

Preparedness of Higher Education Institutions for the Digitization of the Educational Process



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Abstract At the modern stage of development of information technology, the most important aspect of efficiency of higher education in Russia is preparedness of the higher education system in general and professors at higher education institutions in particular for working with digital technologies. Research findings presented in this paper allow assessing such indicators as the level of digital literacy of university professors, their mastering of ICT competencies, as well as the level of development of the digital educational environment of Russian higher education institutions, including the degree of availability of digital equipment in higher education institutions, the use of educational software products and online education services, the degree of development of training and online education technologies. This research allows making several significant conclusions which are necessary for the development of the higher education system in Russia in the context of the digital economy and the development of necessary methodological tools for the comprehensive assessment of preparedness of higher education institutions for the introduction of digital education technologies and products.

Keywords Digital education technologies · Digital educational environment · Online education services · Digital literacy · ICT competencies of a university professor

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1 Introduction

The processes of informatization, multimediization and virtualization as successful trends in the development of education significantly changed characteristics of both the educational process as such and the educational space. Therefore, as a matter of fact, there are no ways of updating educational processes without taking into account the peculiarities and innovations determined by the abovementioned processes, and the efficiency of vocational education and training substantially draught depends on the degree of filling the educational process with digital technologies and products [8].

2 Methodology

Education digitization process, on the one hand, requires development of the digital educational environment—a complex of digital teaching aids, electronic learning resources, and on the other hand—modernization of the educational process which provides for teaching students how to work and live in a digital environment [14, 15].

In addition, digital literacy and competency of university professors and their preparedness for digitization of education [2, 6, 7] are the key condition for digitizing education.

Hence, the assessment of degree of preparedness of higher education institutions for the digitization of the educational process must take into account the totality of factors defining the efficiency of the digital transformation of higher education institutions and the education system in general.

3 Results

The analysis of factors of digitization of the educational process in the higher education system of the Russian Federation which is mainly based on statistics and monitoring data led to the following conclusions.

3.1 Level of Development of the Digital Educational Environment of Higher Education Institutions

(a) Degree of availability of digital equipment in higher education institutions

The computer infrastructure of Russian higher education institutions is slightly inferior to that of European universities. According to statistical data, there is an average of 1 computer per 4 students in Russian higher education institutions [5].

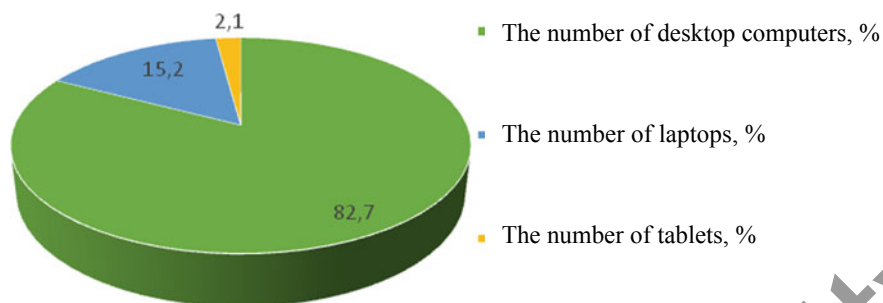


Fig. 1 Percentage of laptops and tablets in the total number of personal computers in higher education institutions (%), 2017 [18]

The number of handheld devices (laptops and tablets) is increasingly growing among personal computers (Fig. 1); multimedia projectors, interactive whiteboards, and other peripheral equipment (printers, scanners, multifunction devices) have been widely used.

A topical issue is the assessment of the quality of the university's Internet access. According to experts of the Higher School of Economics, the minimum Internet bandwidth necessary for the use of digital technologies and products should be at least 2 Mbps (the minimum Internet bandwidth abroad is 100 Mbps) [18].

According to educational system monitoring, the Internet bandwidth of 97.7% of Russian higher education institutions is 2 Mbps or lower.

Costs for digital technologies per higher education institution are 6.2 million rubles, a considerable part of which (62.3%) accounts for the purchase of personal computers, telecommunication equipment, servers, and payment for telecommunication services.

