

Technological and Methodological Aspects of the Formation of Digital Competencies of Future Teachers in the Republic of Kazakhstan

B. Klara^{1,*} and T. Almash²

¹Taraz Regional University named after M. Kh. Dulaty, Taraz, Kazakhstan

²Abai Kazakh National Pedagogical University, 050010, Dostyk ave13, Almaty, Kazakhstan

Received: 9 Sep. 2023, Revised: 10 Oct. 2023, Accepted: 20 Oct. 2023.

Published online: 1 Dec. 2023.

Abstract: The article identifies technological and methodological aspects of the formation of digital-creative competencies of future teachers in the conditions of distance education in the Republic of Kazakhstan, reveals the essence of the concepts of competence, digital competence, digital-technological competence, digital-methodological competence, creativity, and digital pedagogical campus. The article describes the essence of the components of competence in a new content: organizational ability; ability to empathize; reflective ability. One hundred and sixty (160) future teachers of Taraz Regional University named after M. Kh. Dulaty took part in the research work. During the study, an online survey and an online test were conducted. A mobile application for the online test has been developed. Only future teachers from Kazakhstan took part in the experimental work, and the digital competencies of future teachers from Kazakhstan were compared with the digital competencies of future teachers from Russia. The article defines the content of digital-technological and digital-methodological competencies of the future teacher in the context of distance learning. The content of the formation of revealed, relative competencies of future teachers in the context of distance education is revealed and a draft is presented.

Keywords: Competence; digital competence; digital-technological competence; digital-methodological competence; smart education.

1 Introduction

In the context of New Kazakhstan, improving the system of training teachers in pedagogical universities and the formation of digital competencies of future teachers is becoming an urgent problem. The process of informatization, which is taking place at a rapid pace in society in the XXI century, has expanded the scale of the information environment at a world level that has not existed for a long time. The informatization process also includes the education system and requires new content of professional training for future teachers.

Innovative pedagogical practices through the internet, internet resources, information media, and the digital environment, that is, information reaches every person, including every teacher, at the same time and in the same volume without visiting their place of work [1]. Training of future world competitive teachers in the conditions of digital Kazakhstan in the Pedagogical University has its own innovative information pedagogical bank fund, innovative media library, and knowledge of new communication technologies, and can conduct innovative research work for the development of creative, intellectual abilities of students, conduct a diagnostic examination of its results and conduct pedagogical monitoring. It also provides for the training of future teachers who can carry out innovative technological activities with high intellectual potential, which can form a technological map of an innovative lesson.

1.1 Literature Review

The essence of the concept of competence

In the psychological and pedagogical literature, the word "competence" is revealed in a broad sense. In Pedagogical sciences, the concept of professional competence is considered in the form of a set of knowledge and skills, the volume of skills in solving problems, the mutual understanding of individual qualities and abilities, a complex of professionally significant personal qualities and knowledge, a whole set of theoretical and practical preparation for work.

Competence is the ability of a teacher to independently master knowledge, professional skills, and culture and adapt them to modern requirements as a specialist. In the short dictionary of foreign words [2], the definition of competence

*Corresponding author e-mail: klara.buzaubakova@gmail.com

(from Latin Competent – proper, capable), is given as an expert in a particular field, competent, with his knowledge has the right to decide or do something. In the encyclopedic Dictionary of the Russian language [3], the concept of competence (from Latin Competent – worthy, striving to achieve, corresponding) is revealed as follows: capable, competent, fluent in their business; knowledge and experience in a particular area.

According to the research of Kazakhstani scientists, the word "competence" includes the concept of complex, broad content characteristics, integrated into professional, socio-pedagogical, socio-psychological, legal, etc. [4,5]. In general terms, the competence of a specialist indicates the interconnectedness of his abilities, qualities, and personal qualities for the effectiveness of his professional activity in any field.

Components of competence

Components of competence include the following:

- 1) Organizational skills - the ability of a specialist to create a rational connection between cooperation;
- 2) The ability to empathize – to understand others; to empathize; to put oneself in the shoes of others;
- 3) Reflective ability – the ability to instantly regulate one's behavior and the behavior of a partner; make effective decisions in conflict situations; create a favorable psychological climate; and predict the development of intersubject relationships [6].

Competence components are revealed in the figure 1.

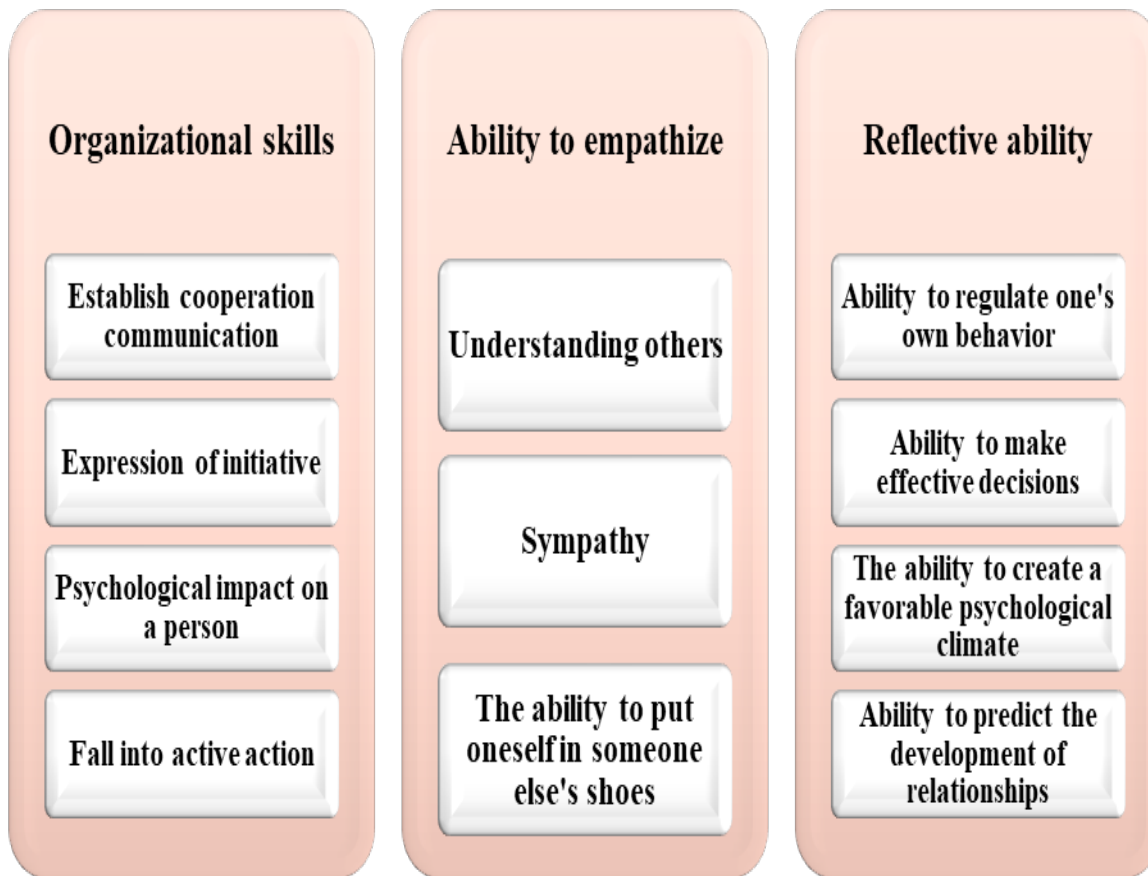


Fig. 1: Components of competence

The essence of the concept of digital competence

At the present stage, the widespread use of modern technologies in the educational process has expanded the training opportunities of educational institutions, and new formats of training have come to life [7]. The "digital generation" has come to life. Today, representatives of the new generation who do not think without the Internet are studying in general education schools, secondary special, and universities.

In the New Century, representatives of different generations are studying, working, and living in Kazakhstan:

- 1) Generation GI (those born between 1900 and 1923);
- 2) Silent (jawless) generation (those who came to life from 1923 to 1943);
- 3) Bebi-Boomer descendants (those born between 1943 and 1963);
- 4) Generation X (those born between 1963 and 1984);
- 5) Generation Y (Millennium) (those born between 1984 and 2000);
- 6) Generation Z (those who have existed since 2000) [8].

