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Distribution of Knowledge through Online Learning and its Impact on the Intellectual Potential of PhD Students*

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Abstract

Purpose: the research aims to analyze the impact of the distribution of knowledge through online learning on the intellectual potential of PhD students and produce recommendations for policy to improve intellectual capacity. During the literature review, it was determined that a large number of studies examined the impact of online learning on the quality of education at different levels. **Research design, data and methodology:** the research methodology is based on subjective assessment and studying the students' opinions. The basis of the study was a comprehensive analysis of primary data obtained through a sociological survey of PhD students. 324 respondents from humanitarian, medical and natural faculties participated in the survey. **Results:** the study revealed that online learning helps increase students' intellectual potential. PhD students had a positive attitude towards the transition from traditional education to online learning. It should be noted that, according to the results, the most popular gadgets were laptops and smartphones, which were characterized by high mobility and ease of use. Based on the obtained results, recommendations were developed for the formation of online learning with a focus on increasing students' intellectual potential. **Conclusions:** based on the results of the assessment of educational and innovative potential, policy recommendations and further research in this area were proposed.

Keywords: Education, Innovation, Intellectual Potential, Online Learning, Online Distribution Channels, Knowledge Distribution, COVID-19 Pandemic

JEL Classification Code: I25, I28, O40

1. Introduction

Today, the Internet is one of the channels for distribution (Al-Abdallah et al., 2014), including educational services

(Soboleva-Tereshchenko, 2019), as well as a channel for the dissemination of knowledge through distance learning technologies (Labate, 2020). Distance technologies contribute to improving educational methods that allow a

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creative approach to the learning process by creating new learning schemes and the distribution of knowledge. The spread of coronavirus infection worldwide has become a serious challenge in the field of education and has proved that distance education has huge advantages in maintaining the distribution of the educational process (Alanazi & Alshaalan, 2020; Liguori & Winkler, 2020). Before quarantine restrictions, distance education was one of the functional parts of the educational system (Harsasi & Sutawijaya, 2018; Saykili, 2018; Weller et al., 2018). Many developed countries were able to react quickly, with an urgent transition from the traditional format of education to distance learning.

The organization of the distance learning process requires the creation of certain conditions for the distribution of knowledge. So, during the pandemic, many online technologies began to be actively used to ensure a continuous educational process. At the same time, educational strategies consisted of both an online learning format and interactive materials (Sabirli & Çoklar, 2020; Stošić et al., 2020).

In the process of studying this issue, there was an intensity of discussion of educational materials, observation, distribution and control of the learning process in distance learning (Dhawan et al., 2020). Consequently, due to the distribution of significant information, the perception of the educational material and the student's academic performance deteriorated and the information received was not fully mastered. In this regard, it can be assumed that the distribution of distance education for students reduces intellectual development, and the distribution of traditional education increases students' intellectual potential.

In the conditions of the pandemic, many teachers needed to show maximum mobility, which makes the educational process continuous and as flexible as possible. Therefore, to increase the level of computer literacy, it is necessary to develop online teaching skills and adapt teaching methods to a new format (Wahab & Iskandar, 2020). As a result, teachers and students have adapted to the online format to develop their intellectual potential. The new educational conditions in which students were forced to immerse themselves in receiving education were characterized by the actualization of online forms innovations in applying online learning technologies. During the pandemic, access to the Internet and technical devices was needed, as well as self-discipline, transparent and timely completion of tasks, motivation and a responsible attitude to learning.

The capacity of teachers and learners to adapt to new conditions directly influences the quality of education and the intellectual potential of learners. Because the pandemic dictated its own rules, the distribution of online learning was the only possible tool for a continuous learning process. There was a choice between a complete freeze of education,

which entails a decrease in the level of education in the country as a whole and the continuation of education by the traditional method, which could have terrible consequences, for example, high mortality among the population from upper respiratory tract disease. Therefore, the distribution of online learning remains the only right choice to support the educational process in the country.