(b) The use of software in higher education institutions

In order to achieve the efficient use of digital technologies in the educational process in higher education institutions, it is necessary to use various software, such as electronic library systems, electronic versions of textbooks and teaching aids, training computer programs, digital reference books, encyclopedias, dictionaries, etc. [16].

The analysis of the use of software in higher education institutions is shown in Fig. 2.

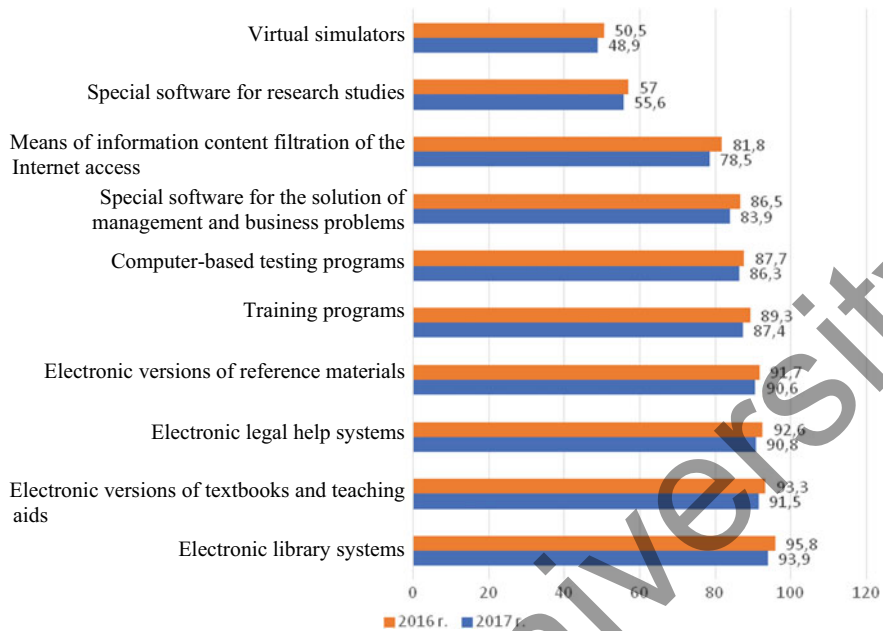


Fig. 2 The use of software in higher education institutions (as a percentage of the total number of higher education institutions; at the end of year) [1]

(c) The use of e-learning technologies

Digitization of higher education requires efficient use of e-learning technologies and online education technologies [19]. Today, the share of online education technologies in the Russian education system is very small compared to educational systems in developed countries; thus, e-learning and distance education technologies are only used in one in three higher education institutions [18].

The analysis has shown that blended learning is mostly used in national universities, while e-learning and distance education technologies are used for the information support of learning of students directly in a higher education institution [18].

That said, most auditors of education programs that are implemented exclusively with the use of e-learning technologies, study in national universities, while online education technologies are mainly used in nonstate universities.

(d) The use of online education services

Another stage of digitization of higher education institutions involves emergence and development of online education services, and, primarily, publicly accessible open online courses MOOC (Massive Open Online Courses) [4, 9].

Analysis of statistics has shown that the number of available courses of MOOC is steadily growing, but the scope of their use in higher education is still quite moderate (Fig. 3).

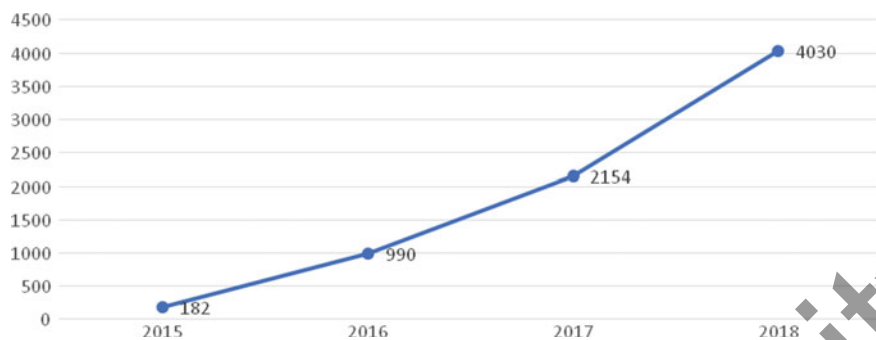


Fig. 3 Dynamics in the number of MOOC, pcs

Among foreign online training platforms that implement MOOC, one may mention edX, Coursera, Udacity, etc.

