

## Distance education in a digital age

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### Abstract

This paper aims to review the present state of digital distance education, assess the problems associated with transitioning to the online space, and determine the priorities of online education. The study draws on the analysis of surveys, monitoring studies, and statistical information from state services. It examines the technical capabilities of educational institutions, the information technology skills of instructors and students, and their motivation. On top of that, it identifies the main problems encountered during the implementation of digital technologies in the education process while paying special attention to the role of online education during the COVID-19 pandemic. Using a psychological portrait of a modern young student, the authors provide some recommendations for the learning content to increase the interactivity of the learning process and improve students' motivation. The article ends with outlining key areas for digital learning development that would improve the overall effectiveness of the education system transformation.

Keywords: Digitalization, distance learning, Generation Z, information environment, Internet technologies

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## 1. Introduction

Information resources and technologies have rapidly entered and firmly taken a leading position in all spheres of modern life. The introduction of advanced technologies and digitalization has become a prerequisite for the successful development of both economic entities and individual members of society. This process has likewise affected the education system. Following the interests and needs of the public, education has left the classroom, gradually changing the ways of delivering information and the very organization of the education process. Transformation of the educational system under the influence of digital technologies, educational applications, and electronic resources has become a global trend, changing the face of the global educational space (Ilina et al., 2014; Bulat & Volkov, 2016; Bulat et al., 2017).

However, the education process cannot be simply transferred to the online environment. Digital education requires changes in teaching aids, educational and methodological approaches, perception, etc. For this, new curricula and materials should be developed that would introduce digital technologies in training, add special interactive programs unique to each discipline, and actively use new technologies in the learning process (both individual like cell phones, computers, laptops and tablets and collective like interactive whiteboards, TVs, and projectors). With this as a backdrop, the field of education can embed VR and AR programs to make the entire practical and theoretical training more interactive and independent learning-centered. Digitalization can stimulate the development of the education system or become a stumbling block when a combination of negative factors becomes an insurmountable obstacle for the participants in the learning process.

Distance education based on information technology has several undeniable advantages over the traditional education system. It broadens knowledge, promotes flexible learning, helps to promote innovative pedagogical practices, expands access to information resources, and enhances collaboration between participants in the learning process. The gradual transformation of the education process and its integration into the digital environment is a worldwide trend. The transition of all educational institutions to distance learning during the COVID-19 pandemic was a test of their quality and an incentive to change.

### 1.1. Conceptual or theoretical framework

Like any innovative process, transformation of an educational system is associated with some difficulties. This study is concerned with digitalization in education, its current state, and development. It aims to identify problems that hinder this process and require greater attention and seeks to determine digital education development priorities. Digitalization of education is an objective trend of modern life, but it is necessary to avoid functional and systemic imbalances when following the innovation. The effective work of the whole education system depends on a careful choice of the development pathway, coordination of the educational activities, development of a concrete action plan, direction of faculty's efforts, and minimization of costs.

### 1.2. Literature review

At a time of rapid technological changes, it becomes increasingly relevant to implement digital technologies in various economic sectors and spheres of human life. Both national and foreign researchers prioritize the issue in their publications.

The digital age has created a new generation of students with special social and psychological characteristics, known as Generation Z. Generation Z has become the primary users of the education system so far. Its young representatives have proven to be exceptionally immersed in virtual

communication, which is becoming more and more natural and intuitive for modern children (Kulakova, 2018). They grew up with a unique understanding of human involvement in digital technology. The computer, the cell phone, the limitless possibilities of the Internet, and other information technologies are an integral part of the daily life of modern youth. Thus, Generation Z has specific requirements for the education system. Information technologies, in turn, provide ample opportunities for individualization of the education process (Sapa, 2015).

European Union defines e-learning as “the use of new multimedia Internet technologies to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration” (Albero et al., 2008). This definition focuses on the technical side of digital education, while the process of acquiring knowledge is referred to as “distance cooperation.”

Kurti (2009) explored the design and development of technology-enhanced learning environments. According to his vision, the main elements of digital distance learning are the students, the learning environment, and the technologies (various tools and resources) used to enhance the learning process. Bingimlas (2009) emphasizes the role of the educator in the successful integration of information computer technologies (ICT). He stresses that ICT trends change fast, new applications appear, and new technical devices are introduced, which puts high requirements on the faculty.

