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Future Teachers' Training in the Context of Education Digitalization

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Abstract

The relevance of the study is confirmed by the global problems of aging of teaching staff, insufficient popularity of the teaching profession, a high level of responsibility and requirements for teacher work (USA, Great Britain, Norway, Greece, Bulgaria) and the need to find effective ways to solve them.

Modern conditions put forward new requirements for the personnel training, for the training of personnel of the future, require the search for new effective forms and methods of organizing the future teachers' professional training, including using distance learning technologies. Higher educational institutions of Russia (V.I. Vernadsky Crimean Federal University, Kazan Federal University) accumulate, summarize and present their experience in the field of teaching staff professional training, taking into account the frontal strategy of socio-economic development of the Russian Federation, priorities 2030, regional policy. The study purpose is to conduct a pilot project for training teachers in the context of education digitalization. Research methods: theoretical methods (comparative analysis of the research subject based on the study of scientific literature and the results of modern psychological and pedagogical research); empirical methods: questioning the faculty and students of federal universities, analyzing the results of students' activities, observing and analyzing the educational process. The study allows us to conclude that it is necessary to update the content, methodological support for the pedagogical personnel's professional training, taking into account the requirements of the present. The practical significance of the results lies in improving the quality of teaching staff training.

Keywords: future teachers' training, digitalization, pedagogical education, competencies, digital pedagogy.

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Introduction

Sociocultural changes in society determine the expansion of the existing professions spectrum, new professions, professions of the future. The structure of consumers of education and the requirements for them are changing: there is an increase in the additional professional education sector, the rapid development of adult education; introduction of the principle of lifelong learning, which determines the need for training teachers (Sokolova, 2014). Teaching staff training in modern conditions takes into account several aspects:

– change in the students' training quality of receiving pedagogical education due to the rejection of the training linear trajectory;

– changes in the content of teacher training programs and teaching technologies;

– identification of the possibilities and results of the teacher training variability.

A modern teacher must be proficient in digital technologies, ICT. Digital educational technologies are changing the society life as a whole and its professional sphere, acting not only as a tool, but also as an environment for the existence of a modern person and a professional. Digitalization makes it possible to implement individual educational routes in the process of training future specialists, provides variability and independence of the process of acquiring knowledge, expands the possibilities of obtaining, processing, storing and broadcasting information. The educational process in higher education in the context of education digitalization is aimed at the formation of future teachers' digital professional competence. It is determined by the Decree of the President of the Russian Federation as of July 5, 2018 "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024" that modern and safe digital educational environment creation is one of the priority tasks in the education field.

Khutorskoy & Khutorskaya (2008) has studied the information competence formation that provides the skills of the subject of the educational process in relation to the information contained in academic subjects and educational areas. Among the information competence elements the researchers highlight motivation, need and interest in acquiring knowledge, skills and abilities in the technical, information and software field; the system of the modern information society that is representing in a set of social, natural and technical knowledge; knowledge that constitutes the informative basis of search cognitive activity; methods and actions that determine the operational basis of search cognitive activity; experience in search activities in the software and technical resources field; experience of human-computer relationship.

According to Kizik (2004), informational competence consists of some elements: the ability to independently search and process information necessary for the high-quality professional tasks performing; readiness for self-development in the information technology field, necessary for continuous professional development and self-realization in professional work; the ability for group activities and cooperation using modern communication technologies to achieve professionally significant goals.

Researchers have studied such aspects of digitalization in education as the digital competence of university students as a resource for the future professional's competitiveness (Olkhovaya & Sadova, 2011), innovations in mentoring in the digital education field (Merzon, Sibgatullina-Denis, Vanchova, & Ushakova, 2021), digital literacy (Denisov, 2018), network competence as an element of digital literacy (Egunova, 2020).

At the same time, a comprehensive study is required on the problem of introducing a competence-based approach in the formation of future teacher's digital professional competence. The problem of the digital professional competence formation has acquired a particular relevance in the digitalization era, rapid digital technologies development and artificial intelligence, organization of the educational process using distance educational technologies during the pandemic.

Purpose and objectives of the study

Conducting a pilot project for teachers' training in the context of education digitalization is the purpose of the study. Among the study objectives, the following are highlighted: to determine the key methodological approaches and principles of teachers' professional training in the context of education digitalization; to reveal the level of teachers' readiness for pedagogical activity in the digitalization context.

Literature review

The research problem is based on a comprehensive analysis of the teacher education development on the global, national and local scales, confirmed by the results of numerous studies on future teachers' professional training; the formation of a highly qualified pedagogical staff for improving the education quality (Karpov, Kuznetsova, Kuznetsova, & Shadrikov, 2011; Gorbunova, 2014), the need for updating educational systems (Baydenko, 2006), digital pedagogy (Grinshkun, 2014; Gorbunova, 2015; Tregubova, Katz, & Shibankova, 2020; Khrulyova, 2019).

