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## Practical Implementation of the Process of Digitalization of Education in Master Programs

Timur G. Vezirov (a), Valentina N. Kormakova (b), Anna Fensel (c),  
Maria A. Lapina\* (d)

(a) Dagestan State Pedagogical University, 367003, Makhachkala (Russia), 57 Yaragskogo St.,  
timur.60@mail.ru

(b) Belgorod State National Research University, 308015, Belgorod (Russia), 85 Pobeda St.,  
kormakova@bsu.edu.ru

(c) University of Innsbruck, 6020, Innsbruck (Austria), 52 Innrain, anna.fensel@uibk.ac.at

(d) North Caucasus Federal University, 355017, Stavropol (Russia), 1 Pushkina St., mlapina@ncfu.ru

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### Abstract

Modern information and digital society impose new requirements for the preparation of master level students in the application and production of electronic publications and resources, as well as in the development of methods and means of information interaction in the process of implementing the capabilities of information and communication technologies (ICT) and the self-extraction and presentation of knowledge. The work aims at solving one of the problems of digitalization of education in the direction of training 44.04.01 "Pedagogical education" (in the master's program "Information and Communication Technologies in Education"). The leading method for studying this problem is the method of comparison and grouping, which allows us to identify the effectiveness of electronic educational materials and digital educational resources as components of the process of the digitalization of education in the preparation of master's degree graduates.

We present a practical implementation of the process of digitalization of education in the training of masters in the master's program "Information and Communication Technologies in Education" at the Faculty of Mathematics, Physics and Informatics of the Dagestan State Pedagogical University, where the main place is represented by the author's electronic educational materials on the subjects of the variable part of the main professional educational program (MPEP).

The materials of this paper can be useful for the implementation of higher education MPEP under the conditions of digitalization of modern society.

*Keywords:* digitalization of education, master level students, master's program, electronic educational materials, web portfolio, ICT tools, digital educational resources.

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\* Corresponding author. E-mail: mlapina@ncfu.ru

## International Forum on Teacher Education)

### Introduction

Education is one of the main tasks of any country and any society. Vocational training of future teachers is given an important place in the documents determining the nature of updating teacher education in our country (the Law "On Education" and the Law "On Education of the Russian Federation"; "The Concept of Modernization of Russian Education until 2010; State Program of the Russian Federation" Development of Education for 2013-2020"; The concept of support for the development of teacher education in 2013; Program for the modernization of teacher education 2014-2017; Federal project "Modern Digital Environment in the Russian Federation").

The development and adoption of the Professional Standard for Educators in 2013 was aimed at establishing standards for professional and pedagogical activity, which should become the basis for determining the results of professional training at a pedagogical university.

The relevance of introducing a tiered system of higher pedagogical education requires a high degree of adaptive capabilities in the conditions of the modern Russian educational space, and this is determined by the breadth of theoretical and practical training of master level students.

According to previous research (Stankevich, 2010; Order of the Ministry of Education and Science of Russia, 2015; Vezirov & Babayan, 2015), modern pedagogical education cannot be covered by only one of the following models:

- Behavioral paradigm (development among students of predefined and observable pedagogical skills);
- Personal paradigm (the actions of the teacher and the environment created by them depending on the goals of the teacher);
- The traditional paradigm (teaching is seen as a craft that is passed on to future educators from expert educators);
- A research-oriented paradigm (the development of future teachers' potential for reflective action and their tendency to critical research).

Education in the field of information technology began to develop rapidly and attract young people.

In the UNESCO document "ICT Competency Framework for Teachers. UNESCO Recommendations" (UNESCO, 2018) it is noted that the digitalization of education is a multidimensional process that affects

the requirements for the competence of teachers, teaching materials, ICT, the motives of the daily work of students and teachers (Osina, 2007). This process is associated with the policy and socio-economic development of the state.

In education, digitalization is aimed at ensuring the continuity of the learning process, as well as its individualization based on advanced learning technologies. Digitalization has arisen in connection with the intensive development of ICT. The concept of “digital literacy” is currently used in the analysis of the use of computers, mobile devices, application programs and applications for solving various professional and pedagogical problems (NAFI, 2018).

### **Purpose and objectives of the study**

The work aims to theoretically substantiate and practically implement the process of digitalization of the education of teachers in the training of master’s degree students.

