International
Journal of Society, Culture & Language
IJSCL

Journal homepage: www.ijscl.net
ISSN 2329-2210 (online)

A Post-Pandemic Systematic Review of E-Learning: A Cross-Cultural Study

Peyman Nouraey[1a], Mohammad Bavali[2a], Fatemeh Behjat[3b]

ARTICLE HISTORY:

Received June 2022
Received in Revised form October 2022
Accepted December 2022
Available online April 2023

KEYWORDS:

Covid-19 pandemic
E-learning
Online education
Culture
Systematic review

Abstract

E-learning has recently gained a tremendous amount of attention worldwide; however, this phenomenon has not been studied much from the viewpoints of its immediate beneficiaries (i.e., students and teachers). This systematic review aimed at creating a conceptual framework consisting of the most significant problems and challenges vs. opportunities and solutions associated with e-learning. In doing so, we established a corpus of post-pandemic articles. Out of 2126 original research articles published between March 2020 and March 2022, 13 were included. These sources were obtained through MetSearch and were representative of 14 countries, 2726 student participants, and 1374 educator participants. Through thematic analysis, each document was categorized under certain themes. Technical, physical, mental, interaction, assessment, and pedagogical issues, as well as proper training, IT literacy, and additional burdens on students and educators, were the main challenges and problems found in association with e-learning. The opportunities and solutions included improvements in communication, interaction, teaching, and learning, as well as accessibility, convenience, productivity, and safety.

[1] PhD Candidate, Email: peymannouraey@gmail.com
[2] Assistant Professor, Email: mbvl57@gmail.com (Corresponding Author)
Tel: +98-917-1058559
[3] Assistant Professor, Email: fb_304@yahoo.com
[a] Department of English Language, Shiraz Branch, Islamic Azad University, Shiraz, Iran
[b] Department of English Language, Abadeh Branch, Islamic Azad University, Abadeh, Iran
http://dx.doi.org/10.22034/ijscl.2023.1971247.2799

1. Introduction

Electronic learning (e-learning), digital learning (d-learning), and mobile learning (m-learning) are widely used interchangeably to refer to the concept of online education. However, these terms may vary in their scope and purpose, as well as the environment they are surrounded with. In reality, d-learning is a macro concept covering both e-learning and m-learning simultaneously, with m-learning being a subset of e-learning (Kumar Basak et al., 2018). In addition to these terms, distance learning and online learning exist too. However, among all these concepts, e-learning seems to be a more generic term and is more frequently used by the public (Paulsen, 2002).

The term e-learning was first coined by Masie in a seminar in 1999, although Masie (2007) believes that the first phenomenon pertinent to e-learning occurred during the 1920s when a commercial radio broadcasted classroom lessons to the children of farmers who lived in rural areas. E-learning has long been used in parallel with traditional learning methods. However, the various challenges and problems of e-learning reported worldwide indicate that it is still in its infancy (Tavangarian et al., 2004).

In March 2020, when the World Health Organization declared a pandemic, nearly all sectors dealing with education were closed and shortly urged to opt for alternative means, i.e., online education. To date, several studies have been conducted to delve into different aspects of e-learning. However, not many of them focus on the pros and cons of e-learning from the perspectives of its immediate beneficiaries, i.e., students and teachers (Gherhes et al., 2021). Looking at those studies, the present systematic review aimed at answering the following question:

- What are the challenges, problems, opportunities, and solutions associated with e-learning worldwide?

To answer the research question, we carried out a thematic analysis through a systematic review. Our objective was to create a conceptual framework to categorize the items in question.

2. Methodology

2.1. Materials

The materials included original research articles. Our search was done through Cardiff Metropolitan University's e-library (MetSearch, 2022). ProQuest Central, Scopus, and ScienceDirect were the sources we looked into. The criteria for inclusion were a) the relatedness to the topic, i.e., challenges, problems, opportunities, and solutions of e-learning during the Covid-19 pandemic, b) the language of the document (English), c) the date of publication (from March 2020 to March 2022), d) review status (peer-reviewed only), e) field of study (i.e., only articles related to education), and f) level of education (only higher education). Both open and online access sources were included.

2.2. Procedure

2.2.1. Data Collection

Our search words were (e-learning AND Covid-19 OR challenges OR problems OR opportunities OR solutions). We established a corpus of post-pandemic studies. Two external raters were involved in determining whether a source should be included. In addition to the inclusion criteria, a quality criteria checklist was created and used for this purpose (Appendix 1). Some sources were duplicated and therefore excluded. The data collection, consisting of six different stages (Figure 1), began on the 14th of March and ended on the 7th of May 2022.

Each source was then categorized under a certain theme. In addition, each theme had some lemmas. This model of keyword and lemma extraction was adapted from an earlier study (Nouraey & Karimnia, 2015). Table 1 shows the themes and their possible lemmas extracted from the included sources.

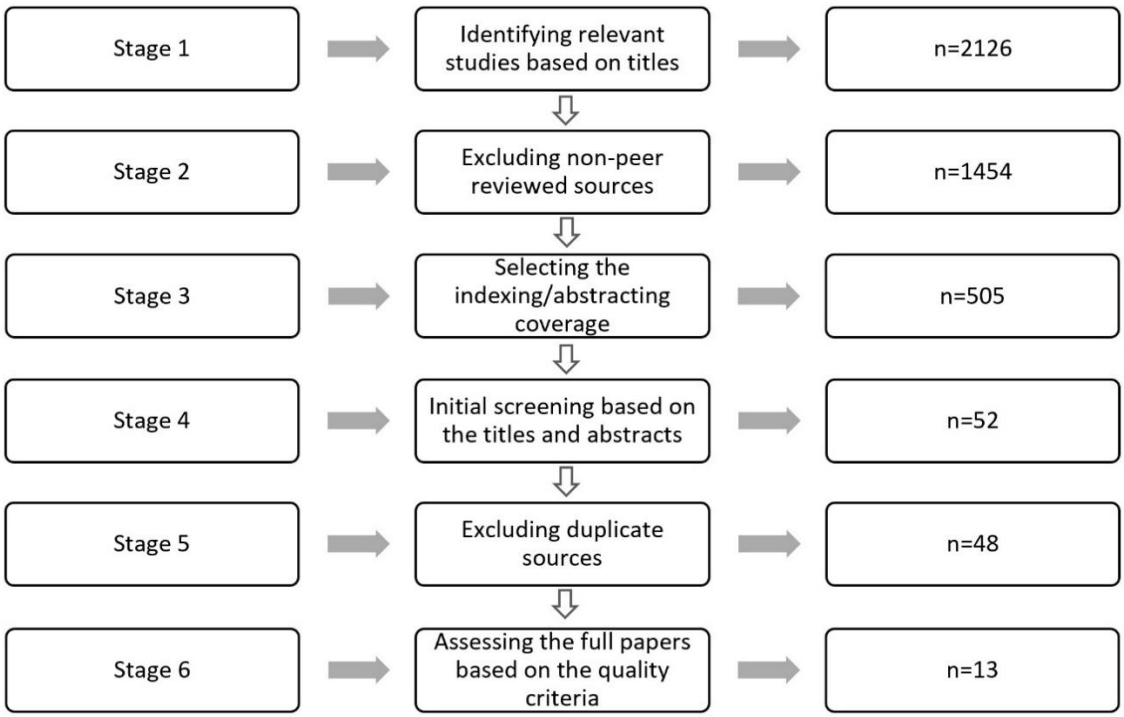

Figure 1
Stages of the Selection Process

Table 1
The Themes and Their Possible Lemmas

Themes	Direct Lemmas	Possible Indirect Lemmas
Challeng*	challenge, challenging, challenged, challenges	question, confront, difficulty, doubt, complaint, objection, conflict
Problem*	problem, problems, problematic	issue, barrier, obstacle, matter, disadvantage, drawback, shortcoming, demerit, negative
Opportun*	opportunity, opportunities, opportunistic	chance, advantage, benefit, pro, merit, positive
Solution*	Solution, solutions	answer, result, explanation, clue, key, conclusion, determination