Salavati (2016) stresses the complexities of educators’ everyday practice and takes a closer look at the problem areas of the digital technologies’ introduction. Following Kurti (2009), he identifies six problem areas:

- (1) resource component (devices and technical support);
- (2) organizational component at the level of an educational institution;
- (3) state and economic support;
- (4) social component (the level of computer literacy and the psychological readiness of the students);
- (5) technological component (quality of content, security);
- (6) simplicity and comfort in use; the author also draws attention to the fact that the success of digitalization in education depends on the spread of digital technologies in society and professional practice.

In 2018, NAFI Analytical Center assessed the digital literacy of various social groups in Russia. The groups were compared according to the indicators of information, computer, communication, media literacy, and attitude towards technological innovations (Figure 1).



Figure 1. Digital Literacy Levels in Different Social Groups  
Source: Reproduced from Aymaletdinov et al. (2019).

### *1.3. Related Research*

The study shows that only half of the Russian population is fully aware of digital technologies and can widely use them for professional development. Citizens who are professionally engaged in educational activities are the most IT-literate. The importance of educators' attitudes and perception of digital technologies in education was highlighted by M. A. Camilleri and A. C. Camilleri (2017). A similar issue was raised by Bocconi et al. (2013). Both groups of researchers shift the focus of digital technology in education from devices and infrastructure to students and pedagogy.

Castaño-Muñoz et al. (2014) suggest that distance learning based on digital technology is more effective compared to face-to-face education. At the same time, the comprehension of educational materials directly depends on their interactivity. Bocconi et al. (2013), Hoskins and Crick (2010), and Wastiau et al. (2013) share this opinion. They believe that the quality of knowledge and its comprehension directly depends on the digital competence of the educator and the ability to organize the learning process in such a way as to maximize the involvement of students.

Berger and Thomas (2011) highlight the potential opportunities and obstacles of integrating digital technologies in education. Their findings align with the survey conducted by Glover et al. (2005) and underline the need for digitalization management and guided development in the education sector. Otherwise, the process of digitalization may remain the prerogative of enthusiasts and gradually lose the support they have already gained. In the end, most authors recognize that the success of digital education is determined by technical capabilities, digital literacy of educators, and their attitude toward digitalization. Digital transformation of education should follow clear-cut guidelines and be well-organized.

### *1.4. Problem statement*

The COVID-19 pandemic was a force majeure for the education system, demonstrating the mismatch between the needs of the time and the system's ability to master the digital space. The education system cannot remain unchanged under such conditions. As a classic service, education can be demanded and appreciated only if it fully meets the needs of potential consumers (i.e., Generation Z students).

### *1.5. Purpose of the study*

This study aims to analyze the problems arising in the implementation of digital technologies in education as well as identify the main priorities of online training by analyzing the current state of digitalization in the field.

Study objectives incorporate the following points:

- examine the state and development of distance learning in higher educational institutions in Russia over the last five years using secondary sources;
- estimate the results of digital technologies' introduction in education during the COVID-19 pandemic and disclose problems of non-personal educator-student communication;
- consider the accessibility of technology needed for online learning;

analyze the readiness of students and educators for distance interaction.

## **2. Methods and materials**

### *2.1. Research model*

The paper focuses on the state of digital distance learning in higher education during the COVID-19 pandemic. The data sources used were scientific articles and statistical reviews from publicly available sources listed below. The information on the availability of digital technologies in educational institutions and among students was taken from official statistical reports for 2010-2018 (Aptekman et al., 2017; Government of the Russian Federation, 2017; HSE University, 2016). The number of personal computers in state and municipal educational institutions per 100 students and the number of fixed and mobile broadband Internet users were taken as proxies to estimate digital education's potential. The survey was aimed at assessing the students' psychological readiness to distance education and their interest in this form of learning.

### *2.2. Participants*

The online questionnaires were distributed among 237 respondents aged 17-21 from Kursk, Yaroslavl, Orel, Ulan-Ude, and Krasnodar. As research participants, students of all study years were enrolled. The sample included both individuals who began learning online during the pandemic and the predominance of time was trained remotely and those educated via the blended format. Since it was critically important to study students of different majors, they were chosen randomly to exclude the influence of personal factors on the study results. The readiness of educational personnel for distance interaction was assessed by analyzing feedback from 178 instructors of Orel State University of Economics and Trade, Yaroslavl State Technical University, Southwestern State University, Baikal State University, Kuban State Technological University, and educational materials published on the universities' websites.