Generation Z is a generation with unique features from the XX century to the XXI century, but they are influenced by Generation Y (millennium), and they are characterized by personal independence [9]. At the present stage, along with the traditional form of training, various forms of training using digital technologies are used: distance learning, e-learning, mass open online courses using the internet and digital technologies, and other forms of training. The labor market and employers compare the requirements for future specialists to master digital competencies in parallel with their professional competencies. According to research by scientists, digital technologies become not only a tool but also a human habitat [10]. The labor market and employers are juxtaposing the requirements for future professionals to master digital competencies along with their professional competencies. According to the research of scientists, digital technologies are becoming not only a tool, but also a human habitat.

The digital education environment opens up new opportunities including:

- 1) Transition from teaching in the classroom or classroom to teaching anywhere and at any time;
- 2) Design of an independent educational route;
- 3) Transformation of students from users of electoral resources into creators of new resources.

Based on the results of studies conducted by the European Union to determine the level of mastery of digital competencies by teachers, "only 20-25 teachers learn the necessary digital competencies that allow them to be actively used in the learning process" [11]. In 2006, the European Union characterized the concepts of "digital literacy" and "digital competence", which are among the 8 competencies of continuing education. According to the description of the European Union, digital competence is the ability of people to confidently and constructively use information technologies in the work environment, in their free time, and for communication. The concept of digital competence is also the acquisition by people of the first skills, such as the ability to use a computer in their professional activities, the ability to store information, exchange information, and access network communication over the internet [11].

In connection with the rapid development of information, digital, and telecommunication technologies in the third millennium, the meaning of the concept of digital competence is expanding from year to year. According to the research of scientists Soldatova et al. [12], digital competence is a complex phenomenon that combines four more competencies:

- 1) Information and media integrity. These are knowledge, skills, incentives, and responsibilities associated with the search, understanding, organization, archiving of digital information and their constructive reflection, as well as the formation of an information environment using digital resources (text, video, audio, and video).
- 2) Communication competence. This is the knowledge, skills, motivation, and responsibility necessary for communication, which is created for various purposes (e-mail, chats, blocks, forums, social networks, etc.).
- 3) Technical competence. This is the knowledge, skills, motivation, and responsibility necessary to perform various tasks, safely and efficiently using technology and software tools, including a computer network, and cloud services.
- 4) Consumer competence. This is the knowledge, skills, motivation, and responsibility necessary to solve real-life situations to satisfy various needs using digital devices and the internet in the implementation of everyday tasks [12].

According to the research of scientists, digital competence is the safe choice, reliable, constructive, and effective use of information and communication technologies by an individual in various areas of activity in life (work with digital content, communication, consumption, and Technosphere). Public awareness brings new models to life in the education system:

- 1) Digital technologies that are effective in disseminating knowledge;
- 2) Technological startups in education;
- 3) Competition for talent and the rapid development of the entire industry;

4) Innovation and activism in education;

5) Transparency in global education: open online courses without closing; open universities, "digital universities", etc.

Competence is the ability of a teacher to independently raise knowledge, professional skills, and culture and adapt them to modern requirements, competence is the path to creativity. In the short psychological dictionary, the concept of creativity is defined as follows: Creativity (creation) is a direct translation from Latin – "creation"; "hidden power"; "ability to create". Creativity is the personality quality of an individual who shows a willingness to act productively, and a willingness to make discoveries. The existence of a stable motivation of the individual to achieve high results [13]. The researcher Ospanova [14], revealing the scientific foundations of the formation of creativity of future specialists, offers the following definition of the concept of creativity: "Creativity is the ability to be creative; the level of creative abilities that characterize a person; abnormal thinking of a person; the ability of an individual to discover new ideas; the level of creativity, talent; the ability to make quick ingenious decisions; a high level of intellectual activity; the ability to perceive and understand the new; the ability to solve abnormal situations" [14].

In the context of distance education, the development of creative competencies of future teachers is of great importance. The scientist Ospanova [14] revealed the components of the creativity of future specialists:

- 1) Purposefulness: the ability to plan the pedagogical process; think and act abnormally; clarify goals and objectives; check assumptions; constructive thinking.
- 2) Technological: communicability; ability to apply theoretical knowledge in practice; search for new knowledge; activity; openness to change; adaptation to non-standard activities.
- 3) Reflective: reflection on the situation; self-perception; self-assessment; self-development; self-assessment; the ability to put oneself in the shoes of others, etc. [14].

Scientist Turgunbaeva [15] offers the following definition of the concept of "creativity" from the point of view of pedagogical science: "Creativity is a personality trait that is observed in informational, current processes: the quality of personality that occurs through its inclusion in information substructures; a trait that manifests itself in the search for a solution when proposing a hypothesis and proving its correctness [15]. So, creativity is a single, stable built-quality of the personality, which determines creativity, the ability to discover new, think abnormally, and create ingenious solutions, and creativity is a set of certain processes, actions, and activities. Innovative action is a natural process arising from a person's need, discomfort (inconvenience), or sensitivity caused by a feeling of lack of knowledge, identifying a problem, searching for a solution, offering assumptions; declaring, and formulating the result of a decision.

In the context of distance education, the creative competencies of future teachers are the ability of the future teacher to independently and efficiently work with digital educational content in the information environment. At the present stage, the concept of "technology" has become widely used in the psychological and pedagogical literature [16]. This term is characterized by the arrival of computer technology into life and the introduction of "new computer technology" in the field of education. In science, a new direction of development has come to life – the technological one. The emergence of this technological direction in science and the beginning of its deeper study in pedagogy is no coincidence because pedagogical science has long been striving to find the most effective method in the field of education and training, to use it in life, to obtain high results, and to find new forms and methods of teaching. We state that [17], when technology-assisted educational programs were assessed for use with special education and general education students, the results demonstrated that the kids did better when utilizing the technological tools in the programs.

The essence of the concept of technological competence

The word "technology" comes from the Greek language and is formed from two phrases: "techne" means art, skill, or business; "logos" means science, doctrine, and "doctrine of art" or "doctrine of skill" [18]. Initially, the concept of technology began to be used in the field of production, and the term "technological process" was introduced in science. A technological process is a simply controlled production process consisting of a system of operations performed in a certain sequence based on previously known scientific laws [19].

Our analysis of the scientific and pedagogical literature shows that in modern pedagogical theory, there is no identical approach to the concept of "pedagogical technology", some call it the technologization of educational organizations, while others consider teaching as computerization, providing audiovisual means, and the next point of view is to raise didactic projects and the pedagogical system, the degree of its application in practice. All this characterizes this concept, the multifaceted nature of the phenomenon, that is, it requires justification of the methodological orientation of its study. Such orientation is characterized by consistency, action, and individual approach.

Likhachev [20] explains pedagogical technology as a pedagogical influence that affects the educational process as if it were pursuing a specific goal. Meanwhile, the technological process is represented as a certain system of units

(measures) that lead to a specific pedagogical result. According to Likhachev [20], "Pedagogical technology is not the ultimate unchanging mechanical structure, but the core of the constantly changing interaction between the child and the teacher, the content-organizing structure. The essence of pedagogical technology is to create the necessary conditions for the development of creative abilities and to reveal the essence of pedagogical technology [20]. According to Bepalko [21], "pedagogical technology is a content technique that implements the educational process". The well-known methodologist Monakhov [22] defines: "pedagogical technology as a model of well-thought-out pedagogical "activity" that creates favorable conditions for the student and teacher to work together in the design and organization of the educational process).

According to the definition of UNESCO [23], "pedagogical technology is a systematic method of implementing the entire process of teaching and mastering knowledge, taking into account their mutual influence on each other, the tasks of optimizing the form in Education". Choshanov [24] defines technology as a part of the didactic system. According to Selevko [25], pedagogical technology can manifest itself in three different fields: scientific, figurative, and real. In the first case, it is a part, of a region of pedagogical science that studies the purpose, content, and methods of teaching and projects the pedagogical process [26]. Technological skills of the future teacher include operational and methodological skills; psychological and pedagogical skills; assessment skills; diagnostic skills; expert skills; and research skills [27].