2.2.2. Data Analysis

Thematic analysis was carried out to compare and combine data from the included sources. We utilized Braun and Clarke's (2006) guidelines of thematic analyses with six phases, including a) familiarizing with the data, b) generating initial codes, c) searching for themes, d) reviewing themes, e) defining and naming themes, and f) producing the report. Using NVivo 12™, data were obtained through thematic analysis and descriptively analyzed. Intra-rater reliability was achieved through a reanalysis of the documents by the researchers in three different individual phases, with each phase engaging one researcher at a time. Later, the themes and their lemmas were combined and narrowed down to a certain entry. Finally, a conceptual framework was created and discussed.

3. Results

Our final screening led to 13 sources. One source was joint a joint article about two countries (Russia and Kazakhstan); therefore, the data were representative of 14 countries. Out of the 13 sources, 11 were published in 2021 and 2 in 2020. The total number of participants was 2726 students and 1374 educators worldwide. The demographic information of included sources is shown in Figure 2.

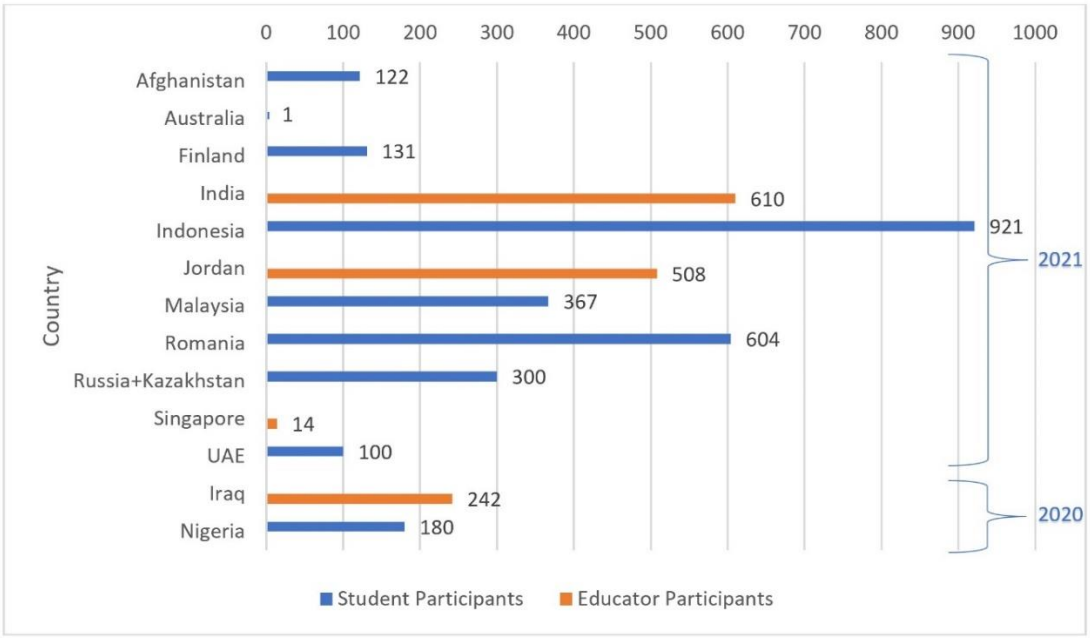

Figure 2
Demographic Information of Included Sources

Using NVivo 12™, a thematic analysis was carried out on the included sources. To this end, the challenges and problems vs. opportunities and solutions associated with e-learning were marked and later analyzed. A summary of the findings is presented in Table 2. After extracting the most relevant information required for data analysis, we categorized the themes and their possible lemmas (Table 3). The findings were then summarized, and a conceptual framework was created (Figure 3).

Table 2
Summary of Included Sources

No.	Author(s), Year	Sample Size/ participants	Method	Country(s)	Main Findings	
					Challenges and Problems Associated with E-Learning	**Opportunities and Solutions Associated with E-Learning**
1	Al Rawashdeh et al., 2021	100 university students	survey	UAE	E-learning affected students negatively (radiation, electromagnetic field, obesity, etc.), increased students' social isolation, created difficulty in providing extracurricular activities, increased the responsibilities and burdens of students, increased academic misconduct, including cheating in exams, limited the teacher's role in guiding students, did not focus on all senses (hearing and vision only). The application of e-	E-learning facilitated communication anytime and anywhere (both student-student and student-teacher communications). It reduced administrative burdens for faculty members. In addition, the course was available 24/7.

					learning would require certain qualifications, as well as additional costs, and parents usually could not follow up on their children due to electronic illiteracy.	
2	Gherhes et al., 2021	604 undergraduate students	survey	Romania	Lack of interaction was the main disadvantage of e-learning. Technical problems encountered during the internet connection and lack of practical applications were important disadvantages, too.	Time efficiency, convenience, and accessibility were the three main benefits of e-learning.
3	Kamysbayeva et al., 2021	300 graduate students	discussion and questionnaire	Russia and Kazakhstan	Problems such as the internet connection quality and personal electronic devices were the main disadvantages. In addition, the underdevelopment of interaction skills, as well as self-motivation and self-organization difficulties, were reported. The significance of having a coherent curriculum with appropriate learning materials was highlighted; this could be obtained through utilizing interactive digital resources to keep the attention, interest, and professional inspiration among students. The importance of personal interactions was also highlighted.	E-learning had a positive impact on the development of technological competencies (e.g., IT competencies, digital literacy, and analytical competencies) concerning professional activities.
4	Karasneh et al., 2021	508 university educators	questionnaire	Jordan	The main drawbacks of online teaching included poor internet connection, disadvantages in old learning tools (e.g., uploading capacity), and the family atmosphere. In addition, technical and computer skills were areas that required development.	Online education had some benefits: being prepared for online teaching and being comfortable communicating with students via online platforms. Online learning support from the institutions had also increased as compared to the pre-pandemic period.
5	Karkar et al., 2020	242 academic members	survey	Iraq	Some technical issues related to the	NA

					infrastructure, technical support, and a reliable server connection were highlighted. As compared to social media, specialized e-learning platforms may offer more services; however, educators and students are reluctant to use them because they are more familiar with social media platforms. Several educators lacked the motivation to utilize e-learning tools as they had doubts about whether this platform would assist in their current education tasks or if it was just another routine layer to be added. This practice was reported as a common attitude among educators in developing countries.	
6	Kurniawati & Noviani, 2021	921 undergraduate students	survey	Indonesia	Respondents complained about communication limitations (due to the lack of verbal and nonverbal cues), network problems, application problems, the longer duration of time spent on e-learning, eye strain problems, muscle tension, interruptions due to the uncertain study schedule, appetite disorders, eating delays, mental problems, stressful tasks that disrupt learning comfort, difficulty adjusting, cognitive overload, and helplessness.	NA
7	Sarwari et al., 2021	122 undergraduate students	survey questionnaire and in-depth semi-structured interviews	Afghanistan	The main disadvantages of e-learning included low-speed internet, the high cost of internet service (as most people live in poverty, particularly after the Covid-19 pandemic struck), technical problems (especially when taking tests and opening files), eye	Quicker feedback was provided to the students.