### *2.3. Data collection tools*

All the necessary data were collected from publicly available sources, the websites of Sberbank of Russia and Validata, as well as surveys conducted by the Levada Center. Calculation and assessment were done by means of WPS Office software as this office suite provides a large number of possibilities to work with data, can be used in any operating system, and supports Google Disk, Dropbox, Evernote, and OneDrive. It was these functions that were used for further research results calculation.

### *2.4. Data collection process*

Research data collection was done from April to May 2020 by receiving electronic questionnaires from the survey respondents.

### *2.5. Data analysis*

Educational materials were analyzed using the results of qualitative research conducted by Sberbank of Russia together with the Validata agency over the past five years (Azarenok, 2009). Thus, the study uses objective figures obtained from statistical sources as well as subjective assessments of experts and education process participants. The main challenge of the study was to combine the instructors' and students' views of the subject and content of distance learning into a single concept.

### *2.6. Ethical issues*

All survey participants signed informed consent for the collected information to be further used within the limits of this study and possible future works on the topic. For respondents under the age of majority, permission was taken from their parents or guardians.

### 3. Results

The governmental attention to this issue is not accidental. The level of education is a determining factor in shaping the scientific and technical potential of the country and its global competitiveness. However, according to a yearly statistical digest that has been releasing since 2018, Russian citizens are much less interested in obtaining education online compared to the developed countries (Figure 2).

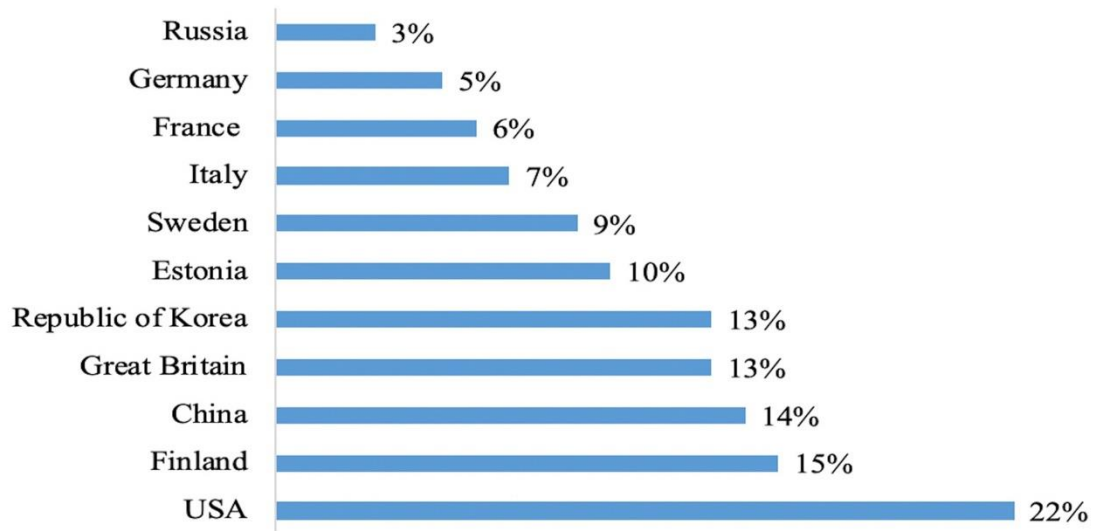


Figure 2. Percentage of Internet Users Receiving Distance Education  
Source: Reproduced from Abdrakhmanova et al. (2018).

Thus, in Russia, people prefer traditional in-class education over distance learning. Nevertheless, according to the American research organization Ambient Insight and the Russian portal Smart Education (Andreyev, 2013), the distance education market in Russia and the Commonwealth of Independent States (CIS) is growing by 20% yearly. Such a rapid increase is driven by student demand.

The results of the survey carried out among 237 students in April-May 2020 are shown in Figure 3. They evidence that young people have a great interest in the use of various information and communication technologies for education. This fact can be explained by the familiarity of the learning approach, the accessibility of information at all times regardless of one's location, and the vast availability of materials.