In the context of distance education, the digital-creative competencies of future teachers are a set of knowledge, skills, and abilities that allow students to freely use information and communication technologies at all stages of the organization of the educational process and, starting with lesson preparation, build individual educational trajectories that help create a digital environment, motivate them and predict educational achievements [27,28]. Today, teachers of the world are increasingly aware of the benefits of the skillful use of modern information and communication technologies in general education [29]. Information and communication technologies help solve problems where knowledge and communication are needed [30]. These include improving educational processes, improving the educational results of students and their motivation for learning, improving interaction, implementing communication and joint projects in the network of educational organizations, and improving the organization and management of digital educational programs. This is not surprising, because internet resources have become available for education, and opportunities for the development of an innovative economy and modern society (structure ICT-competence teachers) [31]. In recent years, many countries, including Russia, have made many efforts to study the conditions and consequences of the use of digital technologies in the educational process, described changes in the work of teachers, new requirements for the administration of education, and at the same time fully studied the positive and useful aspects and negative and negative aspects of this process [32].

A detailed analysis of the experience of leading countries in the field of education made it possible to abandon the simple list of requirements for the technical qualifications of teachers in pedagogical practice. On the contrary, the ICT competencies of a teacher are characterized as a system of applied knowledge, skills, and abilities that allow them to organize all stages of pedagogical work and improve the quality of education based on the effective use of digital technologies (individualization of training, technical solutions for creative tasks, interactive project work, etc.) [33].

The competence of teachers in the use of digital technologies is manifested not only in their ability to use technology in the educational process but also in their approach to cooperation and communication with colleagues, students, teachers, the scientific community, and other stakeholders: the ability to integrate innovation into their practice; the ability to professionally improve and develop themselves [34]. The digital competence of future teachers is a set of skills in the use of information and communication technologies and digital media in the process of setting and solving tasks related to the processing and functioning of this information, training, socialization, and obtaining the necessary knowledge to expand available opportunities.

The technological competencies of future teachers are high-level meta-abilities that allow them to work with information, use the internet, and possess motivated, understandable, safe, critical digital technologies. In addition to technological competencies, the new complex, which ensures the use of computer and digital technologies by a person and forms the core of modern functional literacy of any specialist, includes the expected educational results from the content of a set of other competencies (professional, general professional, universal), which change under the influence of digitalization.

1.2 Purpose of study

The purpose of the study is to identify technological and methodological aspects of the formation of digital-creative competencies of future teachers in the Republic of Kazakhstan in the context of distance education based on a partnership of cooperation between Kazakhstani universities and foreign universities within the framework of the integration of Kazakhstan and European education to improve the system of pedagogical education in Kazakhstan in the new conditions. The research hypothesizes that in the context of distance education, it is necessary to radically change the content of higher education to form digital-creative competencies for future teachers. The use of digital resources in

universities is of particular importance since the digital competencies of future teachers are formed only through their practical skills, such as critical thinking, searching for new information, processing, and sorting. Future teachers studying in the universities in the pedagogical profession must not only deeply master the subjects they teach in the future, but also master the internet resources that allow them to work effectively on a digital learning platform, which will fully improve their professional skills and digital competencies in the future. Objectives of the study include the following:

1. Determination of technological and methodological directions for the formation of digital-creative competencies of future teachers in the context of distance education in Kazakhstan in the new conditions.
2. Development of a model of cooperative partnership for the formation of digital and creative competencies of future teachers in the Republic of Kazakhstan in the context of distance education within the framework of educational integration of Kazakhstani universities and foreign universities, determination of an integrated methodology and mechanisms for implementation.
3. Identification of the effective ways to determine technological and methodological directions for the formation of digital-creative competencies of future teachers in the context of distance education in Kazakhstan in the new conditions.

2 Method

World experience shows that even in the course of distance learning, there is a full opportunity to receive innovative knowledge and improve professional skills. Distance learning – training carried out using information and communication technologies, telecommunication means in the process of indirect (remote) or incomplete indirect mutual educational work activities of a student and a teacher. At the stage of new development opportunities in the context of the Fourth Industrial Revolution, future teachers are subject to the following new requirements: competitiveness; the high quality of education; professionalism; profitability; digital competence, and creativity necessary for distance learning and training.

In the state program for the development of education and science in the Republic of Kazakhstan for 2020-2025: "When receiving higher and postgraduate education, the student must demonstrate 5 learning outcomes: knowledge and understanding in the field of study; application at a professional level, the formation of arguments and solving problems; the collection and interpretation of information; informing information, ideas, solutions; skills of independent continuation of learning" (State program for the development of education and science in the Republic of Kazakhstan for 2020-2025, 2019:13).

To ensure the 5 results of the above training, we must form the following professional competencies in the future teacher:

- 1) Creative skills: desire for innovation, mastery of innovative technologies;
- 2) Search skills: skills of learning, research, accumulation of innovative experience;
- 3) Ability to pedagogical reflection: ability to analyze professional activities and constructive thinking.

2.1 Participants

In the framework of improving the system of pedagogical education in Kazakhstan in the new conditions, 160 future teachers of Taraz Regional University named after M. Kh. Dulaty took part in the research work on identifying technological and methodological aspects of the formation of digital competencies of future teachers in distance learning in the Republic of Kazakhstan.

2.2 Data Collection Instrument

During the study, an online survey and an online test were conducted. To determine the level of digital competencies for the effective use of digital technology by future teachers in Kazakhstan in the new conditions, an online questionnaire was compiled on the topic "I will be a SMART-pedagog!" among the students of 1-4 courses for 3 years, also an online test was taken. For this purpose, a mobile application for the online test has been developed. Only future teachers from Kazakhstan took part in the experimental work, and the digital competencies of future teachers from Kazakhstan were compared with the digital competencies of future teachers from Russia and diagnostic monitoring was carried out.

2.3 Data Collection

In the course of the project, indicators and criteria of the level of digital competencies of future teachers of Kazakhstan are determined, and the meaning is revealed. Among the future teachers of the Kazakhstani University, Taraz Regional

University named after M. Kh. Dulaty and the Russian university, Shadrinsk State Pedagogical University "I will be a SMART-PEDAGOG!" online coaching for future teachers was conducted and a comparative analysis of the level of digital competencies of future teachers was carried out, methods of deduction and induction of research are used.

The level of digital competencies of future Kazakh and Russian teachers who took part in the online course before and after the online course was determined. An online survey of the topics "What I know about distance learning technologies" and "What I learn about distance learning technologies" was conducted, the results of which were processed by mathematical and statistical methods, sorted out, methodological recommendations were developed; and conclusions were drawn.

2.4 Analysis Technique

Most importantly, a SWOT analysis of the formation of digital competencies of future teachers in distance learning in Kazakhstan in the new conditions was carried out. The essence and content of technological and methodological aspects of the formation of digital competencies of future teachers in the conditions of distance learning in the Republic of Kazakhstan were revealed and a SWOT-analysis matrix was developed:

- 1) The strengths and weaknesses of the formation of digital competencies of future teachers in the context of distance learning are identified, and the influencing pedagogical factors are differentiated;
- 2) The risks encountered in the formation of digital competencies of future teachers in the conditions of distance learning are identified, measures to prevent it are clarified, opportunities are studied; and pedagogical prerequisites are determined.

3 Result and Discussion

The phrases and concepts "Generation Z", "digital generation", "network generation", etc. are used to identify the younger generation socialized in the context of digital technologies in educational and professional activities, which are widespread in everyday life today. A representative of the digital generation, differing in perception, memory, thinking, motivation, behavior patterns, life expectancy, and the world, is a person who is in demand in a digital society and acquires socially and professionally important competencies. Digital ("advanced", "clever", "SMART") technologies form the core of the modern stage of technological development and retain their dominant role shortly.

Smart-oriented education is based on the word's personality, motivation, aptitude, access to free resources, and the use of technologies. Smart education is self-directed, motivated, flexible, technological learning based on self-management, evidence-based, flexible, resource-enriched, and technological teaching methods. The ultimate goal and vision of the Smart - education strategy is to promote the development of creative, global human capital through the "revolution in the classroom", which includes educational content, teaching methods, and evaluation, changing the educational environment with the new educational paradigm.