					and migraine problems due to the excessive use of online tools, lack of access to electricity, smartphones, and laptops, lack of instructors' clarifications through online platforms, and overwhelming workload and pressure on students.	
8	Lin & Nguyen, 2021	1 Asian university student	autoethnography	Australia	Signs of disconnection, isolation, and emotional instability associated with the establishment and development of the e-learning environment were observed.	NA
9	Moy & Ng, 2021	367 tertiary education students from both the private and public universities	survey	Malaysia	E-learning was affected by the internet connection at where one stayed. E-learning was not relatively easy to understand and use. High levels of depression, anxiety, and stress were observed among the participants.	E-learning facilitated studies during the pandemic and allowed communication with lecturers and other students. In addition, e-learning was flexible in time and place.
10	Muller et al., 2021	14 university educators	interviews and thematic analysis	Singapore	Engagement struggles, difficulty in catering to students' needs, inhibiting holistic learning, and educators' workload were the main challenges of e-learning.	The three opportunities were independent learning enabled by flexibility, reflections and improvements related to teaching practice, and overcoming some obstacles concerning student-teacher interaction.
11	Nikou & Maslov, 2021	131 university students	survey	Finland	Emotional and stress management among students was highly crucial for e-learning during quarantine times. The Covid-19 pandemic exerted more negative effects on female students than on males.	E-learning is a better and safer alternative to conventional on-campus education.
12	Oyediran et al., 2020	180 students in private tertiary institutions	survey	Nigeria	The disadvantages of e-learning included poor internet connection, poor electricity supply, high cost and poor quality of e-learning facilities, poor	The advantages of e-learning included wide coverage, cost-effectiveness, uniformity, and a faster teaching and learning process.

					technical know-how, lack of telecommunication infrastructure, and lack of training support by the institutions.	
13	Patra et al., 2021	610 teachers from different universities	survey	India	University teachers face three major challenges, namely, accessibility, information and communication technology literacy and skills, and technological support. Students' accessibility to the internet as well as the speed of the internet were the most important challenges reported.	E-learning was user-friendly. It could be used anytime and anywhere during the pandemic. E-learning was also convenient and productive.

Table 3
Categorized Themes

Domain	Theme	Sub-Theme
Challenges and problems associated with e-Leaning	Technical issues	lacks practical applications is affected by poor internet connection is affected by a lack of personal electronic devices (e.g., laptops, PCs, tablets, smartphones, etc.) is affected by old technical tools (e.g., lack of uploading capacity or device's memory) is affected by the technical support from the institution has less attractive platforms compared to social media platforms is difficult to use requires reliable electricity
	Physical issues	affects students negatively (obesity, radiation, etc.) lacks verbal cues causes eye strain problems causes muscle tension causes headaches, migraines, and eating disorders
	Mental issues	reduces self-organization reduces self-motivation lacks non-verbal cues increases mood disorders such as stress, anxiety, and depression reduces motivation among teachers and students causes emotional instability among students
	Interaction issues	increases social isolation and disconnection is affected negatively by the family atmosphere under-develops interaction skills limits the role of teachers in guiding the students limits student-teacher interaction limits student-student interaction
	Additional burdens	increases burdens, responsibilities, workload, and pressure among students requires additional costs takes longer than face-to-face classes
	Assessments	increases cheating in assessments is ambiguate and some files do not open during the exams
	Proper Training and IT Literacy	requires certain qualifications and literacy, such as IT skills, and technology skills, by both students and teachers
	Pedagogy	lacks a coherent curriculum causes interruptions due to an uncertain study schedule is difficult to understand inhibits holistic learning

Opportunities and solutions associated with e-learning	Communication improvement	facilitates student-student communication facilitates student-teacher communication
	Interaction Improvement	helps student-student interaction helps student-teacher interaction reduces administrative burdens
	Teaching and learning improvement	improves teaching practice improves independent learning provides a faster teaching and learning process improves technological competencies (e.g., IT skills and digital literacy)
	Accessibility	is accessible 24/7 is flexible in time and place is time-efficient has a wide coverage
	Convenience	is convenient is user-friendly
	Productivity	is productive leads into uniformity provides quicker feedback is cost-effective
	Safety	is better and safer compared with on-campus education

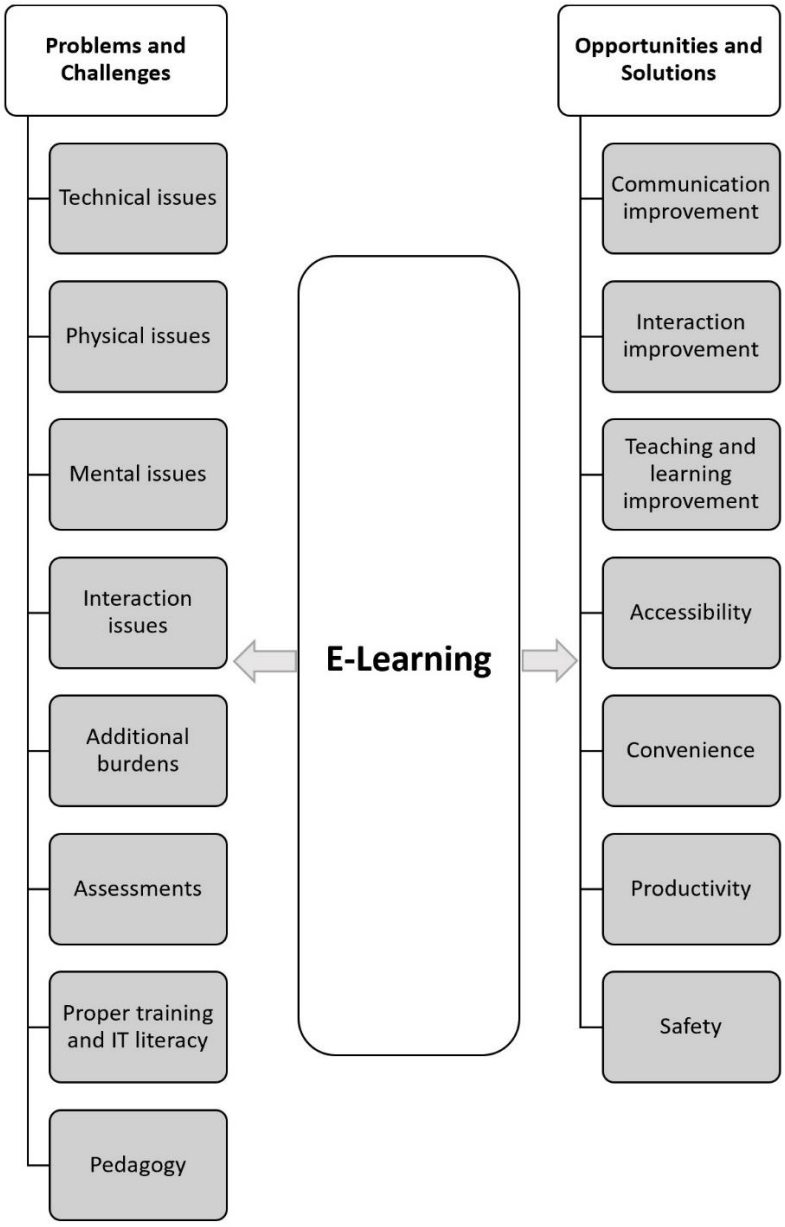

Figure 3

The Conceptual Framework of E-learning Problems and Challenges vs. Opportunities and Solutions

