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Challenges and opportunities for online education of veterinary sciences in Kazakhstan

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The Severe Acute Respiratory Syndrome Coronavirus Infectious Disease 2019 (SARS-COVID-19) pandemic has dramatically improved the attitude that society has toward educational opportunities that are administered online. In many cases, digital platforms were adapted and utilized without formal evaluation of the needs, constraints, and opportunities associated with their use. Here, the eight historical faculties of veterinary sciences of Kazakhstan were surveyed to gather data on the use of online technology for the discipline in the country and the limitations, opportunities, and challenges associated with its use. Results show that technological resources, institutional support, and faculty and instructors' attitudes are highly favorable for the implementation of online education programs consistently throughout the country. In contrast, students' motivations and skills are perceived as variable, although generally favorable, at different locations. The results here provide insights into the challenges and opportunities associated with using online technology for instruction in veterinary sciences in Kazakhstan, which will help create the foundations for implementing this type of program in the country and region.

KEYWORDS

online, education, veterinary sciences, exploratory factor analysis, Kazakhstan

1 Introduction

As with any other aspect of society, education has been heavily impacted by the Severe Acute Respiratory Syndrome Coronavirus Infectious Disease 2019 (SARS-COVID-19) pandemic. Education systems worldwide had to adapt quickly to continue operating while adjusting to distinct control measures, which, in many cases, included partial or total confinement. This adaptation required, in many cases, a broad modification of the structure of educational programs. In Kazakhstan, 3 million students, including almost half a million attending higher education institutions, had to move into distance learning options. At the time, it was believed that the country was mostly prepared for the implementation of digital education programs given that 78% of the population has access to the Internet, that Kazakhstan is among the five countries with the lowest prices for data rates, and that there are a large number of digital education platforms that operate in the country. It was believed that universities could rapidly adapt to those changes because most

had previous experiences with online education before the pandemic and had even actually developed platforms for teaching administration (Nur-Sultan, 2020).

Transformations in the university education system of Kazakhstan began long before the SARS-COVID-19 pandemic, which became a trigger that accelerated those changes. Such evolution in the implementation of online education programs in the country suggests that those changes would remain and that returning exclusively to pre-pandemic pedagogical and administration methodologies would represent a missing opportunity for development (IQAA, 2021).

The SARS-COVID-19 pandemic has shown that distance education can compete with, or ideally supplement, traditional education. Moreover, it has driven the global shift toward online learning. The opportunity, however, comes with challenges. Indeed, the effective implementation of online learning programs requires a substantial amount of time, resources, and support from key stakeholders interested in developing high-quality online education (Avilova and Moldavanova, 2022).

The SARS-COVID-19 pandemic has led to an economic recession that impacted higher education. Those effects include, for example, the restriction of state and sponsorship support and a drop in the solvency of the population that resulted in a decreased demand for commercial educational services. In that regard, the administration of higher education institutions has an opportunity, and a need, to explore the development of post-SARS-COVID-19 business models. New business models should consider the revision of educational technologies in favor of economically feasible, easily adaptable to online, face-to-face, or hybrid modes of study, optimization of the pedagogical and managerial personnel in connection with the development of the online segment, and the widespread use of risk-oriented models of universities' financial management (Dudin and Kononova, 2020).

It is interesting that, initially, online education in general and, in particular, the widespread use of mass open online courses, were considered tools to reduce inequity in access to knowledge; however, the effectiveness of online education in accomplishing such goal is yet to be demonstrated (Bekova et al., 2021). The inequity associated with different levels of access to digital education technologies affects the potential to implement distance learning programs. This phenomenon is not limited to differences in the technical capabilities of Internet access. Instead, it is also a consequence of social, economic, and, in some cases, racial stratification of society. The problem of digital inequity is not only considered from the point of view of the availability of digital resources but, not less importantly, implies the inequity in the level of formation of digital competencies that are significant both in education and other professional activities (Ertl et al., 2020; Guzikova, 2021). Consequently, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has encouraged educational organizations to step up efforts to curb digital inequity in education (UNESCO, 2020).

Preparing and conducting classes online, mastering electronic educational platforms and means of communication, and searching for new sources of information in the absence of sufficient experience in the digital environment become a source of additional stress for teachers and students. Some teachers have complained about the increasing actual workload and excessive reporting required by online education (Fedorova and Butrova, 2021).

