Forming the modern digital educational environment at university

Oksana P. Denisova[1]
Elena A. Tolikina[2]
Olga A. Frolova[3]
Anatoly E. Shamin[4]
Olga N. Shumilova[5]

1. Togliatti State University, E-mail: kseniya101@mail.ru
2. Nizhniy Novgorod State University for Engineering and Economics, E-mail: alenkat2506@mail.ru
3. Nizhny Novgorod State University of Engineering and Economics, E-mail: ekfakngiei@yandex.ru
4. Nizhny Novgorod State University of Engineering and Economics, E-mail: ekfakngiei@yandex.ru
5. Nizhny Novgorod State University of Engineering and Economics, E-mail: Shumilova59@yandex.ru

Abstract: Introduction. The research topicality is due to the introduction of digitalization in all sectors, which causes the changes of methodological approaches to the content and development of digital competence of the educational process participants. Hence, the research objective is to determine the key factors of transformation of educational environment at university, to study the overall structure of digital competence, and to reveal the conditions for its developing and improving in the educational process participants. Materials and methods. The leading research method was the method of polling. Questioning was carried out in writing, using special forms which allowed the respondents to estimate the level of mastering of digital competence factors. The research comprised 304 professors and students of Nizhniy Novgorod State University for Engineering and Economics, 21 y.o. on average. Results. Based on theoretical analysis, the key factors are determined which influence forming the digital competence of citizens. The obtained data revealed the actual level of digital competence of students and professors of Nizhniy Novgorod State University for Engineering and Economics, identify the sources and ways of its development. Conclusion. The results are of practical significance for universities and other educational establishments intending to promote the level of digital competence of the educational process participants. **Keywords:** digital competence, digital economy, digitalization, educational process participants, online-learning.

1. Introduction

Entering the epoch of mass digitalization, which comprises all sectors of economy, changes approaches to the life and professional activity of people (*"DigComp2.1...,* 2017; Asmolov et al., 2010; Dontsov and Drozdova, 2013; Fedorov, 2009; Kalimullina and Trotsenko, 2018; Klassov and Klassova, 2016; Kupriyanovskiy et al., 2016; Kuzmin and Parshakova, 2012, 2013; Ladyzhets and Neborskiy, 2015; Lau, 2006; Lebedeva, 2015; Liseev, 1998; Makoveychuk, 2015; Namiot et al., 2017; *Passport of a priority project...,* 2016; Soldatova et al., 2013; Soldatova and Rasskazova, 2014; Stepin, 1998; Structure of ICT-competence…, 2011; Valeeva and Rudneva, 2016). Humanity is going to become immersed into the data globally connected through mobile technological devices, in the world of smart cities and homes, unmanned vehicles, robots in the streets, and the Internet of

Things. In the nearest future, the following technological trends will influence most the business processes and the demand for digital skills:

- development of mobile Internet;
- the Internet of Things;
- machine intelligence;
- big data and machine learning;
- VR/AR–technologies;
- automation and robotization in industry and economy.

Today, Russia implements a number of initiatives aimed at creating conditions for digital economy development, which increases the country's competitiveness, the standard of living of the population, provides economic growth and ensures national sovereignty. Among these initiatives are "Strategy of informational society development in the Russian Federation in 2017–2030" (Obucheniye tsifrovym…, 2018) and Program "Digital economy of the Russian Federation" (Shamin et al., 2018).

State bodies, consulting companies and researchers have elaborated various models of digital competences (skills), which to a large extent complement each other. They imply that digital competence is based on continuous mastering of competences (the system of relevant knowledge, skills, motivation, and responsibility), ability of an individual to confidently, efficiently, critically and safely choose and apply the infocommunicational techniques in various spheres of life (working with content, communications, consumption, technosphere), and readiness for such activity.

The authors used The Digital Framework for Citizens, proposed in the European Union report. It presents a detailed classification of digital competence, including five areas and 21 digital competences, necessary for all citizens (Table 1).