4. Discussion

The discussion consists of two main sections, namely, the problems and challenges vs. the opportunities and solutions associated with e-learning.

4.1. Problems and Challenges

4.1.1. Technical Issues

The first technical issue encountered by the students might be a poor internet connection, which consequently leads to disruptions and/or disconnections. The issue of internet connection is not only reported by the students in low-economic countries such as Afghanistan (Sarwari et al., 2021), Bangladesh (Sarker et al., 2019), and Nigeria (Adeoye et al., 2020), but also students in high-income countries such as UAE face the same challenge (Amarneh et al., 2021). The availability of personal technological devices has also been reported as a challenge by the students. In some cases, laptops are required for the effective utilization of e-learning (Mutisya & Makokha, 2016). In addition to the hardware, the software (i.e., the e-learning application) has also been highlighted as a challenging issue. According to Almaiah et al. (2020), the successful usage of e-learning applications is related to the adoption factors and understanding of the challenges that the current e-learning applications face. Although several applications specially designed for e-learning are available worldwide (e.g., Blackboard, Microsoft Teams), social media applications such as WhatsApp, Facebook, and Telegram are preferred by students as they feel more comfortable using them (Karkar et al., 2020).

4.1.2. Physical Issues

Several physical health issues related to e-learning users have been reported by the researchers. An example is digital eye strain, a common eye problem associated with prolonged use of electronic devices (Bhattacharya et al., 2020; Jayadev et al., 2020; Mohan et al., 2021). Other physical risk factors include body pain, pain in the neck, pain in the right and/or left shoulders, and muscle tension (Jyotidiwy et al., 2022; Kurniawati & Noviani, 2021). Headaches and migraines associated with e-learning have also been reported (Singh et al., 2021; Subedi et al., 2020).

4.1.3. Mental Issues

Based on the literature, the most common mood disorders associated with e-learning are stress, anxiety, and depression among students (Fawaz & Samaha, 2021; Lan et al., 2020). In general, the mental well-being of students after the spread of Covid-19 has been largely investigated (Alavudeen et al., 2021; Al-Salman et al., 2022; Commodari & La Rosa, 2021; Hassan et al., 2021, Hassan & Bao, 2020). Other psychological issues investigated include emotional instability (Lin & Nguyen, 2021), burnout (Mheidly et al., 2020; Parte & Herrador-Alcaide, 2021), and sleep disorders (Allam et al., 2021; Gusman et al., 2021).

4.1.4. Interaction Issues

Different types of interaction in an e-learning environment may exist. Mensah et al. (2021) investigated four types of interaction, namely, student-content, student-system, student-student, and student-teacher interactions, linking them to course effectiveness. These types were investigated under different terms yet similar concepts. For instance, Kumar et al. (2021) pointed out learner-content interaction while highlighting the fact that the quality of e-learning content may increase students' satisfaction. Another example is the study by Alhin et al. (2017), where the term student-interface interaction was used. In an educational context, effective interaction is of utmost importance. In this regard, Sun et al. (2022) claimed that teacher-student interaction affects students' learning effects, both directly and through the mediating effect of the psychological atmosphere and learning engagement. The body of literature reveals several studies related to the concept of interaction. E-learning, however, can cause social isolation (Leal Filho et al., 2021). In addition, research shows that the interaction between students and their peers and/or teachers is limited in an e-learning context (Boling et al., 2012). According to Sarkar et al. (2019), e-learning materials are poorly designed and mostly do not allow much interaction between students and teachers. Some researchers believe that shyness and lack of self-confidence are the main factors that affect the students' participation negatively (e.g., Al-Fadhli, 2008; Al-Rahmi et al., 2015). The shyness resulting in a lack of participation in e-learning is mostly found in Asian students

(Zhang et al., 2012). As a solution, Ashour (2021) argued that any educational model of e-learning should first be customized to the cultural, local, economic, and social context within which the education occurs.

4.1.5. Additional Burdens

These burdens may include additional costs (Al Rawashdeh et al., 2021), longer teaching and learning time (Kurniawati & Noviani, 2021), and adding to the responsibilities, workload, and pressure among the teachers and students (Sarwari et al., 2021). Additional costs may range between the internet and facilities expenses, including e-learning hardware and software (Abbasi Kasani et al., 2020; Olum et al., 2020) and building up workplaces and offices for the sole purpose of online teaching (Belaya, 2018). According to Nurbayani and Dede (2022), those working from home or working in hybrid modes, especially men, are always faced with surrounding problems.

4.1.6. Assessments

In an e-learning context, assessment is an essential element (Jalali et al., 2018). Due to the lack of physical interaction among the parties involved in an e-learning environment, assessments seem to be a challenging issue (Daradoumis et al., 2013). Bulut (2019) urged the need to propose methods, strategies, and procedures for achieving an effective e-learning assessment process. In a systematic review, Lara et al. (2020) highlighted various open problems in e-learning assessment-related areas, including self-assessment, peer assessment, and automated assessment. Exam security and the tendency among the students to "take shortcuts" (Gamage et al., 2020, p. 16), along with exam delivery, are two important challenges of online education. Pressure for performance, lack of time, motivation, and interest, lack of understanding of plagiarism, and cultural issues and background are the main factors that provoke the students to cheat in their assessments (Gamage et al., 2020). Using test banks is considered to be a mitigating factor to exam delivery and security, especially during the Covid-19 pandemic (Clark et al., 2020).

4.1.7. Proper Training and IT Literacy

Lack of students' and educators' training is one of the potential factors that can affect e-learning negatively (Adeoye et al., 2020, Shafiei Sarvestani et al., 2019). Based on the findings of Dhillon and Murray (2021), some teachers struggle to utilize specific technological features, and it would be beneficial for the teachers to receive regular training. However, in the case of the pandemic, a large majority had to adapt their teaching and learning in a very short time (Dietrich et al., 2020), and therefore, proper training and preparations were not made.