### **Literature review**

The scientific prerequisites for a theoretical understanding of the problem of changes in the vocational training of students of a pedagogical university in the context of the modernization of teacher education are studies:

- disclosure of various aspects of professional training of students of a pedagogical university (Vezirov, Borozinets, & Sorokopud, 2013; Robert, 2014; Vezirov, 2017);
- definition of the requirements for the results of professional training in a pedagogical university based on the characteristics of the development of the pedagogical profession in modern society, as well as the diversification of professional functions, roles and positions of a modern teacher (Stankevich, 2010; Vezirov, 2015);
- development of new approaches to understanding and organizing the space of vocational training at a pedagogical university (Osina, 2007; Robert, 2014; Klepikova, Belenko, Nemtsev, Belenko, & Mezentseva, 2019; Kormakova, Klepikova, Musaelian, Baybikowa, & Lapina, 2019);
- features of the training of master's degree programs in Russia (Stankevich, 2010; Gareeva, 2013; Vezirov, 2015; Vezirov, 2017; Osina, 2007).

In his dissertation research Stankevich (2010) has developed models for the content of science education of bachelor's and master's degree level students, implemented based on a modular and different approach to the training of specialists of a higher professional level science education.

According to Osina (2007), the training of innovative-type specialists with creative thinking, deep knowledge, abilities, and skills in a specific subject area is difficult in the context of modern vocational education. This is because there is little innovation in such training and there is a shortage of qualified teaching staff in the field of innovation.

Gareeva (2013) revealed the pedagogical conditions for the formation of the competence of an expert assessment of the educational environment among graduate students at the stage of university preparation.

### **Methodology**

One of the conditions for the modernization of teacher education is the process of digitalization of teacher education, where ICT tools play an important role.

Under the means of ICT Robert (2014) understands software, hardware, and devices that operate on the basis of the microprocessor, computer technology, as well as modern means and systems for transmitting information, information exchange, providing operations for the collection, production, accumulation, storage, processing, the transmission of information and the ability access to information resources of local and global computer networks.

The ICT-CFT project (UNESCO, 2018), which meets the goals of UNESCO and the UN in the field of education, combines ICT, education and economics, and also connects the use of ICT and educational reforms with economic growth. It is also noted here that ICT tools can become a catalyst for economic growth and significantly improve the quality of education.

### **Results**

In this project, three approaches are distinguished: the use of ICT, the development of knowledge, the production of knowledge that steers the education system to participate in the economic and social development of the country, helping its consistent transition from an economy based on the use of new technologies to an economy based on the use of high-quality labor force, and then to the economy of the information society, which is based on knowledge. As a result, students (younger citizens and workers) learn more and more complex skills that are necessary for economic, social and cultural development,

preserving the environment and improving the quality of life in their country (Order of the Ministry of Education and Science of Russia, 2015).

The intersection of three approaches to learning based on human development (“Application of ICT”, “Mastering knowledge” and “Knowledge production”), and six aspects of work (“Understanding the role of ICT in education”, “Curriculum and assessment”, “Pedagogical Practices”, “Technical and software tools of ICT”, “Organization and management of the educational process”, “Professional development”) define the structure of ICT competency and digital literacy of teachers (UNESCO, 2018).

Modern society in the conditions of its digitalization, presents new requirements for the preparation of master degree students of educated teachers in the application and production of the Internet information resource, as well as the development of methods and means of information interaction in computer networks, the implementation of the capabilities of ICT and digital technologies in the process of self-extraction and representations of knowledge.

As key elements in creating a new system of training for master level students in terms of implementing the concept of supporting the development of the education of teachers can be called (Vezirov & Babayan, 2015):

- 1) Master's program for the training of teachers, methodologists and managers, priority admission to budget places for people working in the education system.
- 2) Practical module in the master's program with the ability to quickly enter the profession of people who do not have a pedagogical education, with primary enrollment for those already working in general education.

Based on a theoretical analysis of research (Stankevich, 2010; Robert, 2014; Vezirov, 2017) on the development of the tiered system of higher pedagogical education in Russia, we can identify the following factors for its systematic development:

- change in the demands of the regional educational market;
- the presence of fierce competition in this system;
- a new understanding of the criteria for assessing the level of professional competence of future masters;

- rethinking the qualification characteristics of future master degree holders of teacher education;
- definition of new principles for organizing the system of higher pedagogical education, taking into account international standards and national experience.

Based on the analysis of the Federal State Educational Standards of Higher Education in the master's degree program 44.04.01 “Pedagogical Education” (Order, 2014), in (Vezirov & Babayan, 2015) we determined the main goals of the training of masters:

- the development of knowledge and scientific thinking among graduate students, the development and consolidation of their skills in conducting scientific and pedagogical work;
- training of research and scientific-pedagogical personnel for universities and other areas of professional activity or further studies in graduate school.