PhD students are a particular category of learners characterized by a high level of independence and awareness of the choice of their profession. Since PhD students are future academic staff, their training contributes to the acquisition and generation of new knowledge and skills and the formation of fresh approaches and preferences in them, followed by an increase in the level of intellectual potential not only of students but also of all sciences and the country as a whole. This study aims to analyze the impact of the distribution of knowledge through online learning on the intellectual potential of PhD students, identify the advantages and disadvantages of online learning, and produce recommendations for policy to improve intellectual capacity.

2. Theoretical Framework and Literature Review

Education development is necessary to grow the country's intellectual potential as a whole and for teachers and students in particular (Konstantinovskiy & Popova, 2016; Samaibekova et al., 2019). Also, there is a positive relationship between intellectual potential, academic success, and job performance (Koropanovskiy et al., 2022). Educational experiences provide individuals with the necessary knowledge, skills, and competencies. So, individuals with higher educational levels tend to allocate more time and effort when engaging in intellectually complex activities (Parisi et al., 2012). An individual's intellectual potential includes knowledge, educational and socio-cultural values, a basic level of education, a professional-qualification level, a degree of talent, and an ability to perceive innovations (Leonidova, 2014). It is the potential capacity of the individual "to quickly and correctly resolve complicated intellectual tasks", and it "enables to acquire new knowledge, intellectual skills and competencies at a fast pace" (Mynbayeva et al., 2015), especially in the digital informational environment (Shipunova et al., 2018).

The worldwide spread of the coronavirus has caused huge changes in the entire education system. As the pandemic spread, various quarantine forms were introduced to ensure safety. Students should continue engaging in academic activities in a new, online format through ICT (information and communication technology). Thus, ICT provides huge opportunities to increase the speed of

teaching, which provides a balance between the abilities of students and achieving the expected result. Moreover, ICTs play an interactive and supportive role in the development of materials (Erstad, 2010). Furthermore, safety, the level of self-satisfaction and time, both teachers and students, are the main factors determining the quality of online education (Ibrahim et al., 2013). ICT development policy provides for expanding Internet access with the cooperation and coordination of both governmental and non-governmental organizations to create qualified human resources and develop educational potential (Joshi, 2017).

Distance learning occurred before the pandemic, as some educational institutions and the state allowed remote education. Undoubtedly, the educational changes affecting the learning process directly impacted students' perception of the transition to a distance format and actualized questions about the availability of online technologies. Some scientists argued that online education is considered and practiced based on the development of technology, pedagogy and social circumstances (Saykili, 2018). Other researchers have studied the advantages and disadvantages of distance education for both students and educational enterprises (Weller et al., 2018). Scientists have also studied the issues of students' perceptions of the curriculum at universities (Harsasi & Sutawijaya, 2018).

One of the quarantine measures during the COVID-19 pandemic was the closure of all institutions, including educational ones. To ensure the distribution of education for students, educational institutions globally decided to change the mode of education from traditional to distance learning. At this rate, the transition to distance learning has involved millions of students worldwide. Liguori and Winkler (2020) emphasized that the pandemic forced higher educational institutions to adapt quickly to online teaching and learning methods. Alanazi and Alshaalan (2020) have a similar opinion, which confirms the significance of distance learning in ensuring the distribution of knowledge in emergency situations.

Dhawan et al. (2020) identified both positive and negative effects of the distribution of distance learning, focusing on the availability of knowledge at a distance. Positive aspects include that in the context of the rapid spread of information and concepts for the application of digital learning, teachers were able to increase computer literacy, namely their skills in using the Internet, social networks, laptops and other gadgets (Arguel et al., 2019). On the other hand, it should be noted that not all teachers and students could adapt to new conditions since they did not have the skills to use the Internet and online learning gadgets, not to mention software applications, which can be attributed to negative effects (Wahab & Iskandar, 2020).