4.1.8. Pedagogy

Some studies have reported the pedagogical difficulties faced by the students in an e-learning platform. For instance, Ayu (2020) reported that some students found e-learning materials difficult to understand. Muller et al., 2021 argued that e-learning inhibits holistic learning. As Adilbayeva et al. (2022) pointed out, the current approach adopted by university teachers is mixing the traditional pedagogical teaching methods with information and communication technology (ICT). However, recently, there has been a growing demand for digital tools, and seemingly, the teachers need to adapt themselves to such digital tools. Therefore, e-learning requires a dedicated pedagogical approach that fits its environment and meets the certain needs of its users. In other words, the existing traditional pedagogical frameworks may not work best in an e-learning environment.

4.2. Opportunities and Solutions

4.2.1. Communication Improvement

Easy communication was reported as one of the pros of e-learning during the pandemic (Igbokwe et al., 2020). According to Al Rawashdeh et al. (2021), e-learning facilitates communication anytime and anywhere (both student-student and student-teacher communications). Malik et al. (2020) highlighted the positive effect of e-learning on the problem-solving skill of students, which in turn, could enhance their learning.

4.2.2. Interaction Improvement

Concerning interaction, conflicting results have been reported. While some researchers claim that e-learning limits different types of interaction, some researchers have found that interaction is improved as a result of e-learning. Interaction is crucially important for obtaining student satisfaction and meeting learning outcomes (Chiero et al., 2015; Fedynich et al.,

2015). For some researchers, e-learning has been successful in providing an interactive environment for both students and educators (Kumar Basak et al., 2018; Vitoria et al., 2018). According to Kumar et al. (2021), administrators and teachers should pay attention to the content development and designing of the course structure and develop a sense of engagement among the students.

4.2.3. Teaching and Learning Improvement

Using digital technologies in education aid educators in teaching differently and contribute to human development (Kenzhaliev et al., 2019). According to Fauzi et al. (2018), e-learning can improve learning by utilizing online media through technology, information, and communication. Therefore, both teaching and learning may be improved as a result of e-learning.

4.2.4. Accessibility

E-learning is available 24/7, and this is one of the advantages of this means of education. Students prefer online education, especially web-based platforms, as they are more accessible (Alhumaid et al., 2020). Moodle, Microsoft Teams, Zoom, and Google Classroom are some of the most popular and favorite e-learning applications among students (Alameri et al., 2020; Noor et al., 2020).

4.2.5. Convenience

Another advantage of e-learning is the convenience for both students and teachers (Adeoye et al., 2020). More specifically, the convenience of participating in meetings from personal electronic devices as well as the ability to participate remotely, were pointed out by Essilfie et al. (2020). Patra et al. (2021) claimed that e-learning systems are convenient not only for conducting classes but also for other tasks and activities like presentations, tests, and evaluations outside the conventional classroom. E-learning is known to be user-friendly (Konig et al., 2020). In addition to convenience, innovativeness, knowledge sharing, and quality are among the factors that build the success of e-learning among students and educators (Salloum et al., 2019).

4.2.6. Productivity

Learner productivity in an e-learning environment may be achieved through proper personalization, adaptivity, and context awareness (Sarwar et al., 2019). Productivity in e-learning has been linked to other factors, such as the applications and platforms used to deliver e-learning (Malik et al., 2020). It can provide quicker feedback to the students (Sarwari et al., 2021) and is more affordable and cost-effective compared to traditional learning (Chowdhury, 2019).

4.2.7. Safety

Health safety during the pandemic is one of the advantages of e-learning reported by researchers (Al Zahrani et al., 2021; Soni, 2020). Due to the spread of Covid-19, e-learning seemed to be a better and safer alternative compared to conventional classroom environments. (Nikou & Maslov, 2021).

The items listed in the present study were mostly in line with the studies conducted during and/or after the pandemic era (e.g., Aini et al., 2020; Alqahtani & Rajkhan, 2020; Mseleku, 2020; Ranjbar Kouchaksaraei et al., 2021; Turnbull et al., 2021). Concerning the categories mentioned in the present systematic review, conflicting results were reported by other studies. For example, some researchers reported that communication was improved due to e-learning (Moy & Ng, 2021), while others argued that communication was negatively affected (Kurniawati & Noviani, 2021). Similar conflicting results related to the concepts of interaction, teaching, learning, and accessibility could be found in the body of the literature.

The main limitation of the present study was the participants' fields of study. We only included those related to education. However, the literature shows a huge number of post-pandemic studies in other fields, such as medicine, nursing, engineering, etc. The rationale behind this exclusion was that teaching and learning in such fields require certain tools and are often far different from subjects in humanities and social sciences.

The present study aimed to highlight the challenges and problems vs. the opportunities and solutions associated with e-learning. With the pandemic in 2020, almost all educational sectors were forced to opt for alternative means of teaching and learning, and e-learning followed by blended learning, was the immediate alternative. Although e-learning has long been used in parallel to traditional learning styles, challenges, and problems have been

reported by the students and teachers around the world. The thematic analysis carried out on the included sources led to establishing a conceptual framework.

Based on the results, the main disadvantages of e-learning were a) technical issues, b) physical issues, c) mental issues, d) interaction issues, e) additional burdens, f) assessment, g) students' and teachers' IT qualifications and literacy, and h) pedagogy. On the contrary, some advantages were reported, including a) communication improvement, b) interaction improvement, c) teaching and learning improvement, d) accessibility, e) convenience, f) productivity, and g) safety, as compared to face-to-face teaching and learning.

Our findings revealed that the effective utilization and delivery of e-learning mostly require certain conditions. These may be linked to various factors such as the IT infrastructure, support from the institution, regular training among students and educators, e-learning platforms and applications, as well as a dedicated pedagogy. The conceptual framework created in the present study could be beneficial to prospective researchers (e.g., for creating survey questionnaires), teachers, students, and policymakers. Future studies may also cover blended teaching and learning, a method mostly utilized at the beginning of 2022 when the spread of Covid-19 got almost under control, and higher education institutions started to operate on-campus again.

References

Abbasi Kasani, H., Shams Mourkani, G., Seraji, F., Rezaeizadeh, M., & Abedi, H. (2020). E-learning challenges in Iran: A research synthesis. *International Review of Research in Open and Distributed Learning*, *21*(4), 96-116. https://doi.org/10.19173/irrodl.v21i4.4677

Adeoye, I. A., Adanikin, A. F., & Adanikin, A. (2020). COVID-19 and e-learning: Nigeria tertiary education system experience. *International Journal of Research and Innovation in Applied Science*, *V*(V), 28-31.

Adilbayeva, U., Mussanova, G. A., Mombekova, N. B., & Suttibayev, N. A. (2022). Digital communication technology for teaching a foreign language and culture through reading. *International Journal of Society, Culture & Language*, *10*(3), 21-30. https://doi.org/10.22034/ijscl.2022.543110.2472

Aini, Q., Budiarto, M., Putra, P. O. H., & Rahardja, U. (2020). Exploring e-learning challenges during the global COVID-19 pandemic: A review. *Jurnal Sistem Informasi*, *16*(2), 57-65. https://doi.org/10.21609/jsi.v16i2.1011

Alameri, J., Masadeh, R., Hamadallah, E., Ismail, H. B., & Fakhouri, H. N. (2020). Students' perceptions of e-learning platforms (Moodle, Microsoft Teams and Zoom platforms) in the University of Jordan education and its relation to self-study and academic achievement during COVID-19 pandemic. *Advanced Research & Studies Journal*, *11*(5), 21-33.

