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International Experience of Using E-Learning during Pandemics and Military Conflicts

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Abstract: The spread of the COVID-19 pandemic and certain military conflicts and wars in different regions have become recent critical conditions in the social development of humanity, which has led to the active spread of the electronic knowledge acquisition system. Therefore, the experience of studying the peculiarities of e-learning implementation during a pandemic and



military conflicts has become relevant. The purpose of this study is to implement a comprehensive review and analysis of existing scientific works on the use of e-learning in crisis conditions. For this purpose, PubMed, Scopus, Web of Science were chosen as the main scientific and metric databases, and Ebsco and Sherpa Romeo were used as additional ones. The criteria for including the literature are based on relevance, relevance to the research topic, and the availability of a detailed methodology. In addition, the emphasis was placed on the works of less than 5 authors and publications written since 2014. Thus, based on these criteria, 62 items were selected for analysis. The analysis was based on thematic and comparative methods. The results characterize the dynamics of the emergence of scientific papers on e-education. It is determined that high rates of interest are present in 2020 and 2022 (both 27.42% of the total). It has also been found that modern countries use various electronic tools to adapt to the crisis: learning platforms, management systems, electronic communications, and electronic journals. The conclusions show that international experience shows that the global education system is adapting to the challenges. E-education has also proven to be effective during military conflicts, in particular the experience of Saudi Arabia, Syria, Ukraine and other countries, which indicates the widespread use of e-education elements.

Keywords: critical conditions, electronic technologies, development, war conditions, global educational system

Introduction

E-learning has become an important tool for implementing training in difficult and critical conditions. The spread of the COVID-19 pandemic and certain military conflicts and wars in different regions have become the most recent critical conditions. Traditional teaching methods have been significantly disrupted, so educational institutions have had to quickly adapt to the new conditions. Modern researchers have described different possibilities of using E-learning tools that have different mechanisms for providing knowledge from different locations (Fauzi, 2022; Huang et al., 2020). A number of studies have also identified some local peculiarities of using this approach for effective knowledge delivery (Tinterri et al., 2022; Vasilache, 2022). Therefore, E-learning is an important approach to adapting the educational system to critical challenges, which contributes to the development of the education system as a whole.

Research Problem

As can be seen from the previous review, due to the spread of the COVID-19 pandemic and various military conflicts, traditional classroom teaching methods have been significantly disrupted, forcing educational institutions to quickly adapt to new conditions. For this reason, the e-learning system has become a critical tool that has influenced the effective continuation of the educational process even in the most difficult conditions. However, despite its widespread implementation, the question of the effectiveness, accessibility, and quality of e-learning in the context of global crises remains open. In addition, it is worth noting that not all countries have a high level of technological development, so in some areas, the implementation of a digital learning system may face additional difficulties.



Research Focus

This review is primarily focused on analyzing international experience in using e-learning during the pandemic and military conflicts. The main focus is on studying different approaches to e-learning implementation, identifying best practices, and analyzing the challenges faced by educational institutions in different countries. Particular attention is paid to comparing the peculiarities of e-learning implementation in different countries and analyzing the main tools used to implement educational services in the analyzed areas.

Research Aim and Research Questions

The aim is to make a comprehensive review and analysis of existing research on the use of e-learning during the COVID-19 pandemic and military conflicts. The main research questions are as follows:

1. What is the dynamics of the emergence of scientific papers on the use of e-learning?
2. What tools are used to implement e-learning in different countries?
3. What are the results of using e-learning in countries affected by the COVID-19 pandemic and military invasion?