The use of digital and information technologies, and electronic textbooks in the educational process of a higher educational institution helps the future teacher to improve his knowledge on his own and also contributes to the formation of his creativity, allowing him to fully and deeply master the material. In the context of distance education, there is a need to update the content of higher education for the formation of digital and creative competencies of future teachers.

3.1 Active Aspect

The pedagogical conditions for the formation of digital competence of the future teacher in the conditions of distance learning are as follows:

- 1) Amount of information speed of information perception;
- 2) Ability to process information in a meaningful way: to find and sort the searched, necessary information;
- 3) Quality of information perception- assimilation of the necessary material;
- 4) The ability to make decisions based on information: to make pedagogical reflections and think constructively, etc.

In the conditions of distance learning, the digital and technological competence of the future teacher is determined by the formation of the skills of the future teacher to work with internet resources, pedagogical sites, portal and digital learning platforms, modern digital educational content, electronic and multimedia textbooks, computer programs, multimedia devices, and the digital and methodological competence of the future teacher is determined. It is characterized by the ability to create an information bank fund and an electronic media library; organize pedagogical coaching and pedagogical training; participate in a pedagogical forum, and discussions, present their innovative project,

and defend their ideas freely (Figure 2).

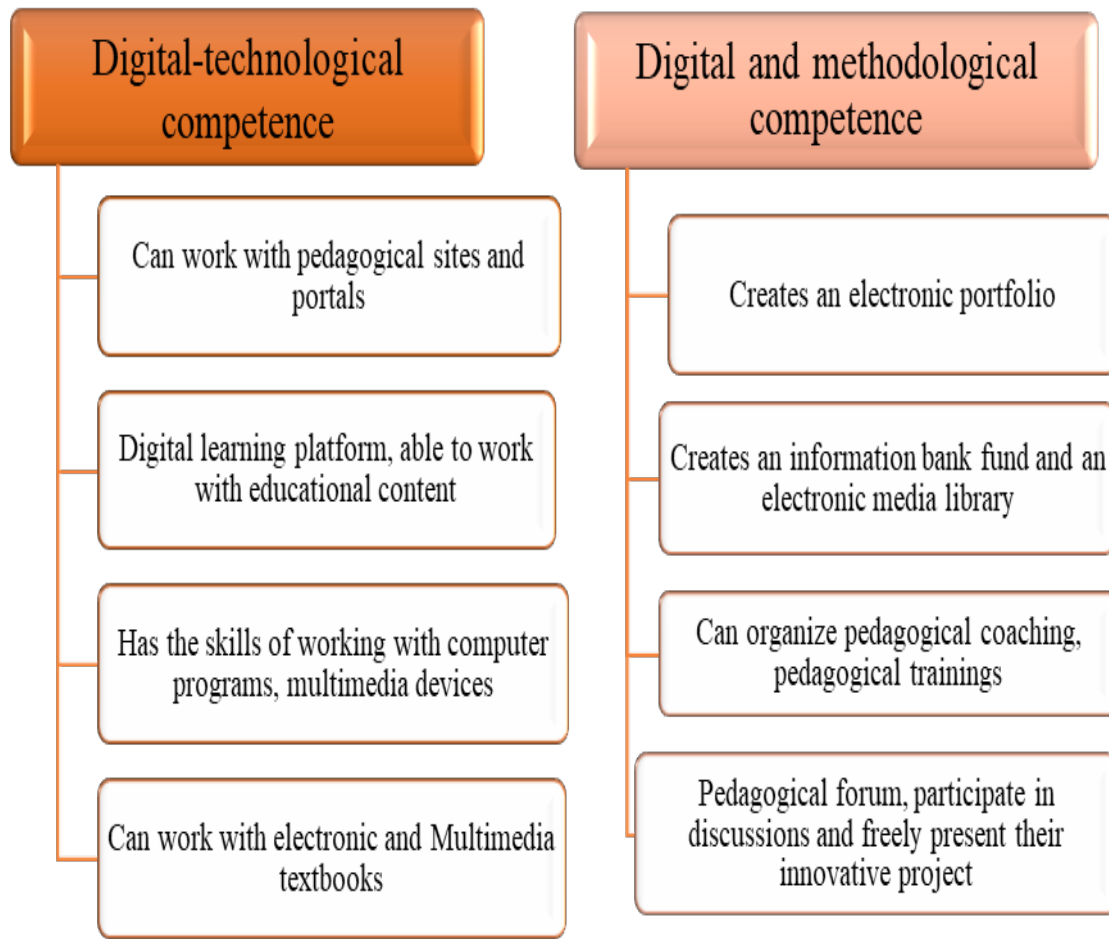


Fig. 2: Digital-technological and digital-methodological competencies of the future teacher in the context of distance learning.

According to Tikhomirov [35], Smart is a society that needs a new paradigm of development, new opportunities for the internet, and specially trained people who create new knowledge. The concept of Smart Education is an adaptive environment for continuous development to create intellectual friendship and the acquisition by students of knowledge, skills, and abilities in the interests of society and the state. The main idea of Smart education is new sources of knowledge used in parallel with traditional lectures and recognition of technologies, etc.

Smart education is a creative educational environment that combines the efforts of professionals. The transition to active content in the acquisition of world-class knowledge requires the modernization of the education system and an intellectual, critical-thinking, problem-solving teacher in the conditions of creating a modern New Kazakhstan. Smart education is an area that includes the complex connection of all educational processes, as well as the methods and technologies used in these processes. Sources of knowledge students are not only students and teachers working in groups or electronic environments but also need to be in the internet space at anytime and anywhere in the world.

At the present stage, the research potential in the field of development of professional competence of an individual, description of phenomena and related approaches "information competence", "digital competence" and "smart-personality competence" is growing. Smart society is a new quality of society, in which the set of technical means, services, and use of the Internet by trained people leads to qualitative changes in the interaction of subjects, which makes it possible to obtain new impressions – social, economic, and other benefits for a better life. In previous studies, some scientists view smart society from three perspectives: as specific changes in the socio-cultural paradigm, as an intersubject space that arises with people trained in terms of technical means, services, and the use of the internet.

The world of information reality is perceived, in which qualitative changes in the interaction of subjects play a key role, allowing to obtain new impressions of life associated with the introduction of Smart technologies. Smart society as a formation coexists in the world of SMART technologies. Smart - competence in pedagogical science is an unstable and not thoroughly investigated phenomenon. At the present stage, approaches to the study and definition of smart - competence as a phenomenon of modern society are being identified. Smart competence is an individual's mastery of smart technologies for searching, analyzing information, and creating innovations that interact in professional online communities. Based on the analysis carried out, Buzaubakova [36] summarizes the views of scientists on the phenomena of "information competence", "digital competence", and "smart competence".

Information technology is hardware and software based on the use of computer technology, providing storage and processing of educational information, its delivery to the student, interactive interaction of the student with the teacher or pedagogical software, as well as testing of students' knowledge [37]. The cultural and historical potential of approaches to the phenomena of information competence, digital competence, and smart competence of a teacher is distinguished by their evolution and change in the direction of the formation of an intellectual personality, ensuring harmony. "Information competence", "digital competence" and "smart-teacher competence" as phenomena of modern reality are reflected in the information society, digital society, and SMART-Society [31].

Information competence is a competence that is associated with the experience of activities in the world of information intelligence, and ways of interacting with techniques and technologies for the implementation of general and professional information needs of the individual. In the use of digital technologies in teaching and learning, the computer as a working tool act as a tool for preparing and memorizing text; text editor; drawing, table tool, graphic editor; counter machine; and thumbnail tool.

The use of digital technologies in teaching and learning is a method used to understand, evaluate, analyze, and synthesize information obtained as a result of observation, experience, reflection, and reasoning [38]. The use of digital technologies in teaching and learning involves the collection of relevant information; critical analysis and evaluation of evidence; guaranteed solutions and accumulated conclusions; and revision of forecasts and recommendations based on extensive experience.