Another critical factor is the country's level of technological distribution development and digital readiness,

especially the availability of information and communications technology infrastructure and broadband Internet access (Alzhanova et al., 2020). After COVID-19, there has been a radical reversal in the ability to access distance learning through modern technology (Stárek & Koubková Pavlů, 2021). For instance, some students live in remote rural areas, where access to the Internet and IT gadgets is limited due to the remoteness of the geographical location, which negatively affects students' intellectual potential (Nashruddin et al., 2020). Internet use in education, especially in higher education, is becoming more widespread and distributing traditional teaching methods (Meteshkin et al., 2021). Therefore, the availability of good Internet and electronic gadgets can ensure the continuity of the educational process.

There is a positive relationship between online learning and students' perceptions of educational material. For example, Astafeva et al. (2020) consider that the application of innovation in many innovative teaching methods for obtaining educational information through online learning is very convenient and interactive for students. Thus, Sabirli and Çoklar (2020) identified the positive influence of brain game usage in education on primary students' academic progress, motivation and attitude. On the one hand, students show great interest in using ICT as a source of education (Stošić et al., 2020). On the other, according to scientists (Alawamleh et al., 2020; Azzi et al., 2021), the distribution of online learning has a negative impact on mental health and teacher-student relationships, adversely affecting the quality of life and academic performance of university students.

The COVID-19 pandemic has greatly changed teaching and learning strategies in many higher education institutions (Paudel, 2021; Mahmood et al., 2022). In this context, these papers studied the views of teachers and students on online education before and after COVID-19 in the higher education system. To achieve this goal, an online survey study was designed. The study used questionnaires to determine the views of teachers and students in the gender context. Flexible online learning removes barriers related to time, place and flexibility, which has proved especially useful for women (Rubin et al., 2018; Veletsianos et al., 2021). Several studies have emphasized the importance of gender mainstreaming in learning and current literature on how males and females s related to differences in human capital and education (Kireyeva & Satybaldin, 2019; Maharjan, 2021; El Filali, 2022).

For the final stage of the literature review, an integrated approach was used to create a sample of articles selected for inclusion in the citation network listed in Table 1.

Table 1: The Main Essence of Previous Studies

Author(s)	The main idea	Findings of the study
Erstad (2010)	Issues of digital competence	The importance of educating the digital generation is to create a space for reflection and distribution of knowledge.
Ibrahim et al. (2013)	The idea of changes in the educational process	Teachers should be included in the planning process and provided with effective professional development in the change process.
Joshi (2017)	Issues of human resource development	The importance of creating qualified human resources for the development of intellectual potential.
Weller et al. (2018)	The open online education process	This study offered a new perspective on the development of the field of open education, e-learning, available education and distance learning.
Arguel et al. (2019)	The idea of an interactive digital learning environment	Strategies play critical tasks in the design for managing the confusion of students who improve online learning.
Liguori and Winkler (2020)	Issues of distance learning	Online education can replace traditional methods in the context of a pandemic.
Alzhanova et al. (2020)	Issues of ICT development	The results showed the importance of research institutes in forming and developing scientific potential.
Stárek and Koubková Pavlů (2021)	The idea of spreading knowledge through online learning	The results showed that modern technologies as distance learning tools play a positive role in the wake of the COVID-19 pandemic.
Paudel (2021)	Analysis of online learning in a gender context.	The research findings indicated that online education could be an alternative to traditional education.
Veletsianos et al. (2021)	Issues of barriers to online learning	The results suggest that speed and flexibility can be beneficial for women.

Thuswise, from the literature review, there needs to be more research distribution of knowledge through online learning on the intellectual potential of doctoral students. The study of this issue in Kazakhstan, mainly because of the COVID-19 pandemic, has yet to be undertaken. Current research is a pioneer in the country. It was revealed that the quality of education and students increase their intellectual potential.

Research questions (RQ) of the study define the research objectives:

RQ 1: How did online learning affect doctoral students' intellectual potential in Kazakhstan during the distribution of pandemic?