Table 1. ***Classification of digital competences***

Competence areas	Competence
1. Informational and data literacy	
1.1 Browsing, searching and filtering data, information and digital content	To articulate information needs, to search for data information and content in digital environments, to access them and to navigate between them. To create and update personal search strategies.
1.2 Evaluating data, information and digital content	To analyze, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. To analyze, interpret and critically evaluate the data, information and digital content.
1.3 Managing data, information and digital content	To organize, store and retrieve data, information and content in digital environments. To organize and process them in a structured environment.
2. Communication and collaboration	
2.1 Interacting through digital technologies	To interact through a variety of digital technologies and to understand appropriate digital communication means for a given context.
2.2 Sharing through digital technologies	To share data, information and digital content with others through appropriate digital technologies. To act as an intermediary, to know about referencing and attribution practices.
2.3 Engaging in citizen-	To participate in society through the use of public and private

ship through digital technologies	digital services.
2.4 Collaborating through digital technologies	To use digital tools and technologies for collaborative processes, and for co-creation of resources and knowledge.
2.5 Netiquette	To be aware of behavioral norms while using digital technologies and interacting in digital environments. To adapt communication strategies to the specific audience and to be aware of cultural and generational diversity in digital environments.
2.6 Managing digital identity	To create and manage one or multiple digital identities, to be able to protect one's own reputation.
3. Digital content creation	
3.1 Developing digital content	To create and edit digital content in different formats.
3.2 Integrating and re-elaborating digital content	To modify, refine and improve and integrate information and content into an existing body of knowledge to create new content and knowledge.
3.3 Copyright and licenses	To understand how copyright and licenses apply for data, information and digital content.
3.4 Programming	To plan and develop a sequence of understandable instructions for a computing system to perform specific tasks.
4. Safety	
4.1 Protecting devices	To protect devices and digital content and to understand risks and threats in digital environments. To know about safety measures.
4.2 Protecting personal data and privacy	To protect personal data and privacy in digital environments. To understand how to use and share personal data while being able to protect oneself and others from damages.
4.3 Protecting health and well-being	To be able to avoid health-risks and threats to physical and psychological well-being while using digital technologies. To be able to protect oneself and others from possible dangers in digital environments. To be aware of digital technologies for social well-being and social inclusion.
4.4 Protecting the environment	To be aware of environmental impact of digital technologies and their use.
5. Problem solving	
5.1 Solving technical problems	To identify technical problems while operating devices and using digital environments, and to solve them (from troubleshooting to solving more complex problems).
5.2 Identifying needs and technological responses	To assess needs and to identify, evaluate, select and use digital tools to solve them. To adjust digital environments to personal needs.
5.3 Creatively using digital technologies	To use digital tools and technologies to create knowledge and to innovate processes and products. To engage individually and collectively in cognitive processing to understand and resolve conceptual problems and problem situations in digital environments.
5.4 Identifying digital com-	To understand where one's digital competence needs to be

petence gaps	improved. To be able to support others with their digital competence development. To seek opportunities for self-development and to keep up-to-date with the digital evolution.

This classification is applied in 21 countries of the European Union (France, Italy, Great Britain, Poland, etc.) and is recommended for teaching and elaborating policies in the sphere of digital economy development (Decree of the RF President…, 2017).

2. Materials and methods

To train competent personnel for digital economy it is necessary to duly modernize the system of education and professional training, to make educational programs comply with the requirements of digital economy, and to widely apply digital tools in the informational-educational environment.

To elaborate new approaches to education and to prepare Russia for transition to a new technological setup, i.e. to digital economy, the Russian government elaborated and is implementing a priority educational project "Modern digital educational environment in the Russian Federation", adopted on 25 October 2016 as a part of the state program "Education development" for 2013-2020 (Order of the Russian government…, 2017). The project objective is to create, by 2018, conditions for systemic increase of quality of and broaden the possibilities for continuing education for all categories of citizens through developing the Russian digital educational environment. To achieve that goal, online education is broadly used, including mass open-access online courses with interactive participation.

Implementing the priority educational project "Modern digital educational environment in the Russian Federation" (MDEE) implies a number of key directions elaborated simultaneously:

- adopting legal-normative acts aimed at developing online education. In particular, they stipulate the status of online courses as equivalent parts of educational programs;
- creating informational resource providing access to online courses in compliance with "one window" principle and uniting a range of existing platforms of online education through a single system of users identification;
- creating, by 2020, of 3.5 thousand online courses on secondary, higher and additional education programs, engaging the leading developers both from public institutions and business community;
- forming the system of expert and user evaluation of the quality of online courses;
- creating ten Regional competence centers in the sphere of online learning;
- training of not less than 10 thousand tutors and experts in the sphere of online learning.