Literature Review

Recent scientific papers have explored various theoretical aspects of using e-learning systems in the context of digitalization of education. In particular, the study by Anggraini and Handayani (2022) identifies the main issues of the development of digitalization of education based on a critical review of the literature. The authors describe both some potential opportunities of this trend and its challenges on the way to widespread implementation. Other authors have also emphasized some of the challenges that widespread digitalization of education brings (Armour et al., 2020). At the same time, the works of contemporary authors also draw attention to the fact that the COVID-19 pandemic has become an important challenge to the further digitalization of education (Barakat et al., 2022). On the one hand, educational institutions have faced the need to adapt quickly, and on the other hand, this has led to active digitalization and the introduction of electronic technologies at different levels of education (Muzaffar et al., 2021). Besides, after the quarantine conditions were eased, some educational institutions did not abandon the electronic education system and switched to a mixed form. Pandey's (2020) study identifies the main issues of using blended learning for its effective implementation. This study is particularly important in terms of its practical component.

Separately, Pisanu (2014) provides an overview of the main innovative solutions and technologies used in the modern education system. This work is important from the point of view of the theoretical and methodological component, as it characterizes and summarizes the main innovative technologies that contribute to the development of modern education, including e-learning. Stukalenko et al. (2016) also described the main innovative solutions that need to be used in the educational system of different regions. However, an important challenge on the way to digitalization was the provision of electronic technologies for an inclusive education system. Contemporary authors have pointed out that this education system is already vulnerable, and new



trends and crises do not contribute to its full development (Baş, 2022; McKenzie, 2020; Mitiku et al., 2014). Some studies also emphasize the importance of using modern electronic tools for the effective functioning of this education system (Sharma et al., 2022; Timoštšuk et al., 2022). However, as demonstrated by Fernández-Cerero et al. (2023), teachers and lecturers need to have digital skills and an appropriate level of training to implement modern technologies. The problem of teachers' readiness to use modern tools to support innovative forms of learning is described in Méndez et al. (2022), which emphasizes the transformation of teacher training in view of the spread of the COVID-19 pandemic. In addition, given the challenges affecting the education system, Jena et al. (2021) conducted a comparative analysis of the effectiveness of implementing traditional or online education. The authors noted that a modern online education system based on innovative learning support tools in certain contexts is also important.

Thus, recent studies emphasize the importance of using modern innovative solutions in crisis situations to support the education system as a whole. However, it is important to characterize different experiences of implementing e-learning systems through the prism of analyzing modern scientific approaches.

Materials and Methods

This study is a review and analytical study based on a systematic analysis of the literature. The work is based on the PRISMA approach, which was used to select the literature to study the topic. Therefore, the study is qualitative.

Sample and Participants

For this review and analysis study, we selected scientific sources, including articles from scientific journals, chapters from collective monographs, and conference proceedings. The sources were selected on the basis of their relevance to the research topic and relevance (mainly publications from the last 10 years). The sources were included in the study based on a modern scientific approach – PRISMA.

Instruments and Procedures

The PRISMA approach was used to implement the systematic collection of literature. The data collection process consisted of the following stages: formulation of a search query, literature search, selection of sources, and analysis of full texts. Table 1 describes the main processes in detail.

Table 1

The Research Procedure

Name of the process	Stages	Main results
Formation of a search query	Use of keywords and phrases	Found 876 results
Initial analysis of titles and annotations	Selection of the main scientific and metric databases: PubMed, Scopus, Web of Science	Selected 134 sources
Formation of an additional search query	Include those sources that are relevant to the research area	Found 54 more items
Preliminary analysis	Use of the same keywords	Selected 119 items



Critical analysis	Selection of additional scientometric databases: Ebsco and Sherpa Romeo	Selected 81 items
Final analysis	Analysis of sources for relevance and relevance	Selected 62 items

Source: Author's development.

