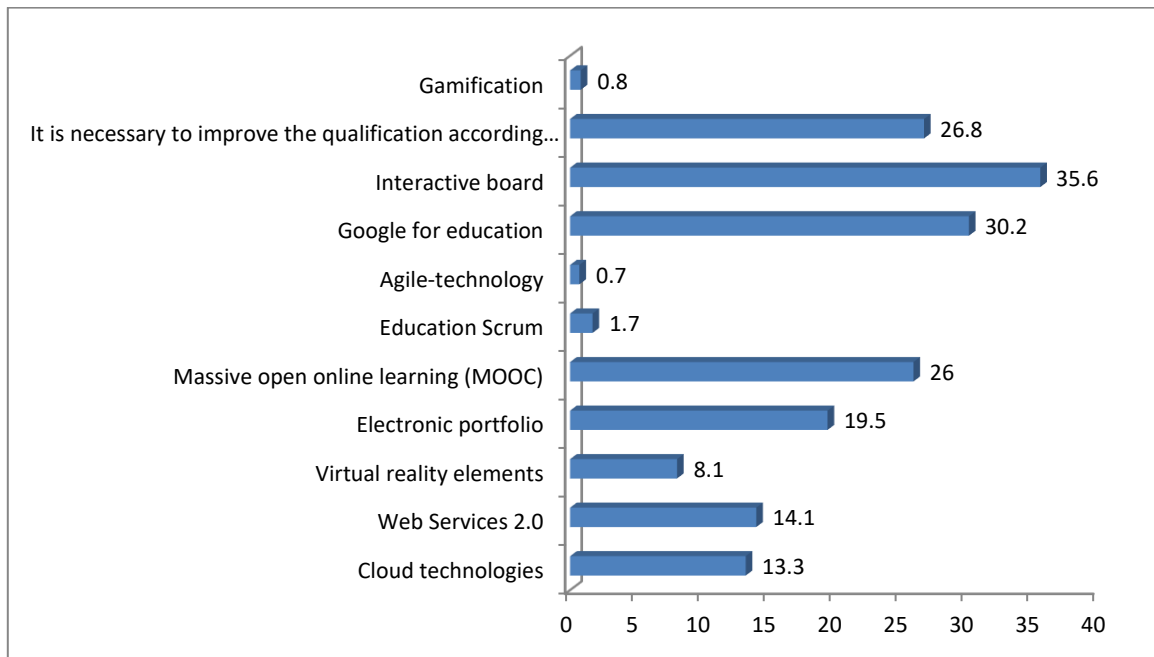


Figure 7. Question: Select a technology that is often used in education from the list below (you can choose several answers) (%)

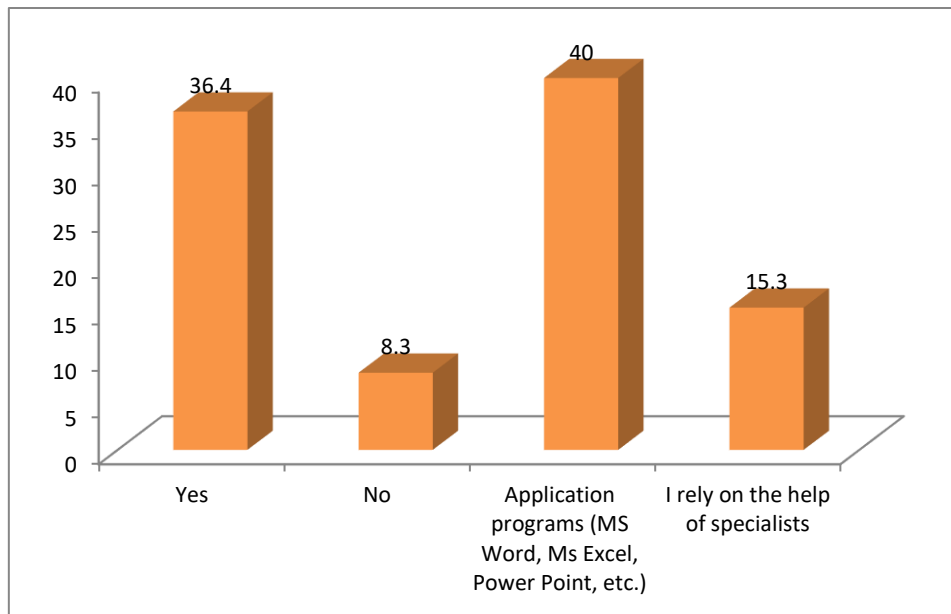


Figure 8. Question: Do you use online platforms to create and develop digital teaching tools (%)?

Table 1. What kind of digital educational resources can you develop and process yourself (select multiple responses) (%)?