3.2 Constructive Aspect

In the context of distance education, the theoretical knowledge of future teachers should be carried out in the direction of professional training, and not only the subject "pedagogy" should be taught in pedagogical universities, but the following branches of modern pedagogy should also be taught: "Digital pedagogy"; "Cyberpedagogy"; "Media pedagogy", etc. To improve the digital creative competencies of future teachers in the Republic of Kazakhstan the SMART-future teacher digital pedagogical campus will include 8 online pedagogical resources:

- 1) SMART - online pedagogical workshop – where future teachers get acquainted with the amazing secrets of the pedagogical profession as a result of watching, analyzing, and testing at the stage of pedagogical practice video lessons of an innovative teacher, both domestic and foreign.
- 2) Smart online pedagogical studio – where future teachers create and prepare their first video lessons.
- 3) Smart-online pedagogical electronic library – the future teacher receives innovative knowledge through internet resources.
- 4) Smart-online methodological portfolio – future teachers acquire the necessary its competencies to learn, apply the advanced innovative pedagogical experience of innovative teachers, and create an electronic portfolio.
- 5) Smart-online coaching – where future teachers acquire the necessary its competencies for conducting pedagogical coaching, training on current problems of pedagogy, and methods of teaching individual disciplines.
- 6) Smart-online coworking-center – an open platform for creative teachers and future teachers; where the future teacher learns creative competencies related to conducting innovative research and research projects on the problems of distance learning;
- 7) Smart-online virtual laboratory – future teachers carry out some laboratory work in their specialty in virtual laboratories.
- 8) Smart digital content – the future teacher develops digital and electronic content in his discipline [36].

Figure 3 presents a sketch of the formation of digital-creative competencies of future teachers in the context of distance education.

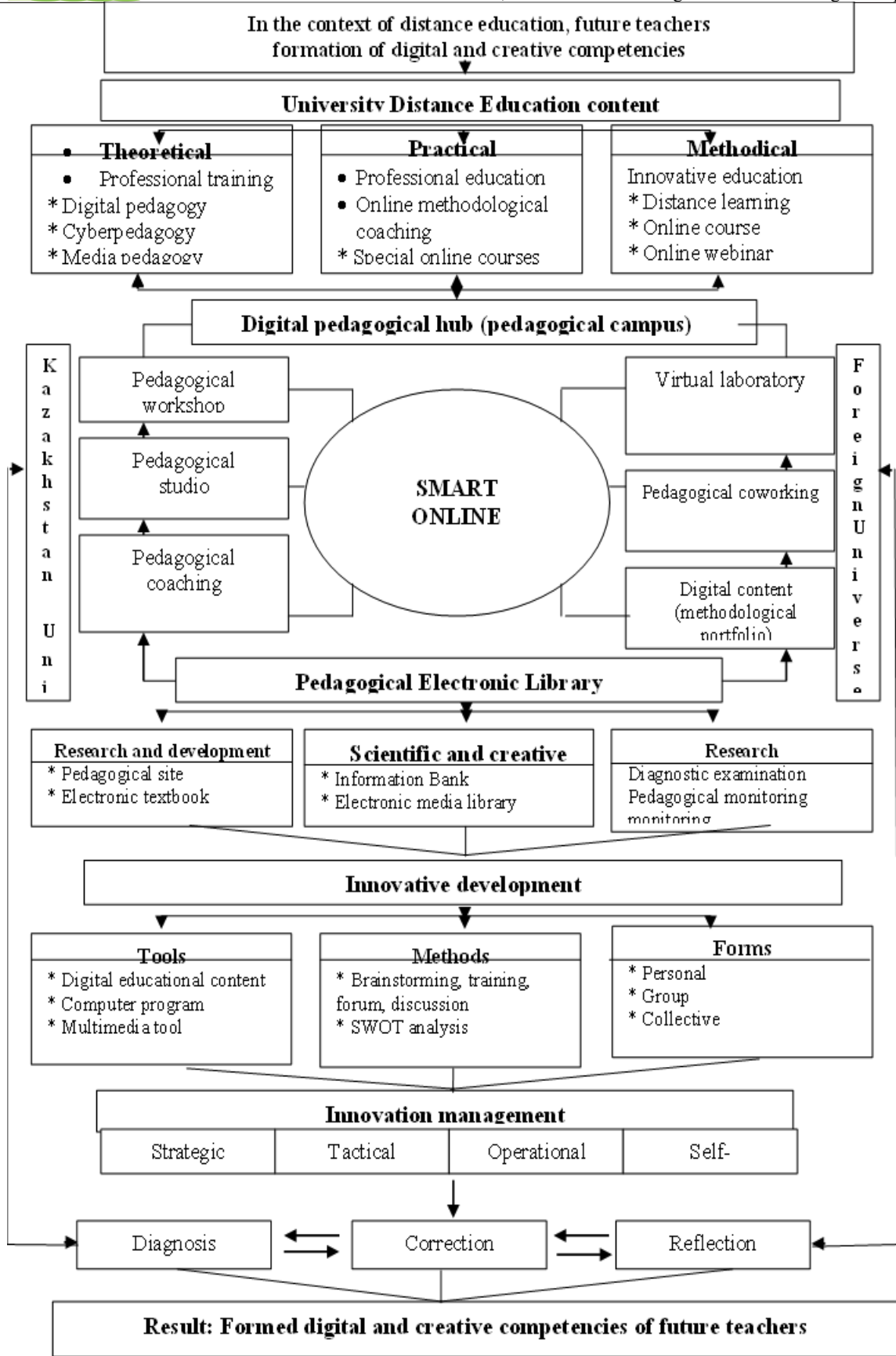


Fig. 3: Formation of Digital and creative competencies of future teachers in the context of distance education

In the context of distance education, the practical knowledge of future teachers is directed to professional education, and online methodological coaching and special online courses for future teachers should be conducted in pedagogical universities on the effective use of digital educational content in the educational process of distance education [39].

The future teacher can also acquire innovative knowledge through online courses and webinars, which are organized remotely. For the formation of digital-creative competencies of future teachers in Kazakhstan in the new conditions, a digital pedagogical hub (pedagogical campus) should be created as an innovative virtual educational platform that will provide access to all digital educational resources in pedagogical universities.

Future teachers will be able to form technological competencies by studying the experience of innovative scientists and innovative teachers. In the digital pedagogical hub, future teachers carry out research and creative work in cooperation with domestic and foreign scientists:

- 1) Search in pedagogical sites and portals, receive innovative knowledge from electronic textbooks;
- 2) Create an information bank fund and an electronic media library in their specialty and future subject;
- 3) Carries out pedagogical diagnostics and monitoring on digital learning platforms used for distance learning (bilimland; kyndelik. Kz; darin online, etc.) And makes swot analyses of educational content, computer programs, and multimedia devices.
- 4) Participate in coaching, pedagogical training, forums, and discussions on topical problems of distance learning in pedagogical coworking, express their thoughts, and acquire the necessary digital and creative competencies.
- 5) The future teacher learns to control himself: he makes pedagogical reflections on each of his actions.

3.3 Authentic Material Aspect

One of the key competencies necessary for the intellectual development of any future teacher is the ability to evaluate educational resources and select, sort, and modify digital resources and materials that correspond to the goals of training, the characteristics of the group of students, and the style of teaching, create a new version and share their project (version) with others, prove their idea, etc. The international online coaching webinar was attended by well-known scientists, future teachers, and methodologists of educational organizations. The purpose of the international online coaching webinar is to identify priority areas for the formation of digital competencies of future teachers. At the online coaching webinar, "I am a smart teacher!" the presentation of pedagogical ideas was made.

Future teachers see the appearance of a smart teacher as an innovative teacher who provides high-quality education to each student in a comfortable school, is critical, very kind, has boundless love for the child, sincerely loves the child, has a warm, cheerful character, understands the student's soul with his heart, is constantly ready to explain to the child incomprehensible material over and over again, help, advise, meet the needs of each child; a master teacher who has developed digital competencies and effectively uses information and communication technologies in the educational process so that he can work in a digital environment; a creative teacher who has a high reflective competence, is critical, can evaluate the teacher himself as a professional, is constantly in search of improving the quality of education; a creative teacher who recognizes personality-forming pedagogical activity as art.