Alavudeen, S. S., Easwaran, V., Mir, J. I., Shahrani, S. M., Aseeri, A. A., Khan, N. A., Almodeer, A. M., & Asiri, A. A. (2021). The influence of covid-19 related psychological and demographic variables on the effectiveness of e-learning among health care students in the Southern Region of Saudi Arabia. *Saudi Pharmaceutical Journal*, *29*(7), 775-780. https://doi.org/10.1016/j.jsps.2021.05.009

Al-Fadhli, S. (2008). Students' perceptions of e-learning in Arab society: Kuwait University as a case study. *E-Learning and Digital Media*, *5*(4), 418-428. https://doi.org/10.2304/elea.2008.5.4.418

Alhih, M., Ossiannilsson, E., & Berigel, M. (2017). Levels of interaction provided by online distance education models. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(6), 2733-2748. https://doi.org/10.12973/eurasia.2017.01250a

Alhumaid, K., Ali, S., Waheed, A., Zahid, E., & Habes, M. (2020). COVID-19 and e-learning: Perceptions & attitudes of teachers towards e-Learning acceptance in the developing countries. *Multicultural Education*, *6*(2), 100-115. https://doi.org/10.5281/zenodo.4060121

Allam, H. K., Helmy, M. S., El Badry, A. S., & Younis, F. E. (2021). Workaholism, sleep disorders, and potential e-learning impacts among Menoufia University staff during COVID-19 pandemic. *Journal of Public Health Research*, *10*(4), 2203. https://doi.org/10.4081/jphr.2021.2203

Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies*, *25*(6), 5261-5280. https://doi.org/10.1007/s 10639-020-10219-y

Alqahtani, A. Y., & Rajkhan, A. A. (2020). E-learning critical success factors during the covid-19 pandemic: A comprehensive analysis of e-learning managerial perspectives. *Education Sciences*, *10*(9), 1-16. https://doi.org/10.3390/educsci 10090216

Al-Rahmi, W. M., Othman, M. S., & Yusuf, L. M. (2015). The effectiveness of using e-learning in Malaysian higher education: A case study Universiti Teknologi Malaysia. *Mediterranean Journal of Social Sciences, 6*(5S2), 625-637. https://doi.org/10.5901/mjss.2015.v6n5s2p625

Al Rawashdeh, A. Z., Mohammed, E. Y., Al Arab, A. R., Alara, M., & Al-Rawashdeh, B. (2021). Advantages and disadvantages of using e-learning in university education: Analyzing students' perspectives. *Electronic Journal of e-Learning*, *19*(3), 107-117. https://doi.org/10.34190/ejel.19.3.2168

Al-Salman, S., Haider, A. S., & Saed, H. (2022). The psychological impact of COVID-19's e-learning digital tools on Jordanian university students' well-being. *The Journal of Mental Health Training, Education and Practice*. Advance online publication. https://doi.org/10.1108/JMHTEP-09-2021-0106

Al Zahrani, E. M., Al Naam, Y. A., AlRabeeah, S. M., Aldossary, D. N., Al-Jamea, L. H., Woodman, A., Shawaheen, M., Altiti, O., Quiambao, J. V., Arulanantham, Z. J., & Elsafi, S. H. (2021). E- learning experience of the medical profession's college students during COVID-19 pandemic in Saudi Arabia. *BMC Medical Education*, *21*, 1-11. https://doi.org/10.1186/s12909-021-02860-z

Amarneh, B. M., Alshurideh, M. T., Al Kurdi, B. H., & Obeidat, Z. (2021). The impact of COVID-19 on e-learning: Advantages and challenges. In A. E. Hassanien (Ed.), *Proceedings of The International Conference on Artificial Intelligence and Computer Vision* (pp. 75-89). Springer. https://doi.org/10.1007/978-3-030-76346-6_8

Ashour, S. (2021). How COVID-19 is reshaping the role and modes of higher education whilst moving towards a knowledge society: The case of the UAE. *Open Learning: The Journal of Open, Distance and e-Learning*. Advance online publication. https://doi.org/10.1080/02680513.2021.1930526

Ayu, M. (2020). Online learning: Leading e-learning at higher education. *The Journal of English Literacy Education: The Teaching and Learning of English as a Foreign Language*, *7*(1), 47-54. https://doi.org/10.36706/jele.v7i1.11515

Belaya, V. (2018). The use of e-learning in vocational education and training (VET): Systematization of existing theoretical approaches. *Journal of Education and Learning*, *7*(5), 92-101. https://doi.org/10.5539/jel.v7n5p92

Bhattacharya, S., Saleem, S. M., & Singh, A. (2020). Digital eye strain in the era of COVID-19 pandemic: An emerging public health threat. *Indian Journal of Ophthalmology*, *68*(8), 1709. https://doi.org/10.4103/ijo.IJO_1782_20

Boling, E. C., Hough, M., Krinsky, H., Saleem, H., & Stevens, M. (2012). Cutting the distance in distance education: Perspectives on what promotes positive, online learning experiences. *The Internet and Higher Education*, *15*(2), 118-126. https://doi.org/10.1016/j.iheduc.2011.11.006

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Bulut, S. (2019). Assessing online learners' academic self-efficacy in a symbiotic learning environment. *SSRN Electronic Journal*, *12*(1), 1-15.

Chiero, R., Beare, P., Marshall, J., & Torgerson, C. (2015). Evaluating the effectiveness of e-learning in teacher preparation. *Educational Media International*, *52*(3), 188-200. https://doi.org/10.1080/09523987.2015.1075101

Chowdhury, D. (2019). Role of e-learning on education: A review of literature. *Asian Journal of Management*, *10*(3), 273-278. https://doi.org/10.5958/2321-5763.2019.00042.8

Clark, T. M., Callam, C. S., Paul, N. M., Stoltzfus, M. W., & Turner, D. (2020).

Testing in the time of COVID-19: A sudden transition to unproctored online exams. *Journal of Chemical Education*, *97*(9), 3413-3417. https://doi.org/10.1021/acs.jchemed.0c00546

Commodari, E., & La Rosa, V. L. (2021). Adolescents and distance learning during the first wave of the COVID-19 pandemic in Italy: What impact on students' well-being and learning processes and what future prospects? *European Journal of Investigation in Health, Psychology and Education*, *11*(3), 726-735. https://doi.org/10.3390/ejihpe11030052

Daradoumis, T., Bassi, R., Xhafa, F., & Caballe, S. (2013, October). A review on massive e-learning (MOOC) design, delivery and assessment. In E. Xhafa (Ed.), *Proceedings of The 2013 Eighth International Conference on P2P, Parallel, Grid, Cloud and Internet Computing* (pp. 208-213). IEEE. https://doi.org/10.1109/3PGCIC.2013.37

Dhillon, S., & Murray, N. (2021). An investigation of EAP teachers' views and experiences of e-learning technology. *Education Sciences*, *11*(2), 1-16. https://doi.org/10.3390/educsci11020054

Dietrich, N., Kentheswaran, K., Ahmadi, A., Teychene, J., Bessiere, Y., Alfenore, S., Laborie, S., Bastoul, D., Loubiere, K., Guigui, C., Sperandio, M., Barna, L., Paul, E., Cabassud, C., Line, A., & Hebrard, G. (2020). Attempts, successes, and failures of distance learning in the time of covid-19. *Journal of Chemical Education*, *97*(9), 2448-2457. https://doi.org/10.1021/acs.jchemed.0c00717