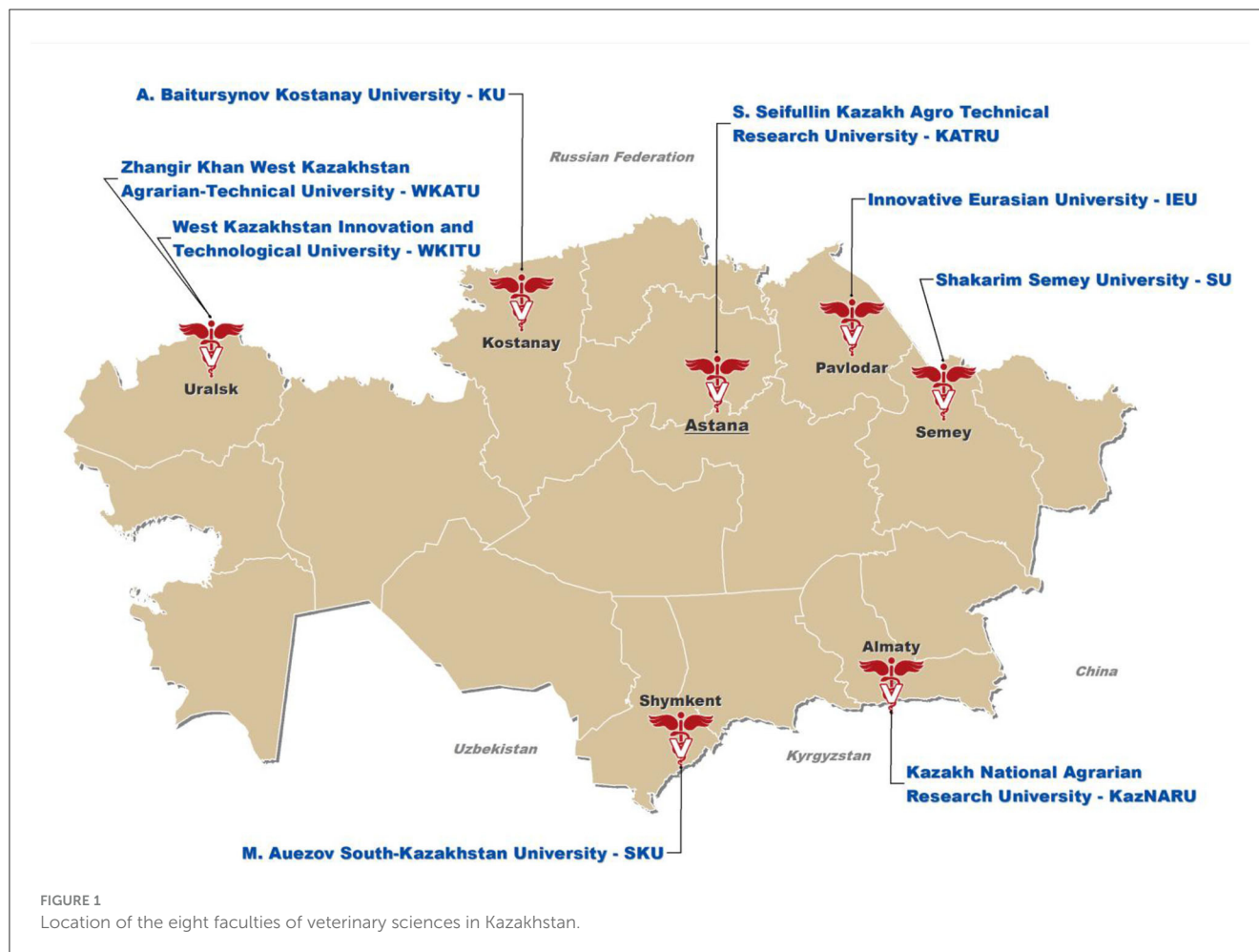
Similarly, some students noted excessive workloads and difficulties mastering the material (Jiang, 2020). Other methodological challenges mentioned include the quality control of distance education, the lack of necessary resources for intermediate and final attestations, the developed system of evaluation tools, and the increase in the risk for "academic fraud" (Yurchenko, 2020). At the same time, applied specialties, such as veterinary medicine, suffer the most due to their practical orientation, the need to use the material and technical base of the university, and the requirements for practical, hands-on training (Zakharova et al., 2021). In turn, distance learning offers an opportunity to supplement training opportunities for institutions and organizations. For example, the World Organization for Animal Health (WOAH) stated that educational programs in veterinary medicine should "ensure that the graduating veterinarian not only has received a level of education and training that ensures sound overall competencies but also has the required knowledge, skills, attitudes and aptitudes to understand and be able to perform entry-level national veterinary service tasks that relate to the promotion of animal and public health" (OIE, 2021). In the post-SARS-COVID-19 era, there may be a leading role for online education to support organizational development to meet those goals.