In particular, to search for sources, we formed search queries that included keywords related to e-learning, the COVID-19 pandemic, and military conflicts, in particular: e-learning during COVID-19 pandemic, online education in conflict zones, digital learning during war, e-learning, innovations, current education. The main search databases are PubMed, Scopus, Web of Science. The specified keywords were entered into these search databases. As a result, 876 results were found. The selection of sources was based on a preliminary analysis of the topic and annotations, which had to relate to the peculiarities of using e-learning in critical conditions and their implementation in the regional framework. Based on this approach, 134 sources were selected. After that, additional databases were included, in particular Ebsco and Sherpa Romeo, where 54 more relevant sources were found. After that, all the results were analyzed for relevance and relevance. As a result, 119 sources were selected. After that, all the results were transferred to Excel spreadsheets, where the year of publication, methodology, and main results were entered. Based on these points, other criteria for including literature were also developed:

1. Consideration of the use of e-learning on a regional or local scale
2. Availability of a detailed methodology
3. Year of publication: since 2014
4. No more than 5 authors in one article
5. Presence of practical value of the research

After taking into account these criteria, 81 items of literature were selected. Later, an additional analysis of the selected studies was carried out, where the textual material was studied. The main criterion for further inclusion was the presence of scientific novelty. Thus, based on this strict approach, 62 items were selected.

Data Analysis

The full texts of the selected sources were analyzed to identify key themes and recommendations related to the use of e-learning during pandemics and military conflicts. Separately, a critical thematic analysis of the content was carried out, which made it possible to identify the main successful practices associated with the use of e-learning in the specified contexts. Special attention was paid to identifying innovative approaches that contributed to the effective implementation of e-learning during crisis situations. A comparative analysis of international experience was also carried out in order to identify and further analyze general trends and unique approaches in different countries and regions.

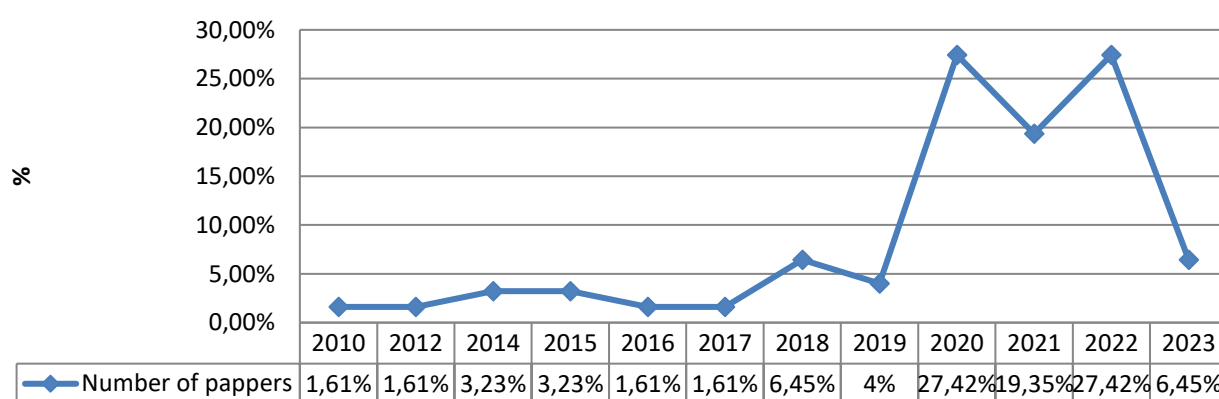
Results



The crisis caused by the spread of the COVID-19 pandemic has affected the development of e-learning around the world, which has dramatically changed the educational space. Currently, the system of electronic education is undergoing significant changes, which indicates its ever-growing importance in the market of educational services (Aboagye et al., 2020; Amarneh et al., 2021; Favale et al., 2020). The organization of the educational process in conditions of remoteness of its participants from each other and their usually mediated interaction in an educational environment that functions on the basis of modern educational technologies is called electronic learning (Fauzi, 2022; Yonata, 2022). Besides, its role is growing in the functioning of the education system in wartime conditions. The analysis of the literature shows that the pandemic has affected the widespread interest of authors in the topic of using e-learning, in particular, for 2020, the percentage of interest in the selected works is 27.42%. High indicators of interest are also present for 2022 - also 27.42%. However, the authors studied this topic even before the pandemic, as evidenced by the works found from 2010. In this sense, the authors mainly studied the theoretical aspects of the use of electronic technologies, or the use of e-learning during the period of local conflicts or wars (See Figure 1).