RQ 2: What are the advantages and disadvantages of online education for doctoral students in Kazakhstan?

RQ 3: What is required to develop online learning to

increase the intellectual potential of doctoral students in Kazakhstan?

According to the research questions, the hypothesis of the study is following: during the pandemic in Kazakhstan, the distribution of knowledge through online learning had a positive effect on doctoral students' intellectual potential, so there is a need to develop online learning taking into account its advantages and disadvantages in PhD program for increasing directly educational and scientific components of intellectual potential of doctoral students.

3. Research Methods and Materials

3.1. Research Design

This study was conducted based on recognised scientific methods, a systematic and holistic approach, as well as based on sociological research methods. Sociological surveys on online education and technologies of online education were observed in the works. The authors attempted to identify changes in learning dynamics in virtual educational organisations through a sociological survey (Bergdahl & Nouri, 2021; Rini & Sawitri, 2022). Other authors have provided a survey among 1,170,769 Chinese students from Guandun province in China who tried to identify the impact of online education on the quality of education, to propose policy implications for advising governments and schools, to improve the delivery of online learning and to identify potential directions for future research in the field of online education (Yan et al., 2021). The authors studied the effects of online learning on students of the Faculty of Pharmacy (Shawaqfeh et al., 2020), the Faculty of History (Akmal et al., 2021) and the medical faculty (Ramachandran & Dinesh Kumar, 2021). In Kazakhstan, there is no such research being conducted.

The survey was conducted on a sample basis. The sample was random. So, according to the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, in 2021, the number of doctoral students in Kazakhstan was 5,924. In this regard, for a sociological survey, at least 260 respondents should be surveyed (calculated based on a sample size calculator with a confidence level of 90% and a confidence interval of $\pm 5\%$; <https://socioline.ru/rv.php>). The representativeness criterion was the geographical distribution of PhD students by region.

3.2. Sample

The survey involved 324 PhD students from all regions of Kazakhstan who are exploring the humanities, sociology and natural sciences. The majority of PhD students were women. Of the total participants, 82% were women. Among

the PhD candidates, the age range of most participants was between 23 and 30. There were also students of a more mature age among PhD candidates (Table 2).

Table 2: Description of the Study Sample

Variable	Frequency	Percentage (%)
Gender		
Male	57	17,6
Female	267	82,4
Age (years)		
23-30	304	93,8
31-40	13	4
>40	7	2,2
Level of curriculum		
1 st year of study	276	85,2
2 nd year of study	14	4,3
3 rd year of study	34	10,5
Preference for learning		
Online	217	67
Offline	107	33
Speciality		
Medicine and healthcare	178	54,9
Engineering and technology	86	26,5
Management and economics	30	9,3
Art and creativity	15	4,6
IT	7	2,2
Humanities and social sciences	4	1,2
Exact and natural sciences	4	1,2

The representativeness criterion was the geographic distribution of PhD students since their geographical location determines the accessibility and quality of the education received. The collected data were processed depending on the study region of PhD students. Thus, the obtained data included in the sample were distributed depending on the university's location. These data are given in a quantitative relationship with the data for the entire array (Table 3).

Table 3: Regional Profile of PhD Students

Region	City	Quantity	Percentage (%)
North	Akmola	2	2,2
	Kostanay	1	
	Pavlodar	3	
	Petropavlovsk	1	
South	Almaty	10	6,6
	Zhambyl	4	
	Kyzylorda	2	
	Turkestan	5	
West	Atyrau	1	2,2
	Aktau	1	
	Mangistau	1	
	Aktobe	4	

East	Ust-Kamenogorsk	10	3,1
Centre	Karaganda	20	6,3
Cities of republican significance	Astana	74	82,8
	Almaty	180	
	Shymkent	6	

In more economically developed regions, the intellectual development potential of postgraduate students is higher than in more economically weak areas, as vulnerable regions have low living standards, poverty and limited access to technology (Aziiza & Susanto, 2020). Individual development of an individual determines the level of perception of information individually, in both men and women (Pliatsikas et al., 2019). The study also considered the age of doctoral students as a criterion, since at a younger age, a PhD student masters and processes information faster than at a more mature age; however, gender and additional life circumstances of a doctoral candidate must be considered.