This paper assessed the challenges and opportunities associated with implementing online education programs in veterinary medicine in the Republic of Kazakhstan. Conclusions here may help create the foundations for developing this type of program in the country, which may also serve as a model for implementation in Central Asian countries.

2 Study population and data collection

Historically, there have been eight faculties of veterinary sciences in Kazakhstan, funded between 1929 and 2013 (Figure 1). One particular condition of Kazakhstan, similar to other former Soviet countries, is that new programs were established relatively recently. Specifically, the programs of the country's eight traditional faculties of veterinary science were modified between 2003 and 2019. In all cases, 5 years are required to graduate, and the degree awarded is referred to as "veterinarian," "veterinary specialist," or an equivalent designation. The number of students that graduate annually per faculty fluctuates between 20 and 380 (median: 97), with ~1,100 new graduates per year graduating in the entire country. Most ($n = 6$, 75%) faculties are housed at Universities that are considered "quasi-state" or "state" because they receive support mostly from public sources, whereas the remaining two Universities are private.

The eight traditional faculties of veterinary sciences of Kazakhstan were surveyed using self-administered questionnaires, which were filled out by each of their Dean's offices. The questionnaire (Supplementary Appendix 1) included three sections. The first section gathered general information about the faculty and university. The second section was intended to collect data on the experience of the faculties in the use of online education in veterinary sciences, including questions on the number of courses or programs administered online, the audience (students and/or graduate veterinarians), the discipline or area, the number of participants trained, the platforms used,



and the language in which the training was done. The third section aimed to assess the faculties' perception of the motivation, skills, and availability of resources of students, instructors, and institutions.

3 Experience in the use of online education

Six (four quasi-state, two private) of Kazakhstan's eight traditional faculties of veterinary sciences (75%) have had some experience using online technology for educational purposes. The target audience was students in five of the six faculties that have used online education. In contrast, teachers were the objective of the online training program in the remaining faculty. The median number of courses or programs administered online per institution was 5 (minimum: 1, maximum 8), whereas the median number of trainees per institution was 200 (minimum: 15, maximum 450). Online platforms used included Zoom, Microsoft Teams, Moodle, and Flipped Classroom. In the six institutions, courses were administered in Kazakh and Russian, whereas English was also used in two. The topics of the courses were variable, including pedagogy, genetic

engineering, food safety, artificial insemination, and pre- and post-mortem examination.

4 Challenges and opportunities

Most faculties of veterinary sciences in Kazakhstan agree that instructors and students are ready and motivated to learn online, will have sufficient technical skills to take advantage of online teaching, and will have minimal internet network and connectivity issues. There was consensus among the eight faculties that the institutions would be able to provide adequate professional training for online teaching for students and instructors and technical and multimedia support, including support for troubleshooting and counseling sessions for students and instructors (Table 1).

5 Discussion

The SARS-COVID-19 pandemic prompted educators and institutions worldwide to shift to online education approaches and systems rapidly. While the SARS-COVID-19 pandemic was an unexpected catalyst for change, it has brought to light the challenges and opportunities associated with online education. In the post-SARS-COVID-19 era, there is a need to reflect on those challenges

TABLE 1 Perception of eight faculties of veterinary sciences in Kazakhstan regarding the resources and attitudes of students, instructors, and institutions toward online education (1: strongly disagree; 2: disagree; 3: neither agree nor disagree; 4: agree; 5: strongly agree).