Essilfie, A. A., Hurley, E. T., Strauss, E. J., & Alaia, M. J. (2020). Resident, fellow, and attending perception of E-learning during the COVID-19 pandemic and implications on future orthopaedic education. *JAAOS-Journal of the American Academy of Orthopaedic Surgeons*, *28*(19), e860-e864. https://doi.org/10.5435/JAAOS-D-20-00579

Fauzi, A., Baharun, H., Mundiri, A., & Manshur, U. (2018). E-Learning in Pesantren: Learning transformation based on the value of pesantren. *Journal of Physics: Conference Series*, *1114*(1), 1-6. https://doi.org/10.1088/1742-6596/1114/1/012062

Fawaz, M., & Samaha, A. (2021). E-learning: Depression, anxiety, and stress symptomatology among Lebanese university students during COVID-19 quarantine. *Nursing forum: An Independent Voice for Nursing*, *56*(1), 52-57. https://doi.org/10.1111/nuf.12521

Fedynich, L., Bradley, K. S., & Bradley, J. (2015). Graduate students' perceptions of online learning. *Research in Higher Education Journal*, *27*(1), 1-13.

Gamage, K. A., Silva, E. K. D., & Gunawardhana, N. (2020). Online delivery and assessment during COVID-19: Safeguarding academic integrity. *Education Sciences*, *10*(11), 1-24. https://doi.org/10.3390/educsci10110301

Gherhes, V., Stoian, C. E., Farcasiu, M. A., & Stanici, M. (2021). E-learning vs. face-to-face learning: Analyzing students' preferences and behaviors. *Sustainability*, *13*(8), 4381. https://doi.org/10.3390/su13084381

Gusman, M. S., Grimm, K. J., Cohen, A. B., & Doane, L. D. (2021). Stress and sleep across the onset of the novel coronavirus disease 2019 pandemic: Impact of distance learning on US college students' health trajectories. *Sleep*, *44*(12), 1-13. https://doi.org/10.1093/sleep/zsab193

Hassan, S. U. N., Algahtani, F. D., Atteya, M. R., Almishaal, A. A., Ahmed, A. A., Obeidat, S. T., Kamel, R. M., & Mohamed, R. F. (2021). The impact of extended e-learning on emotional well-being of students during the COVID-19 pandemic in Saudi Arabia. *Children*, *9*(1), 1-14. https://doi.org/10.3390/children9010013

Hasan, N., & Bao, Y. (2020). Impact of "e-learning crack-up" perception on psychological distress among college students during COVID-19 pandemic: A mediating role of "fear of academic year loss". *Children and Youth Services Review*, *118*, 105355. https://doi.org/10.1016/j.childyouth.2020.105355

Igbokwe, I. C., Okeke-James, N. J., Anyanwu, A. N., & Eli-Chukwu, N. C. (2020). Managing the challenges to the effective utilization of e-learning as a response in COVID-19 Nigeria. *International Studies in Educational Administration*, *48*(2), 28-34.

Jalali, S. M. J., Mahdizadeh, E., Mahmoudi, M. R., & Moro, S. (2018). Analytical assessment process of e-learning domain research between 1980 and 2014. *International Journal of Management in Education*, *12*(1), 43-56. https://doi.org/10.1504/IJMIE.2018.088371

Jayadev, C., Sarbajna, P., & Vinekar, A. (2020). Commentary: Impact of the COVID-19 pandemic on digital eye strain in children. *Indian Journal of Ophthalmology*, *68*(11), 2383. https://doi.org/10.4103%2Fijo.IJO_3028_20

Jyotidiwy, I. A. G., Susilowati, I. H., Hasiholan, B. P., Sitanggang, A. N., & Satria, N. (2022). The posture comparison between students and staff members at University of Indonesia based on their laptop usage in the e-learning system during the COVID-19 pandemic. *Italienisch*, *12*(1), 851-856.

Kamysbayeva, A., Koryakov, A., Garnova, N., Glushkov, S., & Klimenkova, S. (2021). E-learning challenge studying the COVID-19 pandemic. *International Journal of Educational Management*, *35*(7), 1492-1503. https://doi.org/10.1108/IJEM-06-2021-0257

Karasneh, R., Al-Azzam, S., Muflih, S., Hawamdeh, S., Muflih, M., & Khader, Y. (2021). Attitudes and practices of educators towards e-learning during the covid-19 pandemic. *Electronic Journal of E-Learning*, *19*(4), 252-261. https://doi.org/10.34190/ejel.19.4.2350

Karkar, A. J., Fatlawi, H. K., & Al-Jobouri, A. A. (2020). Highlighting e-learning adoption challenges using data analysis techniques: University of Kufa as a case study. *Electronic Journal of E-Learning*, *18*(2), 136-149. https://doi.org/10.34190/EJEL.20.18.2.003

Kenzhaliev, B. K., Kvyatkovskii, S. A., Kozhakhmetov, S. M., Sokolovskaya, L. V., Kenzhaliev, É. B., & Semenova, A. S. (2019). Determination of optimum production parameters for depletion of Balkhash copper-smelting plant dump slags. *Metallurgist*, *63*(7), 759-765. https://doi.org/10.1007/s11015-019-008 86-9

Konig, J., Bremerich-Vos, A., Buchholtz, C., Fladung, I., & Glutsch, N. (2020). Pre–service teachers' generic and subject-specific lesson-planning skills: On learning adaptive teaching during initial teacher education. *European Journal of Teacher Education*, *43*(2), 131-150. https://doi.org/10.1080/02619768.2019.1679115

Kumar Basak, S., Wotto, M., & Belanger, P. (2018). E-learning, m-learning and d-learning: Conceptual definition and comparative analysis. *E-learning and Digital Media*, *15*(4), 191-216. https://doi.org/10.1177/2042753018785180

Kumar, P., Saxena, C., & Baber, H. (2021). Learner-content interaction in e-learning-the moderating role of perceived harm of COVID-19 in assessing the satisfaction of learners. *Smart Learning Environments*, *8*(1), 1-15. https://doi.org/10.1186/s40561-021-00149-8

Kurniawati, A., & Noviani, J. (2021). Indonesian students' perception about the effectiveness of e-learning implementation during COVID-19. *The New Educational Review*, *66*(4), 95-107. https://doi.org/10.15804/tner.21.66.4.08

Lan, H. T. Q., Long, N. T., & Hanh, N. V. (2020). Validation of depression, anxiety and stress scales (DASS-21): Immediate psychological responses of students in the e-learning environment. *International Journal of Higher Education*, *9*(5), 125-133. https://doi.org/10.5430/ijhe.v9n5p125

Leal Filho, W., Wall, T., Rayman-Bacchus, L., Mifsud, M., Pritchard, D. J., Lovren, V. O., Farinha, C., Petrovic, D. S., & Balogun, A.-L. (2021). Impacts of covid-19 and social isolation on academic staff and students at universities: A cross-sectional study. *BMC Public Health*, *21*(1), 1213. https://doi.org/10.1186/s12889-021-11040-z

Lin, Y., & Nguyen, H. (2021). International students' perspectives on e-learning during covid-19 in higher education in Australia: A study of an Asian student. *Electronic Journal of E-Learning*, *19*(4), 241-251. https://doi.org/10.34190/ejel.19.4.2349

Mensah, R., Mensah, F. S., Gyapong, D. N., & Taley, I. B. (2021). E-Learning interactivity: Perspectives of Ghanaian tertiary students. *The Online Journal of Distance Education and E-Learning*, *9*(1), 60-73.