The research was conducted over ten weeks. It included a literature review, the development of a semi-structured questionnaire, a pilot survey at the beginning of the study, a survey during the study and the analysis of the obtained data. The sociological survey was used to obtain primary data from April to mid-May 2022.

4. Results

According to the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, in 2021, the number of doctoral students in Kazakhstan was 5,924. During the COVID-19 pandemic, namely in 2020, the number of doctoral students in Kazakhstan increased by 551 people (8.66%) and amounted to 6,914 people. At the same time, the increase in the number of doctoral students occurred at the universities of three Kazakhstan megacities, where 79.63% of doctoral students' study. In some regions, there is a slight decrease in the number of doctoral students. It should be noted that in 2019, 1,775 people were admitted to the doctoral program, in 2020 – 2,094, in 2021 – 1,710; graduated: 2019 - 905 people, in 2020 – 1,446, in 2021 – 2,503. The growth in the number of graduated PhD students indicates an increase in the number of researchers with a scientific degree, which suggests an increase in the country's intellectual potential.

The PhD students marked that smartphones and laptops provided not only access to online learning platforms but also communication about studies, the ability to read recommended literature and access to the assessment system to monitor their academic progress. These gadgets are characterized by ease of use and transportation, which allows PhD students to be mobile and study 'anywhere',

which is unrelated to a personal computer, as it obliges them to study at home.

The most unpopular gadget among PhD students during their studies was the tablet. The tablet is not equipped with additional functional tools like a mouse and keyboard. The mouse and keyboard make it easier to work with gadgets the tablet does not have. Therefore, using a tablet is inconvenient and time-consuming. Only 3,4% of respondents used it. So, the mobility of doctoral students contributes to the use of more time for study and the acquisition of more knowledge, which leads to increased intellectual potential.

During the pandemic, educational institutions in Kazakhstan switched to distance learning. Most universities used online learning platforms such as Zoom, MS Teams, Webex, Sirius, Moodle, Dis KazNMU, Classroom, Skype, Coursera and WhatsApp. The quality of information perception depends on used gadgets and educational platforms, which is regarded as a general indicator of the quality and development of education. About a quarter of the PhD students pointed out the uncomfortable conditions for perceiving educational information and noted that it was difficult to perceive information online. Notwithstanding, most of the PhD students replied that they had perfectly acquired online and offline data.

Below are the results obtained based on processing the sample data, which were distributed by levels of perception, development and receipt of the educational program (Table 4).

Table 4: Distribution of Respondents' Ratings According to the Degree of Satisfaction with the Educational Program

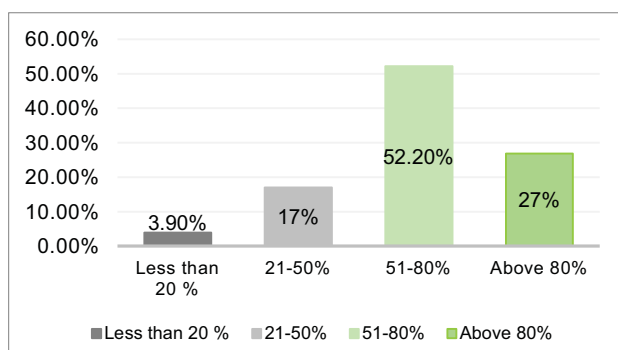
Variable	High	Middle	Low
Mastering the educational platform (Zoom, MS Teams, Webex, Sirius, Moodle)	0,522	0,420	0,058
Perception of educational information online	0,460	0,310	0,230
Getting a quality education	0,321	0,574	0,105
Mastering quality education	0,270	0,691	0,039
Quality of online classes	0,321	0,574	0,105