Answer choice	Answers (%)
Text, presentation, flipchart, spreadsheet	88.3
Screencast	11.2
Videocast	17
Digital storytelling	1.4
Gamification	1
Infographics	3.3
QR code	4.8
Mental map	4.7
Virtual laboratory	3.8
Elements of virtual reality (VR)	3

Table 2. Evaluate your level of knowledge and use of modern information and computer technologies (%)

Answer choice	Answers (%)
Not enough	11.2
Average	61.3
I can teach others	15.8
In this direction I must take advanced training courses	11.7

Table 3. Choose the appropriate definition for you (%)

Answer choice	Answers (%)
I can easily find the information I need on the Internet	84.1
It is difficult to find the information you need on the Internet	15.9

Table 4. What works do you often use information and computer technologies for (you can choose several answers) (%)?

Answer choice	Answers (%)
Using e-government services (egov.kz)	39
In search of information necessary for education and training	76.9
Viewing online stores and making orders	15.4
Instagram (Instagram, telegram, WhatsApp, WhatsApp, Etc.), communicating with people, reviewing content, etc.	52.6

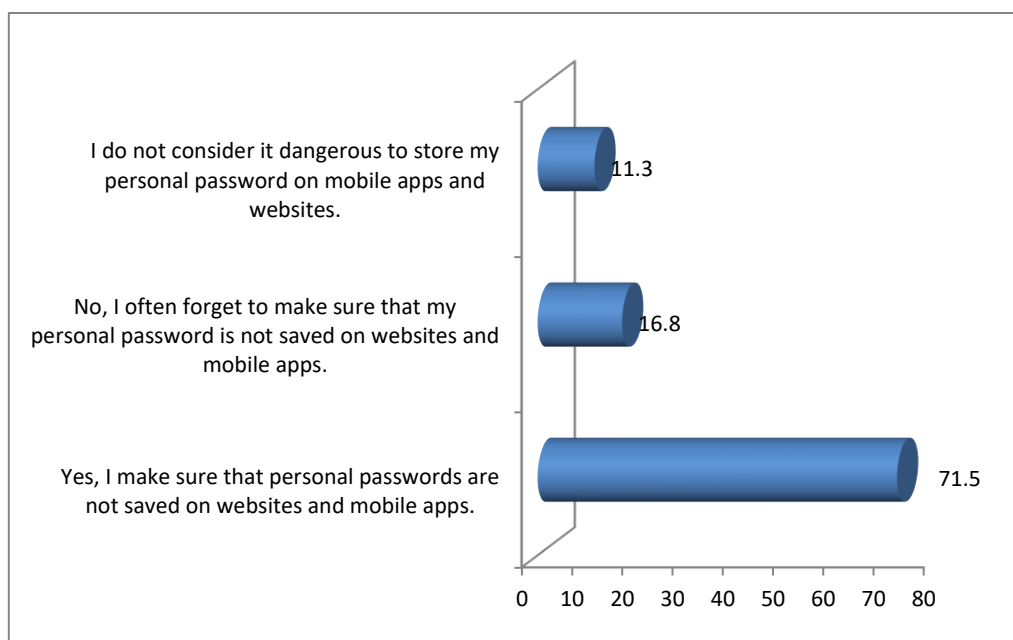


Figure 9. Question: Do you follow the security rules when using information and computer technologies (%)?

In solving the first problem, it is necessary to systematically analyze the research works of the countries of the near and far abroad in determining the content of the concepts of “digital literacy”, “digital competence”, “digital competence of teachers”, and designing a structural and content model for the formation of digital competence of teachers. As part of creating an information system, it is necessary to implement systematic work to provide methodological support to school teachers and conduct various educational seminars, competitions, and conferences. The digital competence assessment software allows you to track changes in the level of digital competence associated with professional development, and, as a result, the impact of teacher productivity in its dynamics.

The proposed advanced training course “Digital pedagogy” there are modern teaching technologies: combined educational technology, mobile learning, massive open online courses (MOOC), joint learning (collaborative learning, we-learning), cloud technologies in education, social networks and media in learning (connectivism), interactivity, multimodal learning, immersive learning, technology “flipped classroom” teaching methods, based on digital technologies (gamification, digital storytelling, Edutainment, Education, Scrum, Agile technology, creating digital educational content (screencast, podcast, infographics, mental map, QR code, video coding, animation) using professional software and web technologies, systematic knowledge of digital copyright, intellectual property rights, and information security.