Future teachers had the opportunity to test and improve their digital competencies by passing a specially prepared test consisting of 10 questions. The online coaching webinar provided future teachers with advanced forms of teaching technologies from the point of view of digital education, the partnership between the teacher and the student guided the effective use of new forms of digital content of educational material, opening the way for future smart teachers to get acquainted with the best achievements of world-class science and innovative practices of well-known scientists.

Within the framework of the international coaching webinar, participants were invited to participate in the online test consisting of 10 questions on the topic "The use of digital educational resources in training. Information and communication competence (ICT)". The purpose of the test was to study the competencies of future teachers regarding the types of digital educational resources and the possibilities of their use in the educational process. 160 future teachers took part in the online test, but not a single participant was able to correctly answer all the questions. A maximum of 8 points were awarded to 30 participants - future teachers. This corresponds to 8 correct answers out of 10 questions. 50 of the future teachers participating in the online test correctly answered 7 questions, which indicates that the digital competencies of future teachers are sufficiently well formed.

Table 1 presents the results of the online test on the topic "The use of digital educational resources in teaching. ICT competence".

Table 1: Results of the online test on the use of digital educational resources in teaching. ICT competence

№	Question	«Correct» answer, %	«Incorrect» answer, %
1	Informatization of education means	87,5% (140)	12,5% (20)
2	Information and Communication Technology (ICT) is:	93,8% (150)	6,2% (10)
3	ICT literacy is:	93,8% (150)	6,2% (10)
4	ICT competence is:	68,8% (110)	31,2% (50)
5	The benefits of using a computer in teaching	31,2% (50)	68,8% (110)
6	Digital educational resources	81,3 % (130)	18,7% (30)
7	How digital educational resources differ from traditional "paper" textbooks	62,5 % (100)	37,5% (60)
8	An automated workplace ... is called	6,3% (10)	93,7% (150)
9	Choose from the list, select educational facilities that include a distance format	31,3 % (50)	68,7% (110)
10	What are digital educational resources?	75% (120)	25% (40)

Based on the results of the test, three questions were identified that were most often given the correct answers.

Question 5, "The benefits of using a computer in teaching", was answered by 100% of the respondents who took part in the online test correctly.

93.75% of respondents, that is 150 respondents, who took part in the online test, answered question 8 correctly.

Question 4 was answered correctly by 68.75% of respondents, that is 110 respondents.

In recent years, the informatization of education has begun to be carried out within the framework of educational organizations. The pandemic of 2020 reassessed existing approaches to informatization of education and pushed it beyond the boundaries of organizations, isolating the teacher and student at the place of residence., This radically changes both the established organization of education and the requirements for teachers, the recipients of education themselves, and their parents.

For the 1st question "Informatization of education means" ... "Informatization of education is a set of measures to transform pedagogical processes based on the introduction of information products, tools, technologies in education" was correctly answered by 87.5% of respondents, that is 140 future teachers. The results of question 1 showed that 6.3% of respondents (10 future teachers) who took part in the online test received an incomplete answer "The development of information perception skills of users through a computer", and 6.3% of respondents (10 future teachers) chose an incorrect answer called "The use of computers in the education system".

Information and communication technologies (ICT) play an increasingly important role in our lives, including communication and learning. It is necessary to be able to use these technologies effectively for students and the learning community as a whole. In this regard, the second question was devoted to understanding the essence of the concept of ICT.

Question 2 called "Information and Communication Technology (ICT)" was correctly answered by 93.8% of respondents (150 future teachers) as "A pedagogical technology that uses special methods, software, and technical means to work with information", only 6.3% of 10 respondents, that is, only 10 future teachers chose the wrong answer "The use of a computer as a tool for building an optimal learning strategy".

If 93.8% of respondents (150 future teachers) correctly answered question 3 called "ICT literacy is the use of digital technologies, means of communication and/or networks to access, manage, integrate, evaluate and create information to work in modern society", then only 6.3% of 10 respondents, that is, only 10 future teachers, chose the wrong answer "A special type of competence necessary for the successful work of a programmer".

One of the information and communication technologies is a computer. Computerization of learning can be defined both in a narrow sense and in a broad sense: in the narrow sense, "the use of this computer as a teaching tool", and in the broad sense, "the multi-purpose use of this computer in the educational process". The test participants were asked to choose the advantages of using a computer in training.

ICT competence is the correct answer to question 4, which is called "68.8% of respondents (110 future teachers)

correctly answered that "the user has reliable mastery of all components of ICT literacy skills to solve problems arising in educational and other activities", 30 future teachers (18.8%) chose the wrong answer "knowledge of various computer programs and their use for information processing", 10 future teachers (6.3%), use of communication tools".

Several correct answers were proposed to question 5, which is called "The benefits of using a computer in teaching", 68.8% of respondents (110 future teachers) who took part in the online test chose the wrong answer "interactivity (interaction with the student, imitation of natural communication", 50 future teachers, i.e. 31.3% of respondents found the correct answer "adaptability of educational material", and 30 future teachers, that is, 18.8% of respondents chose the answer "facilitate the work of the teacher", and 30(18.8 %) future teachers chose the correct answer "control the individual work of students outside of school hours", which is more appropriate for the use of synchronous communication platforms in distance learning than using a computer in general education.

81.3% of respondents (130 future teachers) who took part in the online testing of the so-called "Digital educational resources" submitted the correct answer: "a set of electronic objects that can be used in different forms of organizing educational activities, in different combinations, for different purposes", while 20 future teachers, i.e. 12.5% of respondents, were satisfied with the incorrect answer "digital encyclopedias", 10 future teachers, i.e. 6.3% of respondents answered "electronic training sessions" he pointed to the wrong answer.

The development of information and communication technologies shows that digital educational resources take their rightful place. Therefore, it directly depends on the teacher how the choice of educational resources will be pedagogically justified. The development of high-quality digital educational resources allows you to automate the educational process. Creating resources with students can diversify project activities and increase their interest in research activities [26].

The results of the answers to the sixth question indicate that not all respondents understood the concept of digital educational resources.

To check whether future teachers have a deeper understanding of digital educational resources, 62.5% of respondents (100 future teachers) who took part in the online test of question 7 "Digital educational resources differ from traditional "paper" textbooks" chose the correct answer "interactivity of learning, motivation of active student activity and learning motivation", and 30 future teachers, i.e. 18.8% of respondents, chose the answer "ensuring the integrity and continuity of the didactic learning cycle, another 30 (18.8%) future teachers were satisfied with the answer "saving paper production and printing textbooks".

Only 6.3% of respondents (10 future teachers) who took part in the online test correctly answered "software and hardware complex of automated systems for automating certain types of activities", while 75% of respondents (120 future teachers) chose the wrong answer "ergonomic provision of an automated system for coordinating the parameters of the working environment at the workplaces of automated system personnel, 20 (12.5%) future teachers received the answer "technical support of an automated system for automating certain types of activities", and 10(6.3%) future teachers received the answer "software complex of an automated system for automating certain types of activities".

The linguistic resources necessary to support the educational environment are created and used not only in research projects but also within the framework of creating a university educational environment in the form of a system of individual automated workplaces.

Only 31.3% of respondents (50 future teachers) who took part in the online test correctly answered "the electronic, mobile, network" to question 9 as "Select forms of education from the list, which include remote formats", 50% of respondents (80 future teachers) chose the answer "the electronic, mobile, network, autonomous, mixed", and 18.8% of the remaining respondents (30 future teachers) chose the answer "the mobile, network, offline, mixed, shared".

Since digital educational resources include graphics, text, digital, speech, music, video, photo, and other information aimed at realizing the goals and objectives of modern education, the question "What are digital educational resources? only 75% of respondents (120 future teachers) who took part in the online test correctly answered "all of the above options are correct", while 12.5% of respondents (20 future teachers) chose the answer "multimedia files", and 12.5% of the remaining respondents (20 future teachers) chose the answer "presentations".

Future teachers are well versed in the concepts of "Information and Communication Technology", "ICT literacy", "ICT competence", "Digital educational resources", and have a low level of mastery of the concepts of "Automated workplace", "The educational facilities that cover the distance format" (Figure 4).