Source: Organized by authors based on the collected data

The collected data show that many respondents noted that these online learning platforms have a simple interface and are easy to master. Thus, more than half of the PhD students pointed out that the assimilation of educational material was easy and less than half of the respondents encountered difficulties in mastering the learning platform. At the same time, about 5% of the respondents felt it extremely difficult to master the platform's functions. Most PhD students observed the positive dynamics of the quality of education and are positive about transitioning from traditional education to online learning. Meanwhile, one-tenth of the respondents believe online learning has

decreased in quality and needs strengthening. The majority of respondents believe that online learning does not interfere with obtaining a quality education.

According to the progress of the PhD students, online learning does not prevent them from obtaining a quality education. The distribution of respondents by assessing the level of acquiring educational material in online learning shows that online learning does not affect the quality of education and helps increase PhD candidates' intellectual potential (Figure 1).



Source: Organized by authors based on the collected data

Figure 1: Distribution of Respondents by Assessing the Online Learning

Over 80% of the material during online learning was learned by 26.9% of the PhD students, and 52.2% of the PhD students learned more than half of the study materials. In particular, 17% of the surveyed PhD students consider acquiring the educational material in the online format challenging, as it is difficult to focus in front of a computer screen. Hence, educational material received in the course of online education is perceived as worse. According to the primary data, i.e., 4% of the surveyed people (more precisely 13) believe that they acquired less than 20% of the educational material. So, 79,2% of PhD students have mastered more than half of the curriculum. Since there is a positive relationship between intellectual potential and academic performance, there can be two conclusions: firstly, online learning did not have a negative impact on academic performance and acquiring educational material by PhD students, and secondly, the reason for this can also be the high intellectual potential of PhD students. It should be noted that these were mostly PhD students whose ages were over 40 and who encountered problems when using IT technologies in the educational process.

The respondents noted that online learning positively impacted their intellectual potential. They noted that their perception of the educational material and their academic performance did not deteriorate and the information received was mastered. They increased their knowledge of their speciality, improved their research skills and created an

innovative approach in their PhD thesis. In the search for relevant information, PhD students became more independent, having access to a vast amount of studied information and freely managing their time for their education. The most significant advantage of online learning that the PhD students noted is the opportunity of gaining knowledge in any place where there is access to the Internet (206 doctoral students; 79.8%), as well as improving the skills in using IT technologies (152 doctoral students; 47.4%) and different demonstrative tools (105 doctoral students; 32.7%) as a big advantage of online learning. In addition, in their answers, doctoral students noted that the positive side of online learning could be mobility, time-saving (no need to waste time travelling to an educational institution), etc. However, some respondents firmly deny the positive aspects of online learning (34 doctoral students; 10.6%)

Out of 324 surveyed PhD students, 87 replied that there are no negative aspects of online learning for PhD students. On the other hand, the PhD students have pointed out the negative impact of online learning on their psychological and physical condition due to reduced physical activity, which in turn causes several diseases. Thus, another 87 PhD students believe that online learning contributes to a decrease in the quality of education since it negatively affects the perception of the material, especially when the material presented by the teacher is not entirely clear. Also, some doctoral students noted that during online classes, when preparing for classes, ready-made information on the Internet is used, which is read and not processed by PhD students.

The most negatively influencing factors of online learning include heavy traffic and lack of access to the Internet. In addition, many PhD students believe that the increase in study load has a negative impact on the intellectual potential of PhD students. Thus, the significant time spent on seminars, self-study and 'superfluous and unnecessary information' distracts doctoral students from their dissertation research. Among the factors that negatively affect the quality of classes during online learning, there is the imperfection of digital platforms and services for organising remote educational activities. One-fifth of PhD students faced difficulties with getting involved in the discussion. A quarter of students noted that the quality of training decreased. However, some respondents firmly deny the negative aspects of online learning (Table 5).