The educational project implies using modern technologies and best practices in the sphere of online learning, the scientific potential of the best Russian universities, and the experience of the existing online-platforms and business projects. It stipulates that not less than 140 thousand students will get online training, and by the end of 2025 – over 11 million. By 2017, MDEE ensured access to 450 online courses by 20 best Russian universities for schoolchildren, university students and professors.

Introduction of online courses into educational process is aimed at expanding the boundaries of traditional education, giving more opportunities to students and professors. First of all, the MDEE project allows universities, colleges and schools to promote the priority spheres of training, by redistributing the tutors' load and offering a part of subjects in online

regime. It means that the tutors would interact with students more in the course of practical and laboratory sessions.

On the other hand, the project creates a new format of competition between universities and professors all over Russia, which may lead to reducing the number of certain categories of tutors. At risk are those who are not ready to advance their qualification in the field.

Nizhniy Novgorod State University for Engineering and Economics (NNSUEE) is a regional university, whose key mission is to train personnel for those sectors of economy and the municipal entities of areas of social-economic development which have a priority significance for Nizhegorodskaya oblast and the whole region; to preserve and develop the human potential of rural territories; to facilitate the impact of authorities and local self-government of Nizhegorodskaya oblast on the regional market of land educational services. The total number of NNSUEE students is about 5,000; over 1,000 people annually take advanced training and professional retraining courses. The university provides over 50 licensed professional educational programs. Educational activity is carried out in four Institutes: Institute for Economics and Management, Institute for Information Technologies and Communication System, Institute for Engineering, and Institute for Transport, Service and Tourism. The university subsidiaries are specialized educational centers: Center for drivers' training, Center for industrial qualifications, Center for certified training of 1C software users; Center for energy audit, Cisco Network Academy and others.

The university is completely staffed with scientific-educational personnel: over 80% of tutors are Doctors and Candidates of Sciences.

To reveal the level of digital competence of the research-teaching staff and students, we applied the method of polling. The questionnaire was compiled on the basis of The Digital Framework for Citizens. The respondents were offered to determine their level (advanced, basic, initial, undeveloped) of each of the 21 digital competences based on self-estimation. The research comprised 304 respondents, 21 y.o. on average.

To obtain the general results, we summarized the numbers of respondents who determined their level of digital competences as advanced and basic in the set areas (Fig. 1). The majority of the research-teaching staff and students demonstrate the highest digital competence in the sphere of informational literacy – 78% and 97% respectively. Most of the students use the Internet to search for interesting and educational information, actively use cloud technologies for storing information, while professors show competence in analyzing, comparing and critical evaluation of the reliability and validity of the information sources and digital content.

In the sphere of communication and cooperation, the degree of competence at advanced and basic levels is almost equally high, according to the answers by students and professors. The respondents use various kinds and forms of interaction through digital technologies – electronic mail, chats, blogs, forums, social networks, etc., with various aims. Most of the respondents show high degree of readiness to exchange information through digital technologies, as well as to civil participation and cooperation. However, students, unlike professors, not always care about observing netiquette and protecting their reputation in the Internet.

The advanced and basic levels of competence in the sphere of creating the digital content imply the primary skills of programming, creating and editing the digital content in various formats. The polling showed rather intermediate results – 56% of professors and 67% of students, respectively. Professors marked insufficient knowledge of copyright ad licensing of data, information and digital content. Many respondents marked insufficient competence in the sphere of protecting devices and digital content, understanding risks and threats in digital environments.

Rather contradictory results were shown in the sphere of ensuring digital security. For example, 54% of the students assert that they are ready to provide protection of personal data and confidentiality in digital environments, to understand how to use personal data while being able to protect oneself and others from damages, to be able to avoid health-risks and threats to physical and psychological well-being while using digital technologies, to be able to protect oneself and others from possible dangers in digital environments, and to be aware of digital technologies for social well-being and social inclusion. At the same time, only 34% of professors consider themselves to have these abilities advanced and basic levels.

Finally, analysis of competence in the sphere of solving technical problems showed rather low results. Professors and students have difficulty identifying and solving technical problems while operating devices and using digital environments. Only 29% of professors and 31% of students define their level as advanced and basic.

Thus, the research revealed the problem competences which should be paid more attention while organizing the educational process, in particular, the issues of digital safety and solving technical problems. However, in general, the polling allows concluding that the digital competence of students and professors at the university is formed at basic level, which testifies to the fact that the selected trajectory of the educational process digitalization is correct, and allows specifying the growth points in that direction.