From the standpoint of the system-activity approach, some scientists set out a methodology for assessing the teaching staff's qualification level.

Their research provides a description of the professional competencies required for pedagogical activity, and specific diagnostic tools for their assessment. Also, the authors give recommendations on the use of this toolkit for monitoring the quality of pedagogical universities graduates' training, as well as certification of teachers when confirming the suitability of the position held and in order to assign the first and highest qualification categories (Karpov et al., 2011).

The relevance of designing and creating a university innovative educational environment is dictated by the need to bring higher education system in line with the information society requirements, as well as the need to provide conditions for future professionals' self-development and self-education, which is confirmed by regulatory documents and the results of scientific research on innovations in education. By the university innovative educational environment, the researchers mean a single educational space of an educational institution, which allows cooperating the efforts of all interested parties in the future specialists' high-quality training. An innovative educational environment is an open system that accumulates purposefully created organizational-pedagogical, procedural-technological, information resources; a system of teaching aids and methods of their functioning, aimed at innovativeness and comprehensive support of the education and scientific research in a university. The developed scientific and methodological provisions, practical recommendations and approaches, scientific and methodological recommendations on the formation of cluster technology for the implementation of the concept of pedagogical education and the design of a university innovative educational environment can be used to create a model of lifelong pedagogical education (Gorbunova, 2015).

The competence-based approach use is a basic element of the novelty of future state educational standards of higher professional education, one of the main principles of their design. It is this circumstance that determines the obligatory stage of identifying the "portfolio" of competencies, which will later be included in the competence model of graduates of all stages (levels) of higher education. Competencies will be the "core" of a new generation of state educational standards, shifted towards "educational results". This methodology makes it possible to identify, taking into account national and foreign experience, by means of questionnaires and expert survey, the actual "ranks" of competencies. This requires the mandatory involvement of employers, graduates and teachers. The process of identifying competencies itself should become another factor in establishing the principle of its openness to higher impact in Russian higher education. The task of identifying competencies, due to its complexity and systemic nature, involves the next step – the generalization of experience based on the practice of educational and methodological unification and the refinement of methodological recommendations in order to move on to mass development. Russian higher education has a wealth of experience in building qualification models (qualification characteristics), including those in the educational standards of previous generations.

One should also pay attention to those positive and negative aspects that have become the subject of discussions in western educational systems at the stage of development by European universities of a new qualification structure based on the indicators of levels, workload volumes, profiles, learning outcomes and competencies (Baydenko, 2006).

In the context of digital pedagogy higher education institutions should:

- reflect on events in society and respond to them in their educational programs;

- invest in infrastructure for digitalization;

- focus on fostering the human spirit and strengthening global citizenship;

- use the potential of digitalization to create new educational spaces in order to improve the accessibility and quality of education;

- connect experts and scientists to contextualize digital content;

- to ensure trust in digital educational products through quality management;

- to support newcomers in the field of digitalization (Khrulyova, 2019).

Taking into account the current context in which many teachers need to transfer / relocate their planned activities for face-to-face training to a remote / online learning situation, as there are still unsafe conditions for conducting offline classes. The need for teachers to develop media and digital skills is evident. Such competencies will be needed not only at this transitional moment, but also later, in the case of a post-pandemic scenario, to expand learning opportunities using a blended approach (Hepp, Fernández, & García 2015).

The problems of education digitalization, the formation of digital literacy and digital competence are of concern to scientists all over the world.

The UK scholars (Gruszczynska, Merchant, & Pountney, 2013) emphasize the importance of introducing digital technology in the teacher education sector and take into account teaching and learning practices in the school system using digital literacy (Burnett & Merchant, 2011; Davies & Merchant, 2009; Gruszczynska & Pountney, 2012). Burnett and Merchant (2011) describe the structure of digital literacy, which is largely based on sociocultural models of digital practice.

A number of studies have explored how high school teachers develop digital competence in teacher education. Scientists identify eight approaches used to develop the digital competencies of students and teachers: collaboration, metacognition, mixing, modeling, authentic learning, active student learning, assessment and bridging the gap between theory and practice (Røkenes, 2016).

Arnseth, Hatlevik, Kløvstad, Kristiansen and Ottestad (2007) propose to separate the digital competence of teachers and students. Future teachers understand digital tools as key elements of academic life that have a profound impact on the quality of their education. This is especially evident with regard to the possibility of easier collaboration and communication between students and teachers, easier access to information and literature, and greater variety in the use of teaching materials. The use of digital competencies in Norway takes place in accordance with the basic skills prescribed in the curriculum. Digital skills include: the operational use of ICT (formerly called digital skills), the acquisition and processing of digital information, the production and processing of digital information, digital judgment, and the ability to communicate in the digital format (Egeberg et al., 2012).