Questions	Minimum	Maximum	Median
Students are ready and motivated to learn online	3	5	4
Students will have sufficient technical skills to take advantage of online learning	2	5	4
Students do not have internet network and connectivity and speed issues	2	4	3.5
My institution will be able to provide adequate professional training for online teaching for students and instructors	4	5	5
My institution will be able to provide technical and multimedia support, including support for troubleshooting and counseling sessions for students and instructors	4	5	5
Instructors will be as comfortable teaching online as offline	4	5	5
Instructors will be interested in online teaching and will be well prepared for online teaching	4	5	5
Instructors will have, or will be able to prepare multimedia tools (videos, presentations, animations) for online teaching	4	5	5
Network connections are stable and have adequate speed in my city/region	4	5	4
Students and instructors have access to devices (mobile/laptop) suitable for online teaching	3	5	5

and opportunities, which are also influenced by the particularities of countries and disciplines involved, to facilitate change and adoption of online education models (Lockee, 2021; Babbar and Gupta, 2022; Yeh and Tsai, 2022). Here, the challenges and opportunities for online education specific to veterinary sciences in Kazakhstan were assessed, suggesting an open opportunity for its implementation in the country.

One of the most pressing challenges associated with online education is the digital divide and inequity, given that one would not expect all students to have equal access to the technology required to implement online learning programs (van de Werfhorst et al., 2022). This disparity in access to devices and reliable internet connections can exacerbate educational inequities, increasing, rather than reducing, the gap in access to education. Interestingly, only one faculty, located in a remote area of the country, expressed some concerns concerning the motivation and readiness of students to learn online, as well as their skills and resources to take advantage of the opportunity (Table 1). These results show that there may be some limited needs in some specific locations but that, in general, the network and connectivity of Kazakhstan and the engagement of students are appropriate for implementing online programs.

An additional challenge is that of insufficient engagement and motivation (Chiu et al., 2021). Online learning often lacks the social interaction and engagement found in traditional classrooms. Students may struggle with motivation and a sense of isolation. Noteworthy, most faculties believed that instructors will be as comfortable teaching online as in-person, which is important because educators will need to develop strategies for maintaining student engagement, fostering a sense of community, and promoting self-discipline in online environments. Additionally, it was believed that instructors would be interested in and prepared for online teaching (Table 1).

Quality of instruction may also be compromised in an online environment (Aldredge et al., 2019). Instructors must receive proper training in online teaching methods and technologies to ensure effective learning outputs. Institutions should invest in faculty development programs to enhance online pedagogy.

Assessment and Academic Integrity: online education raises concerns about assessment integrity. Cheating and plagiarism can be more difficult to detect in virtual settings. Implementing secure and authentic assessments while preserving student privacy is a significant challenge. Fortunately, there was a consensus that institutions will be able to provide adequate professional training for online teaching for students and instructors and also ensure the technical and multimedia support required for the implementation of online programs, including support for troubleshooting and counseling sessions for students and instructors (Table 1).

Finally, technological issues may also represent a barrier to online education (He and Yang, 2021; Yeh and Tsai, 2022). Technical glitches, unreliable internet connections, and platform compatibility issues can disrupt online classes. Most importantly, there was strong agreement that instructors will have, or will be able to prepare, multimedia tools (Videos, presentations, and animations) for online teaching, that network connections are stable and have adequate speed through the countries, and that students and instructors have access to devices (mobile/laptop) suitable for online teaching (Table 1).

Given that the leadership of Kazakhstan institutions of higher education seems to be prepared to address these challenges, there are a large number of opportunities associated with online education that may support the development of veterinary sciences in the country (Abramson, 2021; Lockee, 2021). Specifically,

- (1) Flexibility and accessibility: online education offers unparalleled flexibility, allowing students to access learning materials at their own pace and convenience. This flexibility can be particularly beneficial for non-traditional students, working professionals (which makes these programs particularly suitable for professional development or outreach opportunities in the veterinary sector), and those with disabilities.
- (2) Pedagogical innovation: digital media provide opportunities for innovative teaching methods, such as gamification, virtual labs, and personalized learning algorithms. Educators

can tailor content to individual needs and experiment with new pedagogical approaches. Resources can also help bridge language barriers, particularly in countries where multiple languages are used for communication—note that previous experiences in Kazakhstan were implemented in three different languages.