Figure 1

Dynamics of Studying Electronic Education



Source: Author's development

During the Covid-19 pandemic, the Polish authorities switched to e-learning at the beginning of the pandemic. The government launched the national e-Podreczniki platform to provide access to educational materials for students. At the same time, teachers were also trained in the use of digital tools, and support programs were introduced for families with limited access to the Internet or devices (Kulikowski et al., 2021; Parlińska, 2022). Besides, as demonstrated in a number of papers in Poland, challenges arose due to unequal access to technology in rural and urban areas. In Austria, the transition to distance learning was quite organized due to the existence of an already developed infrastructure (Hofmeister & Pilz, 2020). The government and schools have been actively using the LMS platform for the purpose of continuing education. During the pandemic, the Digitales Lernen program was created to support students. An important factor is that in Austria, an important emphasis was placed on the psychological well-being of students (Gaisch et al., 2019).

One of the key tools used in Germany is the Quality e-Learning Management System (QEG). In addition during the pandemic, German universities used various digital technologies, virtual



reality and simulation tools (Zawacki-Richter, 2020). Hungary also quickly adapted to the new conditions by using the national e-learning platform KRÉTA. The government provided free internet access for students with disabilities or students from low-income families (Poór et al., 2020). Conversely, as in most countries, teachers and students faced challenges adapting to new methods. Nevertheless, Romania faced major challenges due to unequal access to technology, especially in rural areas. The government initiated the E-learning pentru elevii noștri program, which provided students with all the necessary technical tools. Many schools used Google Classroom and Zoom to organize distance learning (Edelhauser & Lupu-Dima, 2020). Problems with infrastructure and technical support slowed down the overall adaptation process. In Slovakia, e-education was also based on the use of various educational platforms and education quality management systems (Šebo & Pal'ová, 2020). On the other hand, Italy, which was one of the first countries to be affected by COVID-19, quickly adopted e-learning. Besides, teachers used the Edmodo platform to organize training. The government has developed the Piano Scuola 2020 action plan to support educational institutions (Hofmeister & Pilz, 2020).

The experience of Yemen, Syria, and Ukraine demonstrates the substance of electronic tools in supporting an effective learning. Current global instruments in the development of e-learning include adaptive or personalized learning and selection of electronic learning materials (Sakkir et al., 2021). All these tools make e-learning more convenient. Besides, education institutions in war-torn nations struggle to keep up with the pace of instruction. Innovative technologies are being used more and more to solve these issues by improving accessibility. Moreover, peer-to-peer learning platforms, learning via mobile devices, free educational resources, virtual or augmented reality, distance learning programs, artificial intelligence (AI), and machine learning are a few of the cutting-edge technologies being employed in higher education in conflict-affected nations (Aboagye et al., 2020). For example, Saudi Arabian colleges have responded to the Yemeni crisis by implementing e-learning technology, such as online course platforms and video conferencing, to guarantee education continuation for Yemeni students who have been displaced by the conflict. For example, Saudi Arabian colleges have partnered with global organizations to offer online courses specifically designed to meet the needs of Yemeni students (Rajab, 2018).

Higher education in Nigeria has been severely damaged by the Boko Haram conflict. The University of Maiduguri has faced challenges in rebuilding its infrastructure and putting in place adequate security measures to protect its staff and students. Education was also disrupted due to student migration; many are unable to complete their education due to security concerns or lack of access to resources (Udem et al., 2021). The infrastructure supporting higher education has been significantly damaged by airstrikes, bombs and armed attacks on institutions and colleges during the Syrian civil war. The most famous universities in Syria suffered significant damage, several of their buildings turned into ruins. Educational activities are hindered by the destruction of campuses, electronic laboratories, and electronic libraries, which has forced many students to look for a safe place. By offering scholarships, online courses and academic advising services, initiatives such as the Higher Education in Emergencies Platform have aimed to assist internally displaced Syrian students and encourage them to pursue higher education. The Russian-Ukrainian war also affected the education system. Since the beginning of the full-scale invasion of 2024, the education system has actively implemented various electronic technologies in order to make learning safe (Marchenko, 2023). Teachers used various tools, including initial platforms, communication messengers, learning management systems. However, if during the pandemic