Teacher digital competence is a competence that allows a teacher to develop students' digital skills through working with educational materials (Ottestad, Kelentrić, & Guðmundsdóttir, 2014). Digital competence of teachers is interpreted as the ability of a teacher to use ICT with a good pedagogical and didactic understanding of ICT and understand how this can affect teaching strategies, educational training of students (Krumsvik, 2007).

Methodology

The key scientific approach of this research is the competence-based approach. An integral indicator of modern education quality is competence that characterizes a person's ability to mobilize acquired knowledge and experience in a specific situation. Competence-oriented professional education is an objective phenomenon in education, conditioned by socio-economic, political, educational, pedagogical prerequisites.

The implementation of the competence-based approach in the future teachers' professional training is ensured by the following scientific principles: practice orientation, competence, integrativity, individualization, digitalization, variability.

The study applied both theoretical methods (comparative analysis based on the study of scientific literature and the results of modern psychological and pedagogical research projects) and empirical methods (interviewing the teaching staff and testing students of federal universities, analyzing the results of students' activities, observing and analyzing the educational process). The research tool was developed by the authors of this study.

A comparative analysis of scientific literature was carried out in order to study the theoretical aspect of the problem of the formation of future teachers' digital professional competence. Testing of the federal universities students was carried out in order to identify the formation level of professional competencies as components of digital professional competence. Interviewing future teachers was carried out in order to identify their digital literacy and readiness for professional activity in the context of digitalization. The analysis of the results of students' activity was carried out during practical classes, in the process of educational and industrial practice. Observation and analysis of the educational process was carried out in order to study the state of the digital educational environment of the university, the availability of hardware software, equipment for organizing training using distance educational technologies.

The study involved 47 fourth-year students of the study field 44.03.01 "Pedagogical education" and 25 academic instructors. The respondents expressed their voluntary consent to participate in the research.

Results

At the ascertaining stage of the study, future primary school teachers were offered an interview, answering a number of questions, and testing to identify the level of professional and universal competencies. The interview questions were aimed at identifying students' digital literacy and readiness for professional activity in the context of digitalization. The analysis of interview responses showed that future primary school teachers have formed their digital literacy in the course of self-education; the educational organization of higher education does not pay due attention to the development of future teachers' digital literacy. In the course of professional training, students form elementary skills for selecting and processing information, working with a computer at an ordinary user level. Insufficient attention is paid to the work on the formation of participants' digital literacy in the information process. The interview with academic instructors, as well as an analysis of the working programs of the disciplines provided by the curriculum, allow us to conclude that not enough attention is paid to the purposeful work on the formation of future primary school teachers' digital literacy in the course of mastering the main professional educational program.

The proposed test tasks were aimed at identifying the formation level of professional competencies as components of digital professional competence, such as: the ability to implement educational programs in a subject in accordance with the Federal State Educational Standard; the ability to use modern methods and technologies of teaching and diagnostics; the ability to solve the problems of education and spiritual and moral development of students in educational and extracurricular activities; the ability to use the capabilities of the educational environment to achieve personal, meta-subject and subject learning outcomes and to ensure the quality of the educational process by means of the taught subject; the ability to carry out pedagogical support for the socialization of professional self-determination of students. Test assignments made it possible to reveal knowledge about the requirements of the Federal State Educational Standard, the characteristics of the assessment functions, and meta-subject results.

The answers to the test assignments are shown in Table 1.

Table 1. The level of formation of future teachers' digital professional competence (in %)

Evaluation criteria	Sufficient level	Satisfactory level	Initial level
Motivation for the teaching profession	27.3	60.4	12.3
Professional competencies formation	18.6	56	25.4
Frequency of ICT use in educational and professional activities	46.2	31	22.8
Variability of ICT and means use	23.7	37.6	38.7
Willingness to create an electronic information and educational environment and work in it	10.2	19.4	70.4

According to the data, 27.3% of respondents were sufficiently motivated to engage in the teaching profession; at the satisfactory level – 60.4% of future teachers; at the initial level were 12.3% of students. Most of the respondents had a clear understanding of the pedagogical activity essence and its interpretation as a special type of purposeful activity to fulfill a social function – the transfer and transmission of human experience to future adults. The opinion of others plays a significant role in choosing a profession: friends, parents, media, and social networks. The motives for students' choice of the teaching profession can be divided into three groups: the desire to work with children and love for children, the desire to become a teacher, the need to get a higher education, the opportunity to enter a university for a budgetary place.

The future teachers' professional competencies formation was checked using tests. Thus, the sufficient level was found in 18.6% of future teachers; satisfactory – 56% of students; initial – 25.4% of future teachers.

At the sufficient level 46.2% of future teachers often use ICT in educational and professional activities; at the satisfactory level – 31% of students; at the initial level – 22.8% of respondents.