Among online education platforms that implement MOOC in Russia, the best known are as follows: educational platform “Open Education” which serves as a basis for MOOC of leading Russian universities; Universarium, which by 2019 presented 175 courses in 19 subject areas; Stepik’s website, which hosts more than 400 courses [17].

In general, the assessment of preparedness of the educational environment of higher education institutions to the introduction of digital technologies and products shows that only several higher education institutions have implemented automation and informatization and are prepared for digitization. On the other hand, many higher education institutions are still at the initial informatization stage, which includes the formation of IT infrastructure of a university and automation of the educational process. The current level of development of IT infrastructure is indicative of the inadequate digitization of the educational environment of higher education institutions [8].

3.2 Analysis of Preparedness of University Professors for Using Digital Technologies and Products

In order to analyze preparedness of professors of Russian higher education institutions for using digital technologies and products, the findings of NAFI research were used; the level of their digital literacy and ICT competency was assessed in this research [3].

Within the scope of research conducted by NAFI, 634 professors of Russian higher education institutions of various federal districts of Russia were interviewed online.

- (1) The assessment of the digital literacy has demonstrated a fairly high score—the digital literacy index for university professors is 88% (Fig. 4).

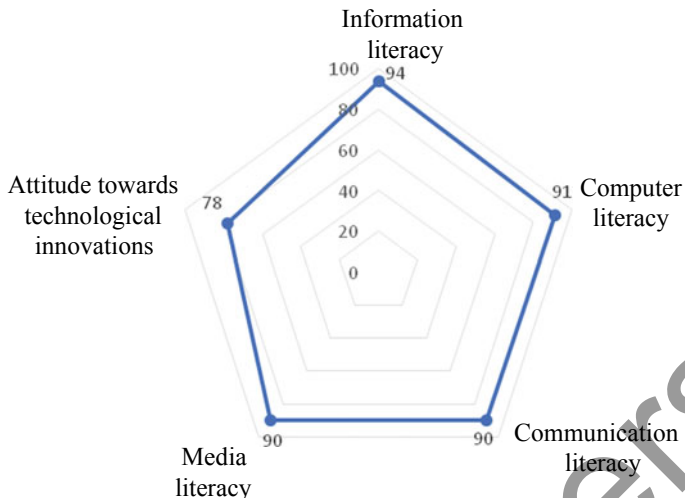


Fig. 4 Digital literacy index for university professors, %

To assess each of the 5 components of the digital literacy index, knowledge, skills and attitudes of university professors in a given field of work with digital technologies and information (Table 1) were identified.

As can be seen from Table 1, the highest percentage is “Information literacy”—94%, and the lowest percentage is “Attitude towards technological innovations”—78%.

(2) The ICT competencies of university professors were assessed using the European Digital Competence Framework 2.0 for teachers (DigCompEdu) [10, 17], which distinguished 22 competencies of teachers, grouped into six blocks:

1. Professional duties
2. Digital resources
3. Teaching and training
4. Assessment of students’ performance
5. Expanding the rights, opportunities and independence of students in teaching and learning activities

Table 1 Assessing the digital literacy index by components

Components of the digital literacy	Knowledge	Skills	Attitudes	Indices
Information literacy	97	98	76	94
Computer literacy	83	99	100	92
Communication literacy	87	89	94	90
Media literacy	86	95	91	90
Attitude towards technological innovations	72	84	78	78