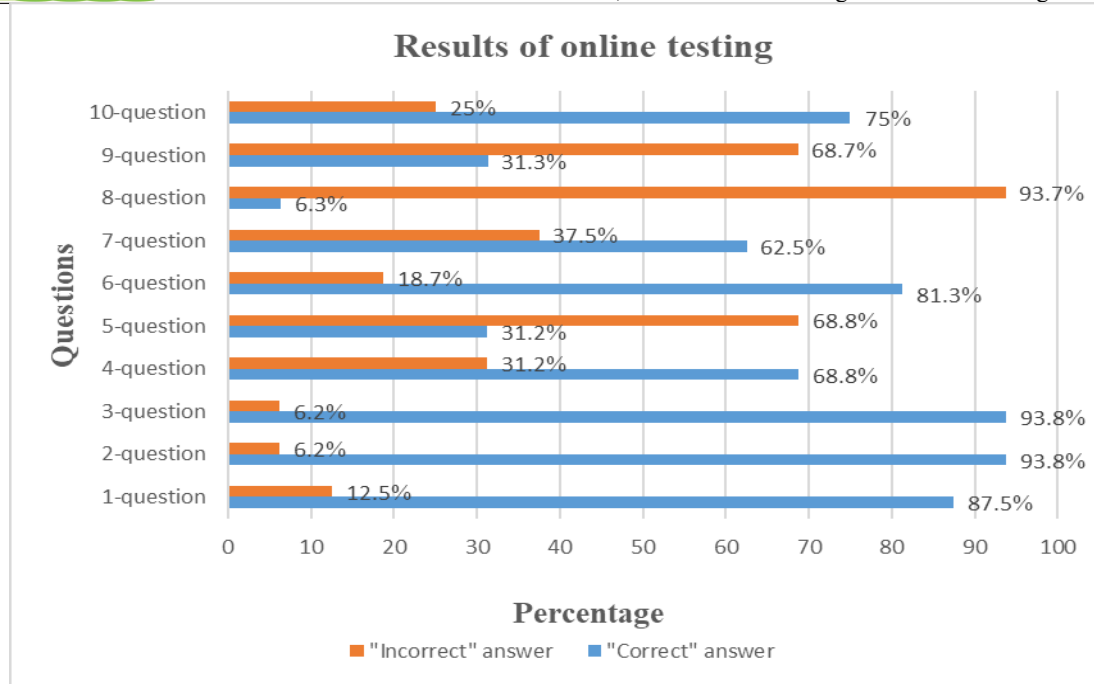


Fig. 4: General statistics of online testing

With the effective use of digital educational resources, it is possible to improve the working conditions of both the teacher and the student: the lesson will be informative, interesting, and presentable, the learning space and time will change, and the illustrative material will significantly expand. Digital educational resources create problem situations and organize the search activity of students, strengthen the emotional background of learning, form the motivation of future teachers, and individualize and differentiate the educational process. In solving certain problems, there is a free movement of information, which determines the need not only to receive information but also to activate it, to ensure maximum use of all types of information, including electronic ones, which helps to disseminate and acquire knowledge.

3.4 Aspects of Intentional Activities

To learn, use, study, and promote innovative practices in distance education in the training of globally competitive teaching staff in Kazakhstan in the new conditions, the international competition "My First Online Lesson" was organized. The international competition was attended by well-known scientists of our country, future teachers, methodologists of educational organizations, and scientists and future teachers of the Shadrinsk State Pedagogical University of Russia.

The purpose of the international online contest is to develop the digital competence of students of pedagogical educational programs, stimulate the creative activity of future teachers, improve the quality of educational activities, and improve the scientific and methodological support of the educational process. The online contest "My First Online Lesson" was able to solve the tasks of activating the creative and professional potential of future teachers, introducing modern innovative educational technologies into the practice of the educational process, improving the professional skills of future teachers, forming a social and professional image of future teachers, etc.

The online lessons of future teachers were evaluated according to 5 criteria: compliance with the content of educational material with didactic requirements; mastery of subject and technological competencies and general erudition of the future teacher; speech culture and optimal style of communication with students; general culture of the future teacher; quality of the video lesson, logic of storyline construction, optimality, content and informativeness of selected fragments; quality of materials attached to the video lesson; effectiveness of the use of information and communication technologies; technical level of recording and editing of a video lesson. Future teachers who took part in the contest used the capabilities of digital educational platforms Zoom, Microsoft Teams, Google Meet, Google Classroom, Padlet, Clideo, Quizizz, Wordwall, Crossword Labs, Canva, Survio, etc. The online competition will guide future teachers to the effective use of new forms of digital content of educational material, to master more advanced forms of teaching technologies from the point of view of digital education.

3.5 Aspects of Collaborative Activities

The importance of digital-creative competence of future teachers in the context of distance education is the ability of the

future teacher to create, plan, and implement digital technologies at different stages of training. At the same time, it is necessary to strive for the fact that in the lesson (when working in pairs, or in a group) the main emphasis will not be on the teacher, but on the student himself. This can also be achieved through the use of digital technology.

For the effective implementation of distance education and training in pedagogical universities using Internet resources, and a digital learning platform, it is advisable to be guided by the following pedagogical principles:

- 1) it is necessary to update the content of education of pedagogical universities: introduce mandatory special disciplines (for example: "Digital Pedagogy", "Cyberpedagogy", "Media pedagogy", etc.)
- 2) Future teachers studying in the universities in the pedagogical specialty should be fluent in the skills of working on a digital learning platform, and internet resources that allow them to fully improve their professional skills in the future, and not just in-depth knowledge of the subjects they teach in the future.
- 3) Extract new ideas, and necessary information from materials, information on the internet resources, and digital learning platform and guide them in future professional activities.
- 4) Ability to sort internet resources, and information received by modern pedagogical requirements.
- 5) Ability to adapt materials obtained from internet resources to their specialty and subject: to take into account the personal characteristics of the specialty, discipline of each student, etc.
- 6) Effective use of materials on internet resources in the learning process in such a way as to arouse the cognitive interest of students.
- 7) In the process of training, students are given tasks of various innovative content using internet resources: drawing up pedagogical cases; making presentations of small scientific projects; SWOT analysis; obtaining a video report; creating video situations, etc.
- 8) Formation of digital-technological and digital-methodological competencies of the future teacher studying at the university: the future teacher should be able to develop his electronic portfolio.

4 Conclusion

Digital technologies make it possible to develop existing methods for monitoring and assessing the level of knowledge of future teachers and create new, more advanced modern methods. At the same time, by analyzing a lot of information about students and their activity in the digital environment, the university teacher can provide him with sufficient assistance, opening up opportunities for independent work of the future teacher in the digital environment.

In the context of distance learning, there is an opportunity to develop additional and determine the digital competencies of future teachers, namely:

- 1) training in digital communication opportunities with students and colleagues;
- 2) Development of skills in creating and exchanging materials with teachers in a digital environment;
- 3) Use of digital content to create educational material and adapt existing ones;
- 4) Deepening knowledge about ways to protect information;
- 5) Assessment of the reliability of information and identification of false or biased information;
- 6) Safe and responsible use of digital technologies;
- 7) Creative use of digital technologies to solve educational problems;
- 8) Use of digital technologies in the educational process and monitoring of students' online activity;
- 9) Learn how to use digital tools to assess and monitor the level of academic performance and intellectual growth of students and apply them additionally.

One of the advantages of using digital technologies in training is the opportunity to actively involve all students in the educational process. Digital technologies can be used to adapt educational activities to the level of knowledge of each student, his interests, and his needs. In addition, in order not to aggravate the situation of existing inequality (for example, not all students have access to the internet and personal computers and flexibility in digital technologies) we must make sure that technology is available to all students.

Funding

The study is funded by the Ministry of Education and Science of the Republic of Kazakhstan within the framework of the grant project AP09259497 "Improving the System of Pedagogical Education in Kazakhstan in New Conditions: technological and Methodological Aspects of the Formation of Digital Competencies of Future teachers in distance learning in the Republic of Kazakhstan".

Conflict of interest

The authors declare that there is no conflict regarding the publication of this paper.