Among the advantages of ICT future teachers singled out: the possibility of expanding the use of electronic teaching aids, fast information transfer; increasing interest in the studied material, attracting attention through the use of sound movement, animation; improving perception and memorization based on visualization; providing a canvas of perception of objects and phenomena using slide shows and video clips; professional situations modeling; motivation to search, research and project activities; additional opportunities for working with students with disabilities.

The variability in the use of ICT technologies and tools was lower. Thus, the sufficient level was revealed only in 23.7% of respondents; satisfactory – 37.6% of future teachers; initial – 38.7% of students.

Among the informatization key areas, students distinguish two groups: organizational (improving the material and technical base, creating an electronic information educational environment, modernizing methodological support), pedagogical (increasing the ICT competence of the teaching staff, introducing ICT technologies into the educational space). Future teachers consider ICT in education as a complex of teaching materials, technical and instrumental means of computing in the educational process, forms and methods of their application to improve the activities of specialists, for education.

The overwhelming majority of respondents were not ready to create an electronic information and educational environment and work in it. They were not always able to efficiently work with information, process and transmit it; use various platforms for self-education and training. Thus, the sufficient level was revealed only in 10.2% of respondents; satisfactory – in 19.4% of future teachers; initial – among the overwhelming majority of respondents: 70.4%.

At the control stage of the study, future primary school teachers were asked to answer a number of questions during the interview, as well as to be tested to identify the professional competencies level.

The answers to the interview questions as part of the control stage of the study are reflected in Table 2.

Table 2. The level of formation of future teachers' digital professional competence of at the control stage of the study (in %)

Evaluation criteria	Sufficient level	Satisfactory level	Initial level
Motivation for the teaching profession	53.19	36.17	10.64
Professional competencies formation	31.1	61.7	7.4
Frequency of ICT technologies use in educational and professional activities	8.4	62.73	8.4
Variability of ICT technologies and means use	27.5	58.2	14.3
Willingness to create an electronic information and educational environment and work in it	20.36	58.8	20.84

The results analysis of the control experiment indicates that the motivation for the teaching profession at the sufficient level was revealed in 53.19% of future teachers; at a satisfactory level – 36.17% of students; the initial level –10.64% of the respondents.

The analysis of the test answers in order to determine the professional competencies formation of future teachers showed the following results: the sufficient level was found in 31.1% of future teachers; satisfactory – 61.7% of students; initial – 7.4% of the respondents.

The results in terms of the frequency of ICT technologies use in educational and professional activities were distributed as follows: at the sufficient level were 8.4% of future teachers; at the satisfactory level – 62.73% of students; at the initial level – 8.4% of the respondents.

According to the criterion "variability of the use of ICT technologies and means", 27.5% of students turned out to be at the sufficient level; at the satisfactory – 58.2% of students; at the initial level – 14.3% of future teachers.

As part of the creation of the readiness for electronic information and educational environment and work in it, the following changes have occurred. Thus, at the sufficient level were 20.36% of respondents; at the satisfactory – 58.8% of future teachers; at the initial – 20.84% of respondents.

The obtained results indicate the interest of future teachers in ICT technologies, means, breadth and variability of their use. But at the same time, it is necessary to pay enough attention to the formation of the future teachers' ICT competence, work in the electronic information and educational resources, in the digital environment.

Discussion

A distinctive feature of competence-based professional pedagogical education is the orientation of the vocational training process towards obtaining concrete results of solving professional pedagogical problems, the digital professional competence formation, which ensures the effectiveness of professional activity in the digitalization context.

Discussion issues requiring the search for effective mechanisms and technologies for solutions include questions about the role and place of digitalization in the higher education educational process, in the process of future teachers' professional training; what role is assigned to a teacher in the modern educational process and what is the gadget role; what knowledge and in what volume must be transmitted to the teacher, and what the student can fully master on his/her own with the gadget help.

The study results confirm the future teachers' interest in the use of ICT in the educational process, the study of work on various platforms and with different means, the breadth and variability of their use. But in the meantime, enough attention should be paid to the formation of future teachers' digital professional competence, to work in the electronic information educational environment in the digitalization context.

Based on the study, we came to an understanding of the need for a modern teacher to develop digital professional competence, readiness for professional activity in a digital educational environment.

Conclusion

The conducted research shows us that it is necessary to update the content, methodological support for the pedagogical staff professional training, taking into account the requirements of our time, in particular in the context of digitalization. The proposed innovations allow ensuring the acceleration of the technological development of the Russian Federation; rapid digital technologies introduction in the social sphere and economy. The emphasis shift in educational activities from the knowledge paradigm to the competence-based one requires the widespread use of problem-search teaching methods in the educational process of the university. The practical significance of the results lies in the quality enhancing of teaching staff training.

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Competing interests

The authors have declared that no competing interests exist.

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