the issue of cyber security was not so important, then this war about dismantled the important role of cyber protection of participants in the educational process (See Table 2).

Table 2

Summary Table of the Use of E-Learning during Pandemics and Military Conflicts

Country	Event	Tools of e-learning	Obtained Results	Authors
Austria	COVID-19	Formation of the Digitales Lernen program to support students. Digital tools for the psychological well-being of applicants Zoom, Microsoft Teams LMS	Increasing readiness for e-learning during a pandemic	Ebner et al. (2020); Gaisch et al. (2019)
Germany	General development of education COVID-19	E-learning quality management system (QEG). Various digital technologies, virtual reality and simulation tools Zoom, Microsoft Teams, local electronic platforms of educational institutions LMS	Formation of a powerful electronic education system Improving teachers' skills Use of electronic technologies in traditional education systems	Brosser and Vrabie (2015); Mardila and Alfajri (2020); Zawacki-Richter (2020)
Romania	COVID-19	Functioning of the E-learning program for our students. Using Google Classroom, Zoom Implementation of virtual reality	Preparedness for e-learning during a pandemic Development of the electronic system of education Formation of a better material and technical base	Edelhauser and Lupu-Dima (2020); Felea et al., (2018)
Georgia	General development of education	Using electronic platforms to support traditional learning	Ensuring institutional diversity Experimental study	Chakhaia and Bregvadze (2018)
France	North-South cooperation COVID-19	During the pandemic, the use of electronic databases of the functioning of the education system, digital educational platforms Before the pandemic - introduction of courses Coursera	Improving cooperation between different regions Effective use of electronic tools	Edouard et al. (2010)



LMS				
Poland	COVID-19	Launch of national platforms, e-Podreczniki Use of augmented reality technologies. Electronic education platforms: Moodle, MS Teams, Zoom	Adoption of e-learning from the perspective of teachers and students Effectiveness of support for applicants within the electronic environment.	Ejdys and Kozłowska (2021); Hofmeister and Pilz (2020); Parlińska (2022); Stecula and Wolniak (2022); Tomczyk and Walker (2021).
Taiwan	Improvement of teachers' qualifications	Use of electronic platforms for teacher training	Influence on the adoption of e-learning systems among teachers Empiricality of research	Chen and Tseng (2012)
Malaysia	Improving the quality of education	MOODLE, Google Classroom	Identifying predictors of e-learning satisfaction among teachers	Cheok and Wong (2015)
Italy	COVID-19	Implementation of the Edmodo platform and other digital tools for organizing learning. The government has developed the Piano Scuola 2020 action plan to support educational institutions Use of virtual reality LMS	Impact of the pandemic on campus academic traffic Development of an effective electronic education system	Favale et al., (2020); Hofmeister and Pilz (2020)
Ukraine	COVID-19 War	Use of electronic platforms Zoom, Google Meet, Microsoft teams Digital tools to support education Moodle LMS	Outline the main challenges for higher education during the war Proven effectiveness of electronic tools	Galynska and Bilous (2022); Marchenko (2023); Meshko et al. (2023)
Cyprus	COVID-19	Use of electronic tools Zoom Remote learning Formation of the national platform for e-learning	The significance of introducing electronic tools within innovative education	Meletioui-Mavrotheris et al. (2022)
Azerbaijan	COVID-19	Use of various electronic education platforms MS Teams, Zoom	Modeling student acceptance of e-learning during a pandemic	Jamalova and Bálint (2022)
Hungary	COVID-19	Use of electronic tools MOODLE, Google	The importance of introducing	Koloszár and Tóth (2020);