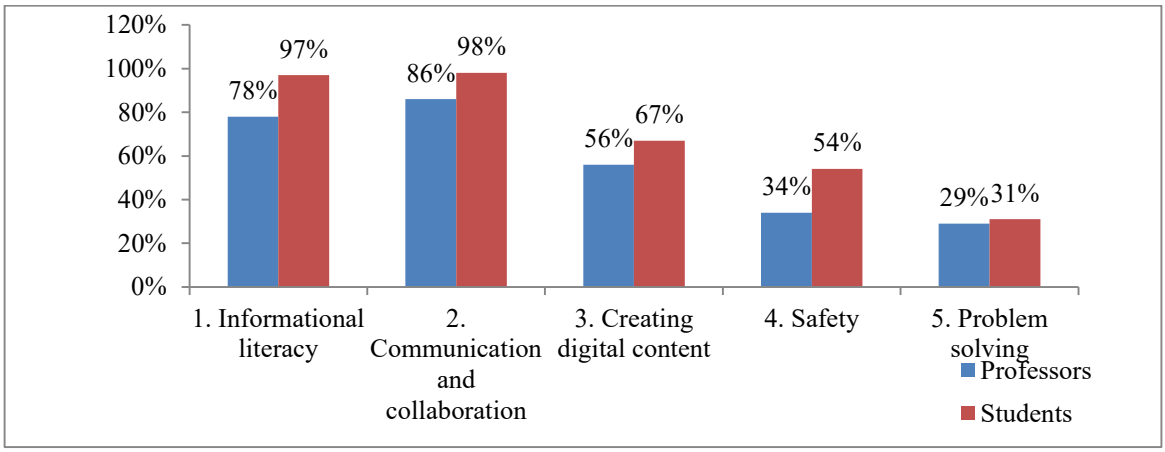

Fig. 1. *Development of digital competence of students and professors*

3. Results and discussion

Below we analyze the possibilities of the university for forming, developing and enhancing the digital competence of students and professors (Shamin et al., 2018; Shamin and Kasimova, 2018).

The modern educational environment at NNSUEE is a set of open informational systems aimed to provide solving various tasks of the educational process. Openness as the main characteristic feature of digital educational environment provides possibility and right to use various informational systems, change them or add new ones.

The educational digital tools at NNSUEE are the developed digital informational-educational environment (a portal), the digital library, the platform for distant learning, the internal and external online courses.

The digital informational-educational environment of the university is based on Moodle platform and comprises digital educational and methodological resources in all disciplines, personal pages of the university divisions, professors and students, the list of recommended online courses, and digital portfolios of students.

Distant learning is organized through Miropolis platform. This platform provides opportunity for arranging distant lectures, seminars and webinars. A tutor contacts students from a virtual office through video connection, feedback is carried out through a chat. Chat seminars take place online: a professor and students join the chat and discussion (or any other type of joint activity offered by the professor) takes place during the set time. The participants may see each other and communicate online. Thus, everyone feels as if working in a students' group.

The digital library gives access to several licensed libraries containing academic and scientific publications.

The scientific-pedagogical personnel of NNSUEE is convinced that today any tutor who is unable to apply digital educational technologies and to organize digital learning, not only loses competitive advantages in the professional community, but often loses authority among students due to the lack of mobility in the means of communication. Such a professor is unable to create a different educational environment — the digital educational environment to interact with students. That is why the informational technologies are an indispensible part of training for NNSUEE professors. To work with students, the professors use the resources of digital informational-educational environment, online learning, professional software, digital control systems, computer simulations, etc.

In the educational process, they broadly use the principle "bring your own devices", when smart phones, notebooks, tablets and other gadgets are used at lessons to get and process information. Cloud technologies are also actively used. Placing information in a "cloud", a professor makes it accessible for students, thus arranging team work on every topic. Also, professors acquaint students with additive technologies – 3D-manufacturing, data transmission infrastructure, and fiber-optic communication technologies.

A popular learning technique is Internet surfing, when a professor sets a task for the students to search for information in the net. Students search for information autonomously, at the same time receiving information about the subject, then submit a report for control.

Realizing the need for digital transformation, the university professors advance their qualification in this sphere, taking a course "Forming the digital educational environment: fundamentals of online-learning"; they actively use vCards and QR–codes. NNSUEE professors took part in a communication session "Boiling spot" arranged by the "University for National Technological Initiative 20.35". The best practices and services were presented at the event, which may assist NNSUEE in implementing the digital transformation of the university.