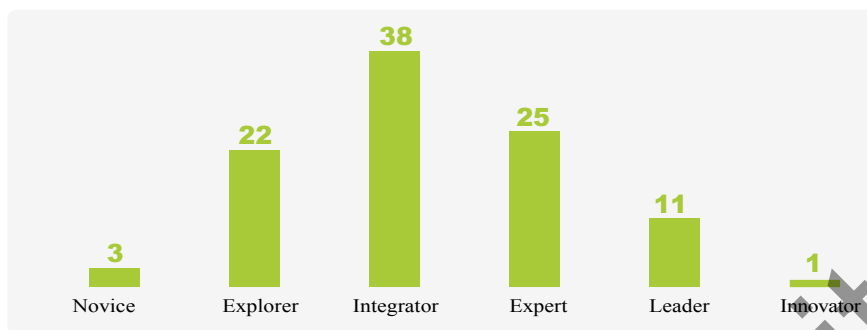


Fig. 5 Distribution of university professors by level of experience in using digital technologies in the educational process, in % of respondents

6. Developing the digital competency of students.

Depending on the level of developed ICT competencies, university professors are classified according to one of 6 experience levels: Novice, Explorer, Integrator, Expert, Leader, and Innovator. The categorization is performed according to the number of points scored in the questionnaire (the maximum total points for all questions in the questionnaire—88).

The identified mean level of ICT competencies of university professors is 45 points.

The distribution of university professors by level of experience in using digital technologies in the educational process is shown in Fig. 5.

As can be seen from Fig. 5, most university professors (75%) have fairly high level of ICT competencies.

The results of assessment of ICT competencies by blocks are as follows.

Maximum score for block 1: Professional duties account for 32% of the teachers surveyed, including in terms of particular competencies:

- Communication with colleagues and students—27%
- Professional cooperation—30%
- Reflexive practices (self-analysis)—31%
- Continuous professional improvement through the use of digital technologies—41%.

Maximum score for block 2: Digital resources account for 36% of the teachers surveyed, including in terms of particular competencies:

- Selection of digital resources—44%
- Creation and modification (adaptation) of digital resources—42%
- Management of digital resources, their protection and exchange—23%.

Maximum score for block 3: Teaching and training account for 30% of the teachers surveyed, including in terms of particular competencies:

- Teaching—31%
- Management of teaching and learning activities—23%
- Collaborative (cooperative) learning—33%
- Self-regulated learning—32%.

Maximum score for block 4: Assessment of students' performance accounts for 37% of the teachers surveyed, including in terms of particular competencies:

- Estimation strategy—32%
- Document analysis—30%
- Feedback and planning—48%.

Maximum score for block 5: Expanding the rights, opportunities and independence of students in teaching and learning activities accounts for 38% of the teachers surveyed, including in terms of particular competencies:

- Providing all students with access to digital devices (PCs, tablets, etc.)—37%
- Differentiation and personalization—35%
- Involvement of students in vigorous activity—43%.

Maximum score for block 6: Developing the digital literacy of students accounts for 41% of the teachers surveyed, including in terms of particular competencies:

- Information literacy—39%
- Communication and collaborative work in a digital environment—54%
- Creation of digital content—51%
- Responsible use of digital technologies—27%
- Solving problems through the use of digital technologies—35%.

Hence, research results suggest the low level of ICT competencies of university professors in all of its components, and, consequently, insufficient level of preparedness for the introduction and active use of digital technologies and products in the educational process [11].

4 Conclusion and Recommendations

The completed research into preparedness of Russian higher education institutions for the introduction of digital education technologies and products allowed making the following conclusions:

- Modern educational environment of Russian higher education institutions and university professors from the perspective of digital literacy and competency are poorly prepared for the active introduction of digital technologies and products [12, 13].

- Today, there are no necessary methodological tools that would enable a comprehensive “inside-out” assessment of preparedness of every Russian higher education institution for the introduction of digital technologies and products, which necessitates development of a comprehensive assessment technique.

Taking into account the above circumstances, research authors suggest assessing preparedness of higher education institutions for the digitization of the educational process on the basis of the analysis of factors that directly influence the digitization of the educational process, in particular: digital transformation of the educational environment of a higher education institution and preparedness of university professors for working in a digital environment.

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