		Classroom Formation of the national platform KRÉTA for e-learning	electronic tools within innovative education	Poór et al. (2020)
Slovakia	COVID-19	Using remote platforms and tools MOODLE, Blackboard	A comparative study of the implementation of e-learning in two universities	Kremenova et al. (2018); Miština et al. (2017); Šebo and Pal'ová (2020)
Bosnia and Herzegovina	Military conflict	Improved educational spaces	Implementation of innovations in training during the military siege of Sarajevo and their effectiveness	Lucić (2020)
Libya	Military conflict COVID-19	The use of modern means of supporting education, government initiatives Platforms: Zoom, Google Meet	Challenges and opportunities from the perspective of students and teachers	Maatuk et al. (2021)
Saudi Arabia	War	Use of electronic courses Electronic platforms Government initiatives	The effectiveness of the use of electronic courses in comparison with traditional training has been proven	Rajab (2018)
Yemen	War	E-learning technology, such as online course platforms and video conferencing, to guarantee education continuation	The effectiveness of electronic means during the war has been proven	Al-haimi et al. (2018), Al Qaidani (2019)
Syria	War	offering scholarships, online courses, and academic counseling services, initiatives like the Platform for Higher Education in Emergencies	The impact of innovative solutions for the learning opportunities of temporarily displaced persons is determined	Sharifian et al. (2021)
Nigeria	COVID-19	Electronic platforms Learning management platforms Communicative means of communication	The importance of the implementation of innovative solutions in the period of crises is studied	Udem et al., (2021)
Sudan	War	Support of the innovative e-education environment Electronic platforms for learning	Support of innovative training Effectiveness of innovative methods	Taha et al., (2023)

Source: Author's development.



So, as can be seen from the final table, modern countries have adapted to the electronic education system, and modern authors have determined its effectiveness in crisis conditions and the importance of implementation in the future. This is an important indicator of the further development of electronic learning environments that provide education to everyone.

Discussion

This review article has demonstrated that the COVID-19 pandemic has influenced the emergence of new research on e-learning. In particular, for 2020, the interest rate of the selected papers is 27.42%. High interest rates are also present in 2022 – also 27.42%. The relationship between the widespread adoption of E-Learning and the pandemic was also established in the work of Aboagye et al. (2020). However, this study also found that the authors had studied this topic before the pandemic, in particular, in those regions where active hostilities took place. Also, by 2019, the authors had formed an important theoretical framework for the study of key tools for implementing e-learning. The results of the study also correlate with the work of Amarneh et al. (2021), which characterized the impact of the pandemic on the development of e-learning.

The results of this study, which identifies the peculiarities of e-learning during the COVID-19 pandemic in Poland, Austria, Hungary, Romania, Italy, and Ukraine, revealed both similar trends, which are largely in line with the findings of other studies in this area. In particular, in Poland and Austria, the process of implementing e-learning was relatively organized due to the existing digital infrastructures. The findings confirm the conclusions of Gaisch et al. (2019), who found that Austrian students demonstrated a high readiness to use e-learning resources, which can be partially explained by prior technological readiness. Besides, the study by Galynska and Bilous (2022) demonstrated some of the challenges faced by the Ukrainian higher education system during the war. These authors noted the problem of access to technology and the psychological difficulties faced by students and teachers. These results also emphasize these challenges, but complement them with information about government initiatives to improve access to e-learning. Jamalova and Bálint (2022) investigated the factors influencing students' adoption of e-learning during the pandemic in Hungary. These authors found that technical training is an important factor for successful implementation. This is in line with the findings that the Hungarian government actively supported students in various ways, including technically. At the same time, in Romania, as noted in this study, the main challenge was unequal access to the Internet, which is supported by the findings of Regmi and Jones (2020) on barriers to e-learning adoption. In Italy, we found that significant work has been done to support educational institutions in their transition to e-learning. These findings are in some ways consistent with Makhachashvili and Semenist (2022), who described the development of e-skills and dynamic learning strategies necessary for effective e-learning in crisis settings.