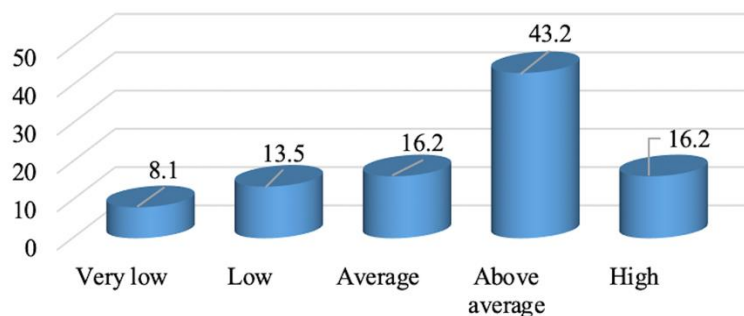


Figure 3. Interest of Students in Using Digital Technology

Generation Z representatives have a high speed of information processing. They easily switch attention, can work in a multitasking environment, as well as quickly master technical innovations, and are very interested in new computer programs and applications. Nevertheless, the survey conducted in April-May 2020 showed a low level of computer literacy among Generation Z students (Figure 4).

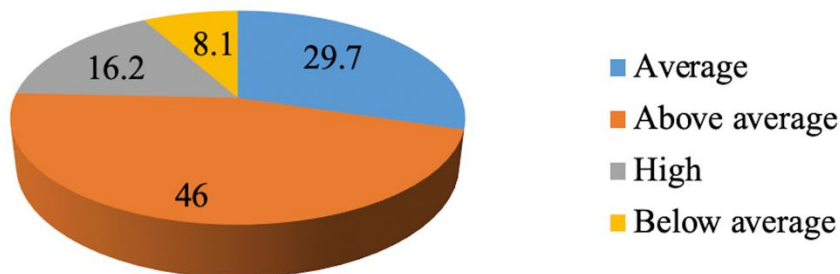


Figure 4. Level of Digital Literacy Among Young Students

Most students held the view that digital technology is more important in everyday life than in education and learning (Figure 5).

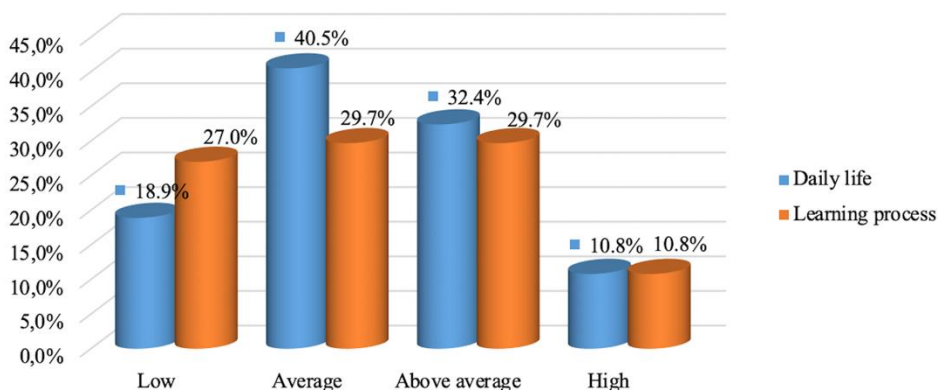


Figure 5. Importance of Internet Technology in Everyday Life and Education According to Generation Z Students

According to the collected responses, the main reasons for low interest in online education were poor quality or irrelevance of the learning materials to their needs, technical barriers, and low level of motivation. The survey showed that 28% of students did not have the opportunity to study remotely due to a lack of technical means or skills to use digital technology. Only 35% of the surveyed were ready to perform tasks independently, study theoretical material from digital media, show interest in creative assignments, and solve problems of increased complexity. At the same time, about 65% of respondents felt more confident when working in a group and needed an instructor to help them. This indicates that students are not ready to learn remotely.

The survey about content preferences showed that 65% of students favored illustrations and video clips as the most interesting ways of delivering information. Audio materials were popular among 57% of them, and only 46% of respondents expressed interest in texts. A likely explanation behind such preferences could revolve around psychological factors. Children from Generation Z are inclined to clip



thinking, which is the inability to keep the focus on a studied object for a long period of time. The information is easier to consume when offered in the form of vivid images, short articles, and videos.

Technical barriers to online education are the lack of personal computers, limitations for Internet access associated with the territorial location or the financial capacity of users, and insufficient amount of equipment in educational institutions. This explains why most Russians have to use smartphones to master education programs, which, though, severely limits their learning opportunities, reduces the perception of educational material, and negatively affects the quality of education in general.