To further enhance forming of digital competences, the university plans participation of NNSUEE representatives in other intensive educational courses by the "University for National Technological Initiative 20.35". NNSUEE participation in the events organized by the "University for National Technological Initiative 20.35" promotes implementation of the main directions of the Strategy for Nizhegorodskaya oblast development in the aspect of advanced digitalization of economy and social sphere, as well as implementation of pilot projects using end-to-end digital technologies and facilitating introduction of digital technologies into the educational process.

NNSUEE students were active participants of master-classes: "IOT-technologies. The Internet of Things", "Data-transfer. Data routing", "Efficient technologies of success", "Lean-technologies. Aviation Processes Factory", and "Generation of Digital Future".

While elaborating the digital approaches to organization of educational process, special attention is paid to online learning. An online course is a course constantly accessible for users through the Internet and developed with the use of digital learning technologies. At

NNSUEE, online courses are implemented either as a part of the basic educational program, in which case the results of learning are registered in the student's records, or as a part of additional training program, when the course completion is marked by issuing a certificate on mastering the additional training program.

Online courses are subdivided into external, or mass open, online courses and internal online courses. The former is developed by the third institutions and are placed on the third educational platforms on open access basis. The online courses placed at NNSUEE educational portal are integrated into the university educational process as internal online courses. The internal online courses are developed by authors' collectives within the university and are placed in the informational-educational environment of NNSUEE.

4. Conclusion

Thus, the research revealed that digital competence is a requirement of the contemporary society which should be net by every citizen. Hence, forming the digital competence of the participants of the educational process at university must be carried out in compliance with the requirements of the global and domestic practices. The experimental data allowed revealing the actual level of digital competence of students and professors of Nizhniy Novgorod State University for Engineering and Economics, as well as to reveal the sources and identify the prospects of its development, among which the most important are the following.

1. Creating the system of evaluating the quality of online courses, comprising automated and expert evaluation and providing students and educational establishments with reliable information on the quality of online courses and online resources. Nizhniy Novgorod State University for Engineering and Economics has developed the system of expert evaluation of the internal online courses and internal online resources. To assess the quality, structure, content and compliance with State Educational Standards of an internal online course, developed by the university staff, an expert commission is formed by an order of a Vice Rector on Academic Work. The commission includes not less than three members – leading specialists in the sphere of the evaluated online course, including professors of the university or another educational institution. The author of the course submits comprehensive information about the online course (work load, content, results of learning, competences at which the online course is aimed, majors in which the course can be used), as well as the full unlimited access to the materials of the online course in digital form. The results of assessment are presented at the session of the Educational and Methodological Board of the university. In case of a positive decision, the course is included into the list of online courses recommended for using within the educational process. In case of an unsatisfactory decision, the course is rejected. After eliminating the drawbacks and further improvement, the author may initiate its reexamination. Each online course developed by the university professors must pass two reviews, one of them external. It is recommended that the reviewers are the leading specialists of the university, scientific-research and other institutions within the area of the online course. A reviewer presents their conclusion in writing. The review must reflect the compliance of the online course with the requirements of Federal State Educational Standard, the working program (if any), the set objectives, the modern level and trends of science and industry; the course content is evaluated; proposals may be made as to improving it; a conclusion on its use in the educational process is given.

2. Creating the informational portal accessible for all categories of citizens and providing each user with access to online course and online resources, developed and implemented

by various institutions on various online platforms. Nizhniy Novgorod State University for Engineering and Economics has developed a digital informational-educational environment, which provides the university students with access to digital resources in all disciplines. It also presents the list of internal and recommended mass online courses.

3. Integrating the portal with the Unified Identification System. Storing and transfer of digital information about the educational achievements of a person in various educational institutions. Forming the digital portfolio.

4. Creating the software enhancing the quality of online learning and reliable assessment of the results of mastering the online courses.

5. Adopting normative acts allowing to master online courses as parts of the main and additional educational programs. Nizhniy Novgorod State University for Engineering and Economics has developed a Statute on organization of educational activity with the use of online courses, to regulate implementation of an online course as a part of the main educational program or an additional educational program.

6. Creating open online courses in the sphere of educational technologies, as well as regional centers for developing competences in the sphere of online learning, to provide training of personnel of educational institutions at all levels with a view of broader use of online courses to enhance the quality of educational programs.