Implementation of a set of scientific and methodological measures to promote digital education and increase the motivation of teachers to use digital technologies in education the purpose of the set of events (seminars, webinars, pedagogical competitions, etc.) organized within the framework of task 6 is to modernize the educational process, to prepare participants of the educational process for life in the context of the formation of the digital educational environment used in the educational process, and to develop human capital in the context of globalization. In addition, these measures provide for the expansion of professional training of teachers to fully use the pedagogical capabilities of digital technologies in education and the establishment of mutual scientific and methodological partnership.

4. Discussion

By “digital competency” scientists understand the individual’s ability to confidently, efficiently, critically and safely select and apply information and communication technologies in various areas of

life (working with content, communication, consumption, the technosphere) based on the continuous development of competencies (relevant knowledge, skills, motivation system and responsibility), as well as his readiness for such activities" (Aymaletdinov et al., 2019). Here, digitalization of education is one of the important problems in achieving the goal for the formation of digital competence of teachers. For example, in 2019 an international Programme for the International Assessment of Adult Competencies research, conducted in Kazakhstan among people aged 16-65 years, showed that problem-solving skills in the digital environment are significantly lower than the average level of Economic Co-operation and Development (OECD) countries (International studies: Kazakhstan..., 2020).

Digital competency is one of eight key competencies for lifelong learning developed by the European Commission (Bogdanovskaya & Zaichenko, 2015). In the future, there is a forecast that useful information does not exceed 20% of the information flow, and the proportion of information noise reaches 80% (Ottestad et al., 2014). Also, the basis of the importance of the formation of digital competencies of teachers are educational trends: open educational resources; massive open online learning; mobile training; corporate training; the growth of e-learning startups; educational potential of social networks; personalized, specialized training; gamification; the emergence of national virtual universities (García et al., 2015; Cavanagh, 2015; Gushchin, 2021).

The issues of creating digital competence for teacher training are in the focus of attention of both the professional public in charge of the development processes of the national education system and the institutions of the European Union. With regard to international research, the concept of digital competence takes priority in European policy documents and initiatives (for example: Digital Agenda, Communication on rethinking education, Opening up education, Grand coalition for digital jobs) (Krasnova & Mozhaeva, 2019). The concept of digital competence, known under the European name DigComp, has made a huge contribution to the development of digital competence at the international level. DigCompEdu includes the following areas of digital competence of teachers: aimed at the use of digital technologies in the professional teaching environment; aimed at developing professional skills of searching, creating and sharing digital educational resources; aimed at forming the necessary skills of teachers to use digital learning tools; related to the possession of digital tools for evaluating educational results; aimed at using digital tools to expand educational opportunities; defines the content of the teacher's activities to support the development of digital competence of students (Redeker & Poonie, 2017). The digital literacy program launched by the Kenyan Ministry of education shows the critical importance of long-term and comprehensive planning for changes that determine the overall effectiveness and impact of digital technologies on improving education (Gable, 2019).

In K. Tokayev's message "Constructive public dialogue-the basis of stability and prosperity of Kazakhstan" set the task of comprehensive implementation of measures to improve the quality of education (President's address "Constructive...", 2019). It is determined by the processes of intensive development of the fourth industrial revolution, in which the role of human capital is increasing. The main feature is education, new requirements of stakeholders, global new requirements, global competition between education providers, intra-system innovators (educational institutions) (Kondakov, 2017; Zinchenko, 2020). It is necessary to implement measures to improve the quality of human capital within the framework of the standards of the OECD countries provided for in the program "100 concrete steps" (Decree of the President..., 2015), it is assumed that it will contribute to solving problems, improving digital literacy in education; improving digital literacy of the population, specified in the state program "Digital Kazakhstan" (Resolution of the Government..., 2017). As a result of solving certain tasks, the solution of the task specified in the state program for the development of education and science in the country for 2020-2025 will be achieved, namely, reducing the gap in the quality of education between urban and rural schools, regions, educational institutions, students (Resolution of the Government..., 2019).

5. Conclusions

The results of the survey showed that in the Turkestan region, there is an urgent need to consider operational measures for the formation of digital competencies of teachers for the creation of digital educational content and the implementation of digital educational technologies in education. It is also necessary to solve the following problems that arise in the process of digitalization of the education system and integration into the world educational space: low activity of teachers in the implementation of teaching methods based on digital technologies in education; low level of use of the educational potential of social networks and cloud services in the educational process; improving the level of methodological training of teachers on the formation of information security of students; increase the level of knowledge of teachers in the field of intellectual property and copyright, in the field of obtaining and using network resources, as well as network communication skills.

Recommendations

The suggestions for future research as a result of this research are as follows:

- Studying a world experience of the development of digital competence in Kazakh pedagogy.
- Developing the methodological system of formation of digital competence of teachers, in terms of human capital development.

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