The authors of this paper contribute to the process of training master level students based on ICT and digital technologies. The main approach adopted by us is that the methodology of using ICT and digital technologies by graduate students can be based on activities to solve research problems using the Internet and developing electronic learning resources, which are the main components of the university's digital educational environment. In the preparation of master level students according to the states' requirements (Order of the Ministry of Education and Science of Russia, 2014), for the individualization of the education, the development of the students' personalities, the universities have the right to determine about 80% of the content of a two-year specialized training program.

Masters' programs involve a narrower and deeper specialization, focusing on graduate students' research and teaching work.

The introduction of ICT and digital technologies in the system of the education of teachers is becoming more and more widespread every year. Most of the educational, scientific and methodological developments used in practice have been translated into electronic form.

For the practical implementation of UNESCO programs in the field of education digitalization, we contribute to the master's training process, which requires highly saturated information and educational environment of the university, which is a comprehensive multi-purpose system combining educational and teaching resources, software products, knowledge control systems and at the same time a highly

constructive environment for organizing various forms of independent work on the basis of ICT educational tools.

Such an environment is one that is dynamically developing, self-organizing system, open to the teacher and student, the diversity of the content and functions of which creates the possibility for students to build an individual educational trajectory.

We in the educational process of the master's program apply the following forms of using ICT and digital technologies:

- 1) The use of copyrighted electronic publications for educational purposes allows you to intensify the activities of future masters, improves the quality of training for a particular discipline, and reflects the essential aspects of objects, visually embodying the principle of visualization.
- 2) The use of multimedia presentations makes it possible to present educational material as a system of reference images filled with exhaustive structured information in the correct order.
- 3) The use of Internet resources, which carries the huge potential of educational services (e-mail, search engines, electronic conferences) and is becoming an integral part of modern education. Obtaining training-relevant information from the network, future master level students acquire useful skills.
- 4) The use of an interactive whiteboard and software for it allows the interactive organization of educational and cognitive activities of future master's degree holders.

Students of the master's degree program 04.04.01 "Pedagogical education" ("Information and Communication Technologies in Education") must be able to solve tasks related to:

- creation and use of pedagogical technologies focused on the formation of skills to carry out various types of independent activities for the collection, processing, storage, transmission, production of educational information, as well as educational activities to formalize the processes of presenting and extracting knowledge and ensuring the comfort and motivation of the educational process;
- functioning of "virtual" open educational systems of telecommunication access based on the potential of a distributed information resource, providing social adaptation to life in the information society;

- using ICT tools and digital technologies in the management of an educational institution of secondary and higher levels of education, developing a policy for their implementation in the educational process;
- using the educational material base of education informatization;
- creation and use of ICT and digital technologies-based tools for monitoring the development of the educational process in organizations;
- organization of research and experimental activities based on means of automating the processing of the results of a training experiment, which takes place both in real conditions and in virtual (Vezirov & Babayan, 2015).

Based on the publications of international scientists (UNESCO, 2009; Wilson, Grizzle, Tuazon, Kwame, & Chi-Kim, 2011; Kassens-Noor, 2012; Prestridge, 2014; Prescott, 2014), we believe that in the educational process it is also possible to use the capabilities of social Internet networks, mobile phone applications more effectively. This will additionally attract students who are active users of these networks, and most of them are now.

Currently, digital educational resources and network social services are rapidly developing, which makes it possible to successfully organize a fundamentally new educational format. One such form is the network form of implementation of master's degree programs.

In the Federal document "Methodological recommendations for the organization of educational activities using network forms of implementation of educational programs", a network form refers to the organization of training using the resources of several organizations engaged in educational activities (Vezirov & Babayan, 2015).

The Dagestan State Pedagogical University and the Novosibirsk State Pedagogical University signed an agreement dated July 5, 2016 "On the network form for the implementation of the main professional educational programs of higher education", "Information and communication technologies in teaching foreign languages" and "Information and communication technologies in education" in the field of training 04.04.01 Pedagogical education" in order to improve the quality of training of students, ensuring the integration of education scientific and scientific activities, expanding students' access to educational resources and their more efficient use, providing students with the opportunity to choose training courses, disciplines, modules, implement a competency-based approach, including using distance

educational technologies and e-learning, as well as exchange training experience, improving the teaching and research work of partner universities. Partner universities provide students with the opportunity to master the educational program using the resources of their organizations (the resources necessary for training, internships and other types of educational activities provided by the online educational program, including internships).

Our practical experience of teaching in the master's program 44.04.01 "Pedagogical Education" (for the master's program "Information and Communication Technologies in Education") at the Faculty of Mathematics, Physics and Informatics of FSBEI HE "Dagestan State Pedagogical University" makes it possible to increase the efficiency of the use of funds, ICT and digital technology in higher education.