7. Creating and implementing not less than 3500 online courses, the results of which mastering can be counted within main educational programs.

Within Nizhniy Novgorod State University for Engineering and Economics, the Institute for Economics and Management has planned to develop about ten internal online courses in 2018-2019. It has already developed online courses in the disciplines: “Organization of entrepreneurial activity” (major 38.04.02 Management), “Statistics” (major 38.03.05 “Business informatics”), professional module 05 “Cashier” (major 38.02.01 Economic and Accounting (by sectors)).

Besides developing and implementing the internal online courses, the professors of Nizhniy Novgorod State University for Engineering and Economics use external (public) online courses. Their implementation takes place on the basis of contracts signed with third parties. For example, one of the network partners of Nizhniy Novgorod State University for Engineering and Economics is the “Open Education” site, housing 348 online courses in various majors. The NNSUEE students take online courses by professors of the leading Russian universities: Lomonosov Moscow State University, Saint Petersburg Pedagogical University, Saint Petersburg State University, NUST MISIS, National Research University “Higher School of Economics”, MIPT, Ural Federal University, and ITMO University. They successfully pass attestation and receive certificates on mastering a discipline or a module through online courses.

Finally, it should be noted that successful enhancement of digital competence, provided the necessary technologies are available, it is necessary to establish continuous transfer of new educational technologies into the educational process, to introduce digital environments and tools, for the educational process to be in line with technological development.

References

Asmolov, A.G., Semenov, A.L., Uvarov, A.Yu. 2010. *Rossiyskaya shkola i novye informatsionnye tekhnologii: vzglyad v budushcheye desyatiletiye [Russian school and new information technologies: a glance into the next decade]*. Moscow.

Decree of the RF President of 09.05.2017 No. 203 "On the strategy of development of informational society in the Russian Federation in 2017-2030". *Collection of legislation of the RF*, 15.05.2017, No. 20, Art. 2901.

"DigComp2.1: The Digital Framework for Citizens with eight proficiency levels and examples of use". 2017. European Union

Dontsov, A.I., Drozdova, A.V. 2013. Vizualnoye vozdeystviye internet-reklamy na molodezhnuyu subkulturu [Visual impact of Internet advertising on a youth subculture]. *Natsionalnyy psikhologicheskiy zhurnal*. No. 2 (10). pp. 25-32.

Fedorov, A.V. 2009. *Mediaobrazovaniye: vchera i segodnya [Media education: yesterday and today]*. Moscow: MOO VPP YUNESKO.

Kalimullina, O.V., Trotsenko, I.V. 2018. Sovremennye tsifrovye obrazovatelnye instrumenty i tsifrovaya kompetentnost: analiz sushchestvuyushchikh problem i tendentsiy [Modern digital educational tools and digital competence: analysis of the existing problems and trends]. *Otkrytoye obrazovaniye*. No. 3.

Klassov, A.B., Klassova, O.V. 2016. Ispolzovaniye sistemy distantsionnogo obucheniya v uchebnom protsesse [Using the system of distant leaning in educational process]. *Nauchnyy almanakh*. 3-2. pp. 165-169.

Kupriyanovskiy, V.P., Sinyagov, S.A., Namiot, D.E., Dobrynin, A.P., Chernykh, K.Yu. 2016. Informatsionnye tekhnologii v sisteme universitetov, nauki i innovatsii v tsifrovoy ekonomike na primere Velikobritanii [Information technologies in the system of universities, science and innovations in digital economy by the example of Great Britain]. *International Journal of Open Information Technologies*. 4 (4).

Kuzmin, E.I., Parshakova, A.V. 2012. *Mediynaya i informatsionnaya gramotnost: programma obucheniya pedagogov [Media and informational literacy: educational program for pedagogues]*. Moscow: Institut YUNESKO po informatsionnym tekhnologiyam v obrazovanii.

Kuzmin, E.I., Parshakova, A.V. 2013. *Media- i informatsionnaya gramotnost v obshchestvakh znaniya [Media- and informational literacy in knowledge societies]*. Moscow: MTSBS.

Ladyzhets, N.S., Neborskiy, E.V. 2015. Universitetskiy barometr: mirovye tendentsii razvitiya universitetov i obrazovatelnoy sredy [Science Studies: global trends of developing iniversities and educational environment]. *Naukovedeniye*. Vol. 7. No. 2 (27).