Table 5: Distribution of Respondents According to the Assessment of Influencing Factors of Online Learning

Factor	Respondent	
	People	Share, %
Increasing the training load	96	29,6
Loaded traffic/lack of internet access	130	40,1
Large time expenditures on the implementation of seminars and self-study	69	21,3

The imperfection of digital platforms and services for organizing remote educational activities	36	11,1
Difficulties with getting involved in the discussion	59	18,2
Decrease in the quality of training	87	26,9
There are no negative sides to online learning	87	26,9

Source: Organized by authors based on the collected data

Substantially, all PhD students replied that online learning positively affects the intellectual potential of future scientific staff: for self-development, there are many online Internet resources, saving time since classes are conducted from home (no time is spent on a trip), contributing to the deepening of knowledge (by spending free time). However, it should be mentioned that depending on the PhD students' speciality or subject, their perceived positive effect of online learning differs. Thus, in the minds of PhD students of medical specialities, online learning has a negative impact on the intellectual potential of PhD students because, for them, it is important to pass learning offline, in practice, since the more practice in medicine they pass, the more practical knowledge and high intellectual potential in other work practice they are going to have.

5. Conclusion and Policy Recommendations

Based on the theoretical review, it was identified that many scientific works have studied ICT usage in online education and its impact on academic performance and quality of education. The majority of researchers claim that online education quality during the pandemic depended directly on the quality of the country's digital security and the quick response of educational institutions during the transition from the traditional format to online learning since online learning is the right and correct tool to maintain the continuity of the educational process in the country. Nevertheless, the issue of the impact of online education on the intellectual potential of PhD students has not been studied earlier, especially in the realities of Kazakhstan.

According to the study's findings during the pandemic in Kazakhstan, the distribution of knowledge through online learning positively affected doctoral students' intellectual potential. There is a need to develop online learning and improve its quality considering its advantages and disadvantages in PhD programs for increasing direct educational and scientific components of the intellectual potential of doctoral students. High-quality education and students' perceptions of the material help to increase their intellectual potential. In particular, online education positively affects the development and building-up of the intellectual potential of PhD students in universities in Kazakhstan, and it has more advantages than disadvantages.

Also, the results show a positive relationship between online education and intellectual potential among doctoral students.

Obtained results of the research are reliable, and based on the results, there could be concluded the following:

1. During the pandemic, the most popular online learning gadgets were laptops and smartphones, associated with their high mobility. Due to availability, Zoom, MS Teams, Coursera and WhatsApp are the most commonly used learning platforms. For most PhD students, acquirement of educational material was easy in the remote mode as there was no limitation in time and space for obtaining knowledge. It should be noted that the competency in using ICT by older people (less competent) leads to the perception that online teaching is ineffective.

2. Most PhD students mark positive dynamics to increase their intellectual potential. They feel that the online learning platform is equally effective as face-to-face teaching. Online learning allowed them to deepen their specialized knowledge and improve their research skills and other competencies. Doctoral students are interested and ready to use online technologies in the learning process. It should be noted that for specialities where practical training is important, for example, medical, online training cannot replace offline classes.

3. The advantages of online learning include mobility (having unlimited access to educational material in time and space), saving time (saving time on a trip to university or internship, business trip) and increasing digital literacy (the opportunity to learn new digital gadgets and platforms, programmes). In contrast, the disadvantages include a deterioration in health status, dependence on the quality of the Internet and high workload due to a large amount of information.

Ultimately, online technologies can be easily integrated into education to prepare PhD students. In summary, it can be concluded that crises force us to find solutions quickly. In this regard, for PhD students' intellectual potential improvement during online education, it is necessary to prepare domestic digital educational platforms, information systems of the ministry and create digital situational centres for developing ICT infrastructure. Improving the competence of teachers to work in the conditions of distance learning and changing the structure and content of the educational process to distance learning would serve as the basis for high-quality education in the country. In the future, conducting a comparative study on the impact of knowledge distribution through online learning on other educated groups would be interesting.

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