Besides, the results of the study also confirmed the importance of implementing e-learning in wartime. Contemporary scholars have also identified the effectiveness of electronic tools to improve service delivery in military conflicts (Rajab, 2018; Sharifian et al., 2021). In general, the research of contemporary scholars has emphasized the importance of using various innovative approaches to support the further development of education despite the crisis conditions. This study also emphasized the importance of using various electronic tools aimed at supporting the mental health of students both during a pandemic and during war. This is also confirmed by the results of other researchers (Rutkowska et al., 2021; Tinterri et al., 2022). These studies found high levels of stress among students during distance learning in Slovakia, which is consistent with this



study in Central and Eastern Europe (Rutkowska et al., 2021). Thus, the scientific novelty of the study is a comprehensive and systematic characterization of the impact of the pandemic and individual military conflicts on the development of the e-education system.

The main limitations relate to a certain subjectivity that may be present in some works, especially if the authors described their native education system. However, the authors tried to solve this problem by validating the selected sources and comparing them with different works. Another limitation may be the emphasis on publications from 2014, which means that earlier works were ignored. However, despite this, the results demonstrate general trends and specific challenges in the implementation of e-learning during the COVID-19 pandemic and certain military conflicts in different countries.

Conclusions

Thus, the international experience of using E-learning during the COVID-19 pandemic shows the use of various tools that have influenced not only the support of education but also the development of this system in general. In particular, European countries widely use learning support platforms, e-learning management systems, e-platforms, e-learning environments with personal accounts for students and teachers, and e-journals. At the same time, an important requirement is the adaptation of teachers to new working conditions: the use of electronic technologies requires a high level of digital skills, the so-called digital competence. International experience shows that in many countries, additional teacher training courses have been held and some technological capacities of educational institutions have been improved (Germany, Poland, Austria, Italy, Hungary). An important experience is the introduction of e-learning in Germany and Hungary, where students from low-income families were additionally supported by certain technological learning tools.

E-learning has also proved effective in times of military conflict. The experience of Saudi Arabia, Syria, Ukraine, and other countries that have been fully or partially involved in separate wars shows the widespread use of e-learning elements. The analysis of scientific papers has shown that e-learning is not inferior in quality to face-to-face education, and during the period of military operations it is relevant and critical for implementation. Thus, this review paper has demonstrated that in the era of crisis, e-learning is important to ensure the provision of quality educational services.

Suggestions for Future Research

Thus, this study has confirmed the effectiveness of using e-learning to ensure the provision of educational services during a crisis: a pandemic, a war. However, as described above, this study has a number of limitations that should be taken into account when writing future works. First, an important nuance is the subjectivity that may be present in the works. Therefore, for future research, it is worth choosing a larger number of works to analyze. The study also focused on the analysis of works from the last 10 years. However, for the next theoretical analysis, it was necessary to demonstrate the development of e-learning through the prism of historical development. This will make it possible to describe how e-learning has developed and what ideas scholars have about this education system have evolved over the centuries (before the COVID-19 pandemic). Another important area for further research is empirical work based on quantitative analysis. That is, it is worthwhile to empirically test the peculiarities of e-learning implementation in a particular



region. This will make it possible to determine not only the prospects for implementing this system, but also some of the shortcomings faced by e-learning. Another important area for further research should be the analysis of the main difficulties in implementing technology-based education. This study should be based on the analysis of the peculiarities of its implementation in low-income regions and assess the impact of e-learning services on the quality of knowledge of students from rural areas. Thus, this topic is not fully explored and there are several areas that need to be clarified and further analyzed.

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Conflict of Interest

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