Lau, Kh. 2006. *Rukovodstvo po informatsionnoy gramotnosti dlya obrazovaniya na protyazhenii vsey zhizni [Manual on informational literacy for life-long learning]*. Moscow: MOO VPP YUNESKO.

Lebedeva, M.B. 2015. Massovye otkrytye on-layn-kursy kak tendentsiya razvitiya obrazovaniya [Mass open online courses as a trend of education development]. *Chelovek i obrazovaniye*. 1 (42).

Liseev, I.K. 1998. Vysokiye tekhnologii v kontekste izmeneniya regulyativov kultury. [High technologies in the context of changing the culture regulations]. In: *Works of scientific-*

practical conference "Vysokiye tekhnologii i sovremennaya tsivilizatsiya". Moscow: Institut filosofii RAN.

Makoveychuk, K.A. 2015. Perspektivy ispolzovaniya kursov v formate MOOK v vysshem obrazovanii v Rossii [Prospects of using courses in MOOK format in the Russian educational system]. *Mezhdunarodnyy nauchno-issledovatelskiy zhurnal*. 63. p. 66.

Namiot, D.E., Kupriyanovskiy, V.P., Samorodov, A.V., Karasev, O.I., Zamolodchikov, D.G., Fedorova, N.O. 2017. Umnye goroda i obrazovaniye v tsifrovoy ekonomike [Smart cities and education in digital economy]. *International Journal of Open Information Technologies*. 5 (3).

Obucheniye tsifrovym navykam: globalnye vyzovy i peredovye praktiki [Teaching digital sciences: global challenges and advanced practices]. 2018. *Analytical report for the 3rd International conference "Bolshe chem obucheniye: kak razvivat tsifrovye navyki"*. Moscow: ANO DPO "Korporativnyy universitet Sberbanka".

Order of the Russian government of 28.07.2017 No. 1632-r "On adopting the program "Digital economy of the Russian Federation". *Collection of legislation of the RF*, 07.08.2017, No. 32, Art. 5138.

Passport of a priority project "Modern digital educational environment in the Russian Federation", adopted by the Presidium of the Council on strategic development and priority projects under the Russian President, protocol No. 9 of 25.10.2016).

Shamin, A.E., Kasimova, Zh.V. 2018. Osobennosti predostavleniya obrazovaniya v regionalnykh vuzakh [Features of providing education at regional universities]. *Vestnik NGIEI*. 10 (89). pp. 119–134.

Shamin, A.E., Smirnov, A.N., Kasimova, Zh.V., Kirilov, M.N. 2018. Rol vuza, subyekta Rossiyskoy Federatsii, v razvitii regionalnoy ekonomiki [The role of a university of a Russian Federation subject in developing regional economy]. *Vestnik NGIEI*. 8 (87). pp. 114-129.

Soldatova, G.U., Nestik, T.A., Rasskazova, E.I., Zotova, E.Yu. 2013. *Tsifrovaya kompetentnost podrostkov i roditeley. Rezultaty vserossiyskogo issledovaniya [Digital competence of teenagers and parents. Results of all-Russia research]*. Moscow: Fond Razvitiya Internet.

Soldatova, G.U., Rasskazova, E.I. 2014. Psikhologicheskiye modeli tsifrovoy kompetentnosti rossiyskikh podrostkov i roditeley [Psychological models of digital competence]. *Natsionalnyy psikhologicheskiy zhurnal*. No. 2 (14).

Stepin, V.S. 1998. Vysokiye tekhnologii i problema tsennostey [High technologies and the issue of values]. In: *Works of scientific-practical conference "Vysokiye tekhnologii i sovremennaya tsivilizatsiya"*. Moscow: Institut filosofii RAN. Available at: http://philosophy.rU/iphras/library/tech/vysok.html#16). Accessed on 20 March 2019.

Structure of ICT-competence of teachers: recommendations by UNESCO. 2011. Paris: UNESCO.

Valeeva, N.G., Rudneva, M.A. 2016. Massovye otkrytye onlayn-kursy v obuchenii studentov ekologicheskogo fakulteta angliyskomu yazyku dlya professionalnoy kommunikatsii [Mass open online courses in teaching English in professional communication to students of Ecology faculty]. *Vestnik Rossiyskogo universiteta druzhby narodov. Seriya: Ekologiya i bezopasnost zhiznedeyatelnosti*. 3.