- (3) Global learning communities: online education transcends geographical boundaries, enabling students to engage with diverse perspectives worldwide. Collaborative projects and international partnerships can enrich the educational experience. This feature is important in former Soviet countries, which have undergone an unprecedented transformation of their educational, organizational, and technological system over the last decades.
- (4) Use of artificial intelligence to support educational programs: online education generates a large volume of data on student performance. These data can be leveraged to identify learning trends, adapt curricula, and provide personalized support, ultimately improving learning outcomes.
- (5) Lifelong learning and upskilling: online education supports lifelong learning and upskilling, allowing individuals to acquire new skills and knowledge throughout their careers, which, again, makes online alternatives particularly appealing for outreach and professional development approaches in the country.

Special consideration should be given to the challenges associated with development of clinical skills in an online setting. Indeed, students in final years require the contact with patients. Hybrid courses may be designed, to facilitate the acquisition of clinical skills through specific in-person interactions. Additionally, there have been some experiences associated with the use of telemedicine and teleteaching in human medicine education that could be applied to the veterinary setting. For example, some institutions of higher education in England have provided their students access to an online library of patient interview recordings and cases (Mian and Khan, 2020).

In conclusion, the SARS-COVID-19 pandemic pushed online education into the spotlight, revealing both challenges and opportunities associated with the implementation of this type of pedagogical approach (Yeh and Tsai, 2022). There will be a need to address critical issues to take advantage of the multiple opportunities that may emerge for online education in the post-SARS-COVID-19 era. Those emerging challenges include digital inequity, engagement of students and instructors, and assessment integrity while embracing the flexibility, innovation, and global reach that online education offers. Results presented in this paper suggest that technological resources, institutional support, and faculty and instructors' attitudes are appropriate for implementing online education programs in Kazakhstan. While students' motivations and skills are perceived as variable at different locations, those are still favorable in the country. Results show that there is an opportunity in Kazakhstan to maximize the potential of online education in the country, for which institutions, educators, and institutions must work together to ensure equitable access, quality instruction, and ongoing support for all learners. Results here will contribute to establishing the foundations for the implementation of educational programs, with

emphasis on outreach and professional development opportunities, for veterinary sciences in the country and region. Ultimately, these opportunities may help overcome emerging issues and support recovery in the post-SARS-COVID-19 era.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/participants OR patients/participants legal guardian/next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

AK: Data curation, Formal analysis, Software, Writing—original draft. AU: Data curation, Formal analysis, Software, Writing—review & editing. DK: Data curation, Formal analysis, Software, Writing—review & editing. AA: Data curation, Formal analysis, Software, Writing—review & editing. YM: Data curation, Formal analysis, Software, Writing—review & editing. ZA: Data curation, Formal analysis, Methodology, Software, Writing—review & editing. AP: Methodology, Writing—review & editing. SA: Conceptualization, Funding acquisition, Supervision, Writing—review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomp.2023.1292515/full#supplementary-material>