References

- [1] M. Halapa & M. Djuranovic. Children and digital media. *Global Journal of Sociology: Current Issues*, vol. 11, no. 2, pp. 71–78. (2021). <https://doi.org/10.18844/gjs.v11i2.5481>
- [2] Short dictionary of foreign words. P. 254, (1990).
- [3] Encyclopedic dictionary of the Russian language. M.: Russian language, p. 794, (1990).
- [4] A. Amirova, K. Buzaubakova, Z. Kashkynbayeva, M. Yelubayeva, Z. Kumisbekova, U. Elmira, & Z. Genç. Training the creative competence of future teachers. (2018). <https://digibug.ugr.es/handle/10481/59960>
- [5] A. Z. Zhumash, A. Zhumabaeva, S. Nurgaliyeva, G. Saduakas, L. A. Lebedeva & S. B. Zhoraeva. Professional Teaching Competence in Preservice Primary School Teachers: Structure, Criteria, and Levels. *World Journal on Educational Technology: Current Issues*, vol. 13, no. 2, pp. 261-271. (2021). <https://eric.ed.gov/?id=EJ1299493>
- [6] K. D. Buzaubakova, A.S. Amirova & A.A. Makovetskaya. Digital pedagogy: Textbook. – Taraz: "IP" Beisenbekova A.Zh.", p. 314 b. (2022).
- [7] H. Uzunboylu, A. I Prokopyev, S. G. Kashina, E. V. Makarova, N. V. Chizh & R. G. Sakhieva. Determining the Opinions of University Students on the Education They Receive with Technology During the Pandemic Process. *International Journal of Engineering Pedagogy*, vol. 12, no. 2. (2022). <https://doi.org/10.3991/ijep.v12i2.29329>
- [8] D. M. Dzhusubalieva. Transformation of education in a digital society / Materials of the international scientific and practical conference "Actual problems and prospects of modern pedagogical education" dedicated to the 70th anniversary of the Doctor of Pedagogical Sciences, professor, academician of MANPO K.K. Zhampeisova. *Almaty: Ulagat*, pp. 35-41. (2022a).
- [9] D. M. Dzhusubalieva. Formation of digital competence of future teachers of foreign language education during university studies / Collection of materials of the round table of the TA appeal "Modern language education: traditions and innovations". Almaty: Abylai Khan Kazakh University of International Relations and World Languages, pp. 10-15. (2022b).
- [10] M. Saidi & F. Cheraghi. Genre analysis of artificial intelligence research article abstracts: Local versus international journal: Genre analysis. *Global Journal of Foreign Language Teaching*, vol. 10, no. 2, pp. 111–119. (2020). <https://doi.org/10.18844/gjft.v10i2.4699>
- [11] European Commission. The European qualifications framework for lifelong (EFQ) Luxembourg: Office for Official Publications of the European Communities. (2008). <https://ecomprences.eu>
- [12] G. U. Soldatova, T. A. Nestik, E. I. Rasskazova & E. Y. Zotova. Digital competence of adolescents and parents: Results of the all-Russian study. *M.: Internet Development Fund*. (2013).
- [13] Brief psychological dictionary. M.: Political literature, p. 317. (1985).
- [14] B. A. Ospanova. Scientific foundations of the formation of creativity of a future specialist in the conditions of university education. Monograph. Turkestan, p. 97. (2006).
- [15] B. A. Turgynbaeva. Andragogy. Almaty: Alatau, p. 85. (2011).
- [16] H. Keser & A. Semerci. Technology trends, Education 4.0 and beyond. *Contemporary Educational Researches Journal*, vol. 9, no. 3, pp. 39–49. (2019). <https://doi.org/10.18844/cej.v9i3.4269>
- [17] B., Baglama, A., Yikmis & H., Uzunboylu. The effects of computer-based video modeling on teaching problem-solving skills to students with intellectual disabilities. *Croatian Journal of Education*, 22 (3), pp. 689-717, <https://doi.org/10.15516/cje.v24i3.4142>
- [18] Russian Pedagogical Encyclopedia: In 2 volumes. Chief editor Davydov V.V. *M.: Great Russian Encyclopedia*, p.

- [19] M.E. Bershadsky & V.V. Guzeev. Didactic and psychological foundations of educational technology. Pedagogical search, pp. 10-11. (2003).
- [20] B. T. Likhachev. Pedagogy: a course of lectures. M.: Yurayt. (1998).
- [21] V.P. Bepalko. The components of pedagogical technology. M.: Pedagogy, p. 192. (1989).
- [22] V.M. Monakhov. Technological foundations of the design and construction of the educational process. Volgograd: Change, p. 211. (1995).
- [23] UNESCO. UNESCO report on the state of affairs in world education for Paris. (1991).
- [24] M.A. Choshanov. Flexible technology of problem-modular education. M.: Public Education, p. 160. (1996).
- [25] G.K. Selevko. Modern educational technologies. M.: National Education, p. 255. (1998).
- [26] A. Satbekova. Technological culture of future teachers and problems of its formation. Kazakhstan sugary mektebi, vol. 4, pp. 46-50. (2006).
- [27] T. A. Aimaletdinov, L.R. Baymuratova, O.A. Zaitseva, G.R. Imaeva & L.V. Spiridonova. Digital literacy of Russian teachers. Readiness to use digital technologies in the educational process. M.: NAFI Publishing House, p. 84. (2019).
- [28] V. C. Magayon, R. Saccuan, & A. Carbonell. Expectation vs. reality: A sentiment analysis of students' experience on distance learning. *International Journal of Learning and Teaching*, vol. 13, no. 4, pp. 260–275. (2021). <https://doi.org/10.18844/ijlt.v13i4.5979>
- [29] L. Mirzoeva. Assessing competence in teacher education: Development of university students' problem-solving skills. *International Journal of Innovative Research in Education*, vol. 10, no. 1, pp. 01–10. (2023). <https://doi.org/10.18844/ijire.v10i1.6811>
- [30] M. C. Garbin, E. T. de Oliveira & S. Telles. Active methodologies supported by interaction and communication technologies in higher education: Communication Technologies in Higher Education. *Global Journal of Information Technology: Emerging Technologies*, vol. 11, no. 2, pp. 47–54. (2021). <https://doi.org/10.18844/gjit.v11i2.6117>
- [31] UNESCO recommendations. Structure of ICT competence of teachers. [Electronic resource]. (2001). URL: https://unesdoc.unesc.org/ark:/48223/pf0000213475_rus (Accessed: 03.01.2023).
- [32] I. V. Sokolova & O.A. Mudrakova. Informatization of society and education: modern theory and practice. Collection of joint scientific works of students and teachers of RSSU. Moscow, p. 145. (2013).
- [33] The Digital Competence Framework. [Electronic resource] (2008). Update date: 13.12.2018. URL: <https://ec.europa.eu/jrc/en/digcomp/digitalcompetence-framework> (Accessed: 03.01.2023).
- [34] I.V. Sokolova & A.E. Sergeyev. Extracurricular activities as a form of integration of science and school education. *Modern high-tech technologies*. Vol. 9, pp. 193-197. (2018).
- [35] V. P. Tikhomirov. The world on the way of Smart education. New opportunities for development. Open education. Vol. 3, pp. 22-28. (2011).
- [36] K. Buzaubakova. The portal smart-pedagog. kz as means of increasing the digital competencies of future teachers. Incte, 22 6th International Conference on Teacher Education. Bragança, pp. 206-208. (2022).
- [37] G. J. Hwang. Definition, framework and research issues of smart learning environments a context-aware ubiquitous learning perspective. *Smart Learning Environments*, vol. 1, no. 1, pp. 1-14. (2014). <https://slejournal.springeropen.com/articles/10.1186/s40561-014-0004-5>
- [38] T. Inaltekin. Examining secondary students' perceptions of the technology-based learning and teaching in science courses. *World Journal on Educational Technology: Current Issues*, vol. 12, no. 2, pp. 71–83. (2020). <https://doi.org/10.18844/wjet.v12i2.4628>
- [39] B. O. Ospanova, R. Z. Aubakirova, B. T. Kuanysheva, G. A. Kabzhanova, T. I. Anatolyevna & Y. V. Tabakaev. The organization of distance education in during the Covid-19 pandemic. *Cypriot Journal of Educational Sciences*, vol. 17, no. 4, pp. 999–1008. (2022). <https://doi.org/10.18844/cjes.v17i4.7104>