A determining factor in the effectiveness of education is the motivation of the students. Distance learning requires students to be self-directed and disciplined. This requires a clear understanding of one's own cognitive goal, capabilities, and willingness to work independently. Students' motivation largely depends on the quality of communication between them and the instructor, their general interest in the subject, and the quality of the educational material, i.e., factors shaped by the educator.

Adjusting the education process to the needs of the target audience affects the professional competence of the educator. It requires changes in the instruction methods, readiness to transform professional thinking, and mastering distance education tools and technologies, which is impossible without strong motivation from the faculty.

Developing teaching materials and mastering new technologies necessitate high effort associated with intellectual, physical, and psychological stress. The survey conducted among 178 university instructors from different regions of Russia revealed a financing problem. To be more specific, digital transformation is a cost-demanding process. Aside from that, education managers lack the understanding of how to assess educators' workload properly. Hence, regulatory and financial support is usually weak. The survey outcomes unveiled that 68% of instructors considered the Russian education system not ready for the transition to distance learning. Only 35% of instructors were of the opinion that the education system is ready for the digitalization of learning.

According to educators, the main disadvantages and difficulties associated with distance education are:

- lack of visual and emotional contact with the students, which reduces the quality of education;
- inability to check whether students work on the tasks independently;
- some academic disciplines require more interaction with other students or the educator and cannot be mastered independently;
- student does not develop social communication and teamwork skills;
- instructor's role as a mentor is greatly reduced;
- lack of motivation among faculty to acquire technical skills and use them in distance learning reduces creativity;
- working with students online while simultaneously preparing digital learning materials increases the workload of the faculty;
- lack of standards for distance learning;
- lack of technical means severely hinders the learning process.

Thus, distance education does not come down to just having a computer with access to the Internet and digital educational materials. It is a system with a complex of objective and subjective factors, such



as availability of modern technology, psychological readiness of the participants (both instructors and students) to the transition to a new environment, high motivation, and sufficient digital technology skills.

Based on the results of both surveys, the authors identify the following priorities in the development of digital distance education:

- (1) improvement of material and technological support of educational institutions to enable online work;
- (2) raising students' digital literacy and enhancing their motivation;
- (3) transformation of educational materials to a digital format, taking into account the psychological characteristics of the generation of students. High interactivity of educational materials increases students' interest and motivation to learn;
- (4) improving organization and financial management of digitalization in higher educational institutions (this includes regulation of instructors' workload in the development of digital learning materials, their upload to the web sources, recording and editing of video lectures, etc.).

#### **4. Discussion**

Today, the development of information technology is a global trend and an urgent need. Digitalization penetrated all spheres of human activity while the Internet continues to develop. According to TAdviser (n.d.), in 2018, web sources were used by as many as 80.9% of the adult population in developed countries. In developing states, their share constituted only 45.3%. As for Russia's total Internet audience in 2018, it surpassed the indicators of the leading countries with its 83%. In general terms, in the year 2019, as many as 53% of the world's population were Internet users, with 109.5 million living in Russia (8<sup>th</sup> place in global ranking) (TAdviser, n.d.).

The growing number of net surfers is the reason for drastic changes in many economic sectors, including education. Following the needs of the target audience, education has become more active in embracing digital transformation. Special attention to this issue is given at the state level in the Decree of the Government of the Russian Federation No. 376 of March 31, 2017, within the framework of the "Development of Education" program. The goal of this project is to provide equal opportunities in access to lifelong learning for all categories of citizens through the development of digital information and the educational environment (Biankina, 2017; Hrossu, 2020).

The digital distance education market of Russia lags behind the global average. Compared to experienced markets, such as Europe and the US, Russia is at the early stage of its formation. Therefore, education service providers in the Russian Federation can use the existing experience and technologies to develop local distance education services.

An overview of the foreign e-learning market shows that in many industries, the effectiveness of digital learning is comparable to the traditional education approach. This conclusion is supported by the UN and UNESCO data. In Germany, for example, employers favor specialists who can study remotely. This is partially due to the high quality of education and knowledge assessment.