The main approach taken by us is connected with the methodology of using ICT and digital technologies by future master level students of the education of teachers, which is based on activities to solve research problems using the Internet, allowing you to transfer the main computational load to external servers in relation to the university due to the application "Cloud" technology.

One of the components of the university's digital educational environment is the 4portfolio.ru platform, where it allows future masters to create and maintain a web portfolio.

Web portfolio is a combination of portfolio technology and social network technology, which acts as a modern tool for interaction in the network community, providing access to personal information of the teacher and student, regardless of the place of work or study.

The web portfolio of the future master is its own website with an unlimited number of pages, which will allow them to present the results in a variety of activities – educational, scientific, creative, etc., as well as a tool for personal development and improvement, for visual self-presentation in the online community.

## **Discussion**

We have created and are maintaining a web portfolio of future master degree holders, where the multimedia projects, developed by them, on the main content lines of the school course in computer science and ICT, as well as electronic publications for educational purposes (EPEP) in various disciplines of the variable parts of the master's study curriculum, occupy an important place.

By EPEP we understand a learning tool that implements the capabilities of ICT tools to provide educational information with the use of multimedia technology and online interactive learning tools (Vezirov, 2017).

We provide educational information in the form of electronic educational-methodical complexes (EMC), electronic educational-methodical module (EMM).

Master students under the guidance of Professor T.G. Vezirov, developed and used in the educational process of educational organizations the following EPEP:

- 1) Computer networks.
- 2) Higher mathematics.
- 3) Multimedia technology.
- 4) Zoology of invertebrates.
- 5) The traditional culture of the peoples of Dagestan.
- 6) Network information resources in the study of a foreign language.
- 7) Geography of tourism.
- 8) Foreign language in the field of jurisprudence.
- 9) Portal technology in education.
- 10) Computer graphics.
- 11) Foreign language.
- 12) Country studies of the Arab countries.
- 13) Means of e-learning in the preparation of bachelors.
- 14) Design activities of a bachelor-lawyer.
- 15) ICT competence of the teacher.
- 16) Social informatics.
- 17) Methodological foundations of informatization of general and higher education.
- 18) Means of information and telecommunication technologies in teacher education.

Some EPEPs are registered with the Federal State Unitary Enterprise Scientific and Information Center "Informregister" of the mandatory federal copy of the electronic publication (Moscow), while others are registered on the website of the Department of Distance Learning and Continuing Education of the Don State Technical University (Rostov on Don, <http://skif.donstu.edu.ru>) in the section "Dagestan State Pedagogical University", as well as on the website of undergraduates of the faculty of mathematics, physics and computer science of the FSBEI HE "Dagestan State Pedagogical University" (<http://magistr-fmf.ru>).

Undergraduates from a partner university (Novosibirsk State Pedagogical University) have access to electronic teaching materials developed by undergraduates of the Dagestan State Pedagogical University together with Professor T.G. Vezirov, which are posted on the portal <http://skif.donstu.edu.ru> and the educational website <http://magistr-fmf.ru>

For graduate students of a partner university, we have prepared video lectures using the WebcamMax program in the following disciplines:

- 1) Theory and methods of informatization of education.
- 2) Modern information and communication technologies in teacher education.
- 3) Distance learning technologies in teaching foreign languages.
- 4) ICT competency of the teacher.
- 5) Internet and web 2.0 services in teaching foreign languages.

## **Conclusion**

Based on the methods and techniques used, as well as from the practical implementation of the network form of organization by the partner university of the educational program, we came to the conclusion that the use of modern ICT and digital technologies allows:

- strengthen motivation, increase interest and expand the cognitive needs of future bachelors and masters of teacher education;
- to ensure individualization of training, to create prerequisites for the transition to personal-oriented training
- to increase the interactivity of training, to develop the dialogical nature of the educational process based on copyrighted electronic teaching materials;
- to strengthen the visualization in training, to increase the level of visualization of the studied material;
- expand the range of educational tasks used in training;
- improve the efficiency of monitoring learning outcomes;
- “immerse” master degree students in a virtual environment with the ability to simulate training and professional situations, initiating manifestations of willingness to solve problems.

An analysis of the motives for using electronic publications and resources in educational activities showed that most future master’s degree holders (78%) have a desire to improve their professional training with the use of modern ICT and digital technologies. Based on the publications of foreign scientists we studied

(UNESCO, 2009; Wilson, Grizzle, Tuazon, Kwame, & Chi-Kim, 2011; Kassens-Noor, 2012; Prestridge, 2014; Prescott, 2014), we believe that in the educational process it is also possible to use the capabilities of social networks of the Internet, mobile phone applications more effectively. This will further attract graduate students who are active users of these networks.

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