References

- Abramson, A. (2021). Capturing the benefits of remote learning. *Am. Psicol. Assoc.* 52, 6. Available online at: <https://www.apa.org/monitor/2021/09/cover-remote-learning>
- Aldredge, M., DuBois, S., Mobley, D., Prejean, E., and Vienne, M. (2019). Maintaining quality in online learning environments—issues and challenges. *Int. J. Innov. Educ. Res.* 7, 361–367. doi: 10.31686/ijer.vol7.iss12.2077
- Avilova, E., and Moldavanova, I. (2022). Higher education in the Republic of Kazakhstan during the global epidemic COVID-19. *Pedagog. Psychol.* 52, 43–50. doi: 10.51889/9556.2022.94.80.005
- Babbar, M., and Gupta, T. (2022). Response of educational institutions to COVID-19 pandemic: an inter-country comparison. *Policy Futures Educ.* 20, 469–491. doi: 10.1177/14782103211021937
- Bekova, S. K., Terentyev, E. A., and Malashonok, N. G. (2021). Educational inequality in the conditions of the COVID-19 pandemic: the relationship between the socio-economic situation of the family and the experience of distance learning of students. *Quest. Educ.* 1, 74–92. doi: 10.17323/1814-9545-2021-1-74-92
- Chiu, T. K. F., Lin, T. J., and Lonka, K. (2021). Motivating online learning: the challenges of COVID-19 and beyond. *Asia-Pacific Edu. Res.* 30, 187–190. doi: 10.1007/s40299-021-00566-w
- Dudin, M. N., and Kononova, E. V. (2020). Management of higher education in conditions of great challenges and threats caused by the COVID-19 coronavirus pandemic. *Probl. Mark. Econ.* 30, 133–145. doi: 10.33051/2500-2325-2020-2-133-145
- Ertl, B., Csanadi, A., and Tarnai, C. (2020). Getting close to the digital divide: an analysis of impacts on digital competencies based on the German PIAAC sample. *Int. J. Educ. Dev.* 78, 102259. doi: 10.1016/j.ijedudev.2020.102259
- Fedorova, L. A., and Butrova, E. V. (2021). Assessment of the impact of the consequences of the COVID-19 pandemic on the system of vocational education as the basis of social development of human capital. *Bull. Altai Acad. Econ. Law.* 4, 126–132. doi: 10.17513/vaael.1657
- Guzikova, L. A. (2021). Higher education: will the “epidemic of actions” become the image of the future? *Quest. Teach. Methods Univ.* 10, 8–18. doi: 10.18720/HUM/ISSN2227-8591.36.01
- He, X., and Yang, H. H. (2021). “Technological barriers and learning outcomes in online courses during the COVID-19 pandemic,” in *Blended Learning: Re-thinking and Re-defining the Learning Process. ICBL 2021. Lecture Notes in Computer Science*, eds
- R. Li, S. K. S. Cheung, C. Iwasaki, L. F. Kwok, and M. Kageto (Cham: Springer), 92–102. doi: 10.1007/978-3-030-80504-3_8
- IQAA (2021). *The Impact of the COVID-19 Pandemic on Higher Education in Kazakhstan. Thematic Analysis of IQAA*. Available online at: <https://iqaa.kz/kk/> (accessed September 8, 2023).
- Jiang, R. (2020). Knowledge, attitudes and mental health of university students during the COVID-19 pandemic in China. *Child. Youth Serv. Rev.* 119, 105494. doi: 10.1016/j.childyouth.2020.105494
- Lockee, B. B. (2021). Online education in the post-COVID era. *Nat. Electron* 4, 5–6. doi: 10.1038/s41928-020-00534-0
- Mian, A., and Khan, S. (2020). Medical education during pandemics: a UK perspective. *BMC Med.* 18, 100. doi: 10.1186/s12916-020-01577-y
- Nur-Sultan, K. (2020). How the Coronavirus Pandemic Affected Education? *Exp. Opin.* Available online at: https://www.inform.kz/ru/kak-pandemiya-koronavirusa-povliyala-na-obrazovanie-mneniya-ekspertov_a3667516 (accessed September 09, 2023)
- OIE (2021). *OIE Recommendations on the Competencies of Graduating Veterinarians (Day 1 graduates.) to Assure National Veterinary Services of Quality*. Available online at: <https://www.woah.org/app/uploads/2021/03/dayone-b-ang-vc.pdf> (accessed September 7, 2023).
- UNESCO (2020). *COVID-19 and Higher Education: Today and Tomorrow. Impact Analysis, Policy Responses and Recommendations*. Right to Education. Available online at: <https://www.right-to-education.org/resource/covid-19-and-higher-education-today-and-tomorrow-impact-analysis-policy-responses-and> (accessed September 04, 2023).
- van de Werfhorst, H. G., Kessenich, E., and Geven, S. (2022). The digital divide in online education: inequality in digital readiness of students and schools. *Comput. Educ. Open* 3, 100100. doi: 10.1016/j.caeo.2022.100100
- Yeh, C.-Y., and Tsai, C.-C. (2022). Massive distance education: barriers and challenges in shifting to a complete online learning environment. *Front. Psychol.* 13, 928717. doi: 10.3389/fpsyg.2022.928717
- Yurchenko, S. G. (2020). New tasks of quality management of distance education in conditions of high readiness (COVID 19). *Bull. Sci. Methodol. Council Environ. Manag. Water Use* 18, 13–25. doi: 10.26897/2618-8732-2020-18-13-25
- Zakharova, U. S., Vilkova, K. A., and Egorov, G. V. (2021). It is impossible to teach this online: applied specialties in a pandemic. *Educ. Issues.* 1, 115–137. doi: 10.17323/1814-9545-2021-1-115-137