The transition of Russian educational institutions to distance learning during the COVID-19 pandemic demonstrated the technical and mental unpreparedness of the national education system and its participants for such transformation. In the vast majority of cases, distance learning was reduced to webinars, students' independent reading of materials, and doing textbook assignments. A survey conducted by NAFI among educators (NAFI Research Center, 2020) showed that they did not appreciate

the quality of digital learning materials available for distance learning. However, this is a problem in many countries (Lalalan, n.d.). Even developed states demonstrated unpreparedness for the complete transition to distance education.

An overview of the world and Russian e-learning market by CMMedia Ltd. states that e-learning has no limitations regarding spheres of economic activity. The effectiveness of online learning depends on each specific industry. One can hardly agree that all educational disciplines can be digitized without loss. For some occupations, such as those related to healthcare or arts, knowledge and skills can only be gained in practice. Some sciences require the use of laboratory facilities (chemistry, pharmacy), which is difficult to do remotely. Therefore, it is necessary to integrate digital technology into the existing system of training. Sergeyev (2020), studying German and Swiss experience in the digitalization of professional education, arrives at a similar conclusion. The combination of gadgets and the educational environment creates conditions for overcoming the boundaries between theory and practice and increases the synergistic effect of learning.

Many authors argue that online classes can save time. Tarasova et al. (2012) emphasize that online learning reduces the educators' burden of preparing for the lessons since they only use the ready-made material. The authors of the Ra-kurs (n.d.), based on the research by Cedar Group, also see time saving as the main benefit of distance learning. Educators involved in the development and implementation of distance courses hold a slightly different opinion. Digital education creates the illusion of an easy organizational and technical solution. In practice, new tasks, such as updating the teaching methods, engaging low-motivated students, etc., have significantly increased educators' workload.

Some argue that digitalizing education will lead to a reduction in costs (Overview of the World, n.d.). This is not the case, however. One of the biggest problems of digitalization today is the insufficient provision of educational institutions with the necessary equipment and software. There are also problems with the speed of the Internet. A large number of children do not have the necessary technical means at their disposal. In addition, there are the costs of course development. Technical progress, technology obsolescence, changes in demand, the life cycle of course materials, and other factors require constant modification of educational material.

Thus, the digitalization of the education system requires a considerable investment of financial and time resources. In this case, the most effective approach would be not a complete replacement of the traditional system with distance learning but the integration of the two methods with different proportions of online and in-class activities depending on the specifics of the discipline.

In the case of distance education, learning outcomes should include a range of competencies and skills not only limited to knowledge. Students must understand multiple cognitive meanings and independently search for answers to practical and original tasks.

The educational environment should not be overloaded with highly specialized digital content, contain unverified information, or have any plagiarized content (e.g., reposts, etc.) The global web resources should be used to foster students' independent reflection skills and encourage them to gain experience and diverse knowledge associated with values and ethical norms.

Overall, online education should promote maximum deformatization of the learning process, create an atmosphere of collective experience, and preserve the most important didactic resource: systemic and deterministic knowledge. The main prerequisites for successful digitalization are technical resources and the high motivation of the participants. Essential competencies for an educator are the

ability to assess the quality and relevance of educational resources to the learning goals, good digital skills, and the capacity to manage digital content.

## 5. Conclusions

The paper assessed the current level of digitalization in education and the readiness of this sector for the transition to distance learning. Based on analysis of publicly available statistical data and the outcomes from additional independent research, the main disadvantages of distance education were identified. Despite the urgent need, the Russian system of distance education is underdeveloped because of:

- poor technical support of educational institutions (lack of equipment and freely available computer programs and applications, which are necessary for high-quality education);
- insufficient level of digital literacy among students;
- low motivation of students to study independently;
- low motivation of faculty to improve their digital skills and adjust their learning materials and training methods.

The study outlines three priorities for the digital education that would speed up the digitalization process and enhance distance learning:

- (1) providing educational institutions with technological support;
- (2) improving technical literacy of students to enable the transition to remote learning;
- (3) ensuring organizational and financial support to motivate educators to develop interesting and engaging learning content;
- (4) encouraging students to seek quality knowledge and gain digital skills.

The level of student engagement is determined primarily by the quality and instructiveness of learning materials and their compliance with student expectations. Instructors need to change their approach to education delivery and way of thinking and master online communication skills. The motivation of the faculty should be supported by providing clear regulations regarding the workload and financial resources to promote digital education.

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