Malik, S., Al-Emran, M., Mathew, R., Tawafak, R., & AlFarsi, G. (2020). Comparison of e-learning, m-learning and game-based

learning in programming education–a gendered analysis. *International Journal of Emerging Technologies in Learning (iJET)*, *15*(15), 133-146.

Masie, E. (2007). Lies about e-learning. In L. Israelite (Ed.), *Lies about learning: Leading executives separate truth from fiction in a $100 billion Industry* (pp. 127-140). ASTD Press.

MetSearch (2022). Cardiff Metropolitan University's e-library. https://metsearch.cardiffmet.ac.uk/discovery/search?vid=44WHELF_CMU:44WHELF_CMU_NUI1.

Mheidly, N., Fares, M. Y., & Fares, J. (2020). Coping with stress and burnout associated with telecommunication and online learning. *Frontiers in Public Health*, *8*, 574969. https://doi.org/10.3389/fpubh.2020.574969

Mohan, A., Sen, P., Shah, C., Jain, E., & Jain, S. (2021). Prevalence and risk factor assessment of digital eye strain among children using online e-learning during the COVID-19 pandemic: Digital eye strain among kids (DESK study-1). *Indian Journal of Ophthalmology*, *69*(1), 140. https://doi.org/10.4103%2Fijo.IJO_2535_20

Moy, F. M., & Ng, Y. H. (2021). Perception towards e-learning and COVID-19 on the mental health status of university students in Malaysia. *Science Progress*, *104*(3), 1-18. https://doi.org/10.1177/00368504211029812

Mseleku, Z. (2020). A literature review of E-learning and E-teaching in the era of Covid-19 pandemic. *International Journal of Innovative Science and Research Technology*, *5*(10), 588-597.

Muller, A. M., Goh, C., Lim, L. Z., & Gao, X. (2021). Covid-19 emergency eLearning and beyond: Experiences and perspectives of university educators. *Education Sciences*, *11*(19), 1-15. https://doi.org/10.3390/educsci11010019

Mutisya, D. N., & Makokha, G. L. (2016). Challenges affecting adoption of e-learning in public universities in Kenya. *E-Learning and Digital Media*, *13*(3-4), 140-157. https://doi.org/10.1177/2042753016672902

Nikou, S., & Maslov, I. (2021). An analysis of students' perspectives on e-learning participation–the case of COVID-19 pandemic. *The International Journal of Information and Learning Technology*, *38*(3), 299-315. https://doi.org/10.1108/IJILT-12-2020-0220

Noor, S., Isa, F. M., & Mazhar, F. F. (2020). Online teaching practices during the COVID-19 pandemic. *Educational Process: International Journal*, *9*(3), 169-184. http://dx.doi.org/10.22521/edupij.2020.93.4

Nouraey, P., & Karimnia, A. (2015). The map of translation studies in modern Iran: An empirical investigation. *Asia Pacific Translation and Intercultural Studies*, *2*(2), 123-138. https://doi.org/10.1080/23306343.2015.1059009

Nurbayani, S., & Dede, M. (2022). The effect of COVID-19 on white-collar workers: The DPSIR model and its semantic aspect in Indonesia. *International Journal of Society, Culture & Language*, *10*(3), 73-88. https://doi.org/10.22034/ijscl.2022.550921.2592

Olum, R., Atulinda, L., Kigozi, E., Nassozi, D. R., Mulekwa, A., Bongomin, F., & Kiguli, S. (2020). Medical education and e-learning during COVID-19 pandemic: Awareness, attitudes, preferences, and barriers among undergraduate medicine and nursing students at Makerere University, Uganda. *Journal of Medical Education and Curricular Development*, *7*, 2382120520973212. https://doi.org/10.1177/2382120520973212

Oyediran, W. O., Omoare, A. M., Owoyemi, M. A., Adejobi, A. O., & Fasasi, R. B. (2020). Prospects and limitations of e-learning application in private tertiary institutions amidst COVID-19 lockdown in Nigeria. *Heliyon*, *6*(11), e05457. https://doi.org/10.1016/j.heliyon.2020.e05457

Parte, L., & Herrador-Alcaide, T. (2021). Teaching disruption by COVID-19: Burnout, isolation, and sense of belonging in accounting tutors in e-learning and b-learning. *International Journal of Environmental Research and Public Health*, *18*(19), 10339. https://doi.org/10.3390/ijerph181910339

Patra, S. K., Sundaray, B. K., & Mahapatra, D. M. (2021). Are university teachers ready to use and adopt e-learning system? An empirical substantiation during COVID–19 pandemic. *Quality Assurance in Education*, *29*(4), 509-522. https://doi.org/10.1108/QAE-12-2020-0146

Paulsen, M. F. (2002). Online education systems: Discussion and definition of terms. *NKI Distance Education*, *202*, 1-8.

Ranjbar Kouchaksaraei, S., Rohaninasab, M., Nikjo, P., & Jannati, Y. (2021). The education users' opinion about the E-learning in Covid-19 pandemic in the world: A review study. *Clinical Excellence*, *10*(4), 41-51.

Salloum, S. A., Al-Emran, M., Shaalan, K., & Tarhini, A. (2019). Factors affecting the e-learning acceptance: A case study from UAE. *Education and Information Technologies, 24*(1), 509-530. https://doi.org/10.1007/s10639-018-9786-3

Sarker, M. F. H., Al Mahmud, R., Islam, M. S., & Islam, M. K. (2019). Use of e-learning at higher educational institutions in Bangladesh: Opportunities and challenges. *Journal of Applied Research in Higher Education*, *11*(2), 210-223. https://doi.org/10.1108/JARHE-06-2018 -0099

Sarwar, S., Qayyum, Z. U., Garcia-Castro, R., Safyan, M., & Munir, R. F. (2019). Ontology based e-learning framework: A personalized, adaptive and context aware model. *Multimedia Tools and Applications*, *78*(24), 34745-34771. https://doi.org/10.1007/s11042-019-081 25-8

Sarwari, K., Kakar, A. F., Golzar, J., & Miri, M. A. (2022). Distance learning during COVID-19 in Afghanistan: Challenges and opportunities. *E-Learning and Digital Media*, *19*(2), 144-162. https://doi.org/10.1177/20427530211044757

Shafiei Sarvestani, M., Mohammadi, M., Afshin, J., & Raeisy, L. (2019). Students' experiences of e-learning challenges; A phenomenological study. *Interdisciplinary Journal of Virtual Learning in Medical Sciences, 10*(3), 1-10. https://doi.org/10.30476/ijvlms.2019.45841

Singh, H. K., Joshi, A., Malepati, R. N., Najeeb, S., Balakrishna, P., Pannerselvam, N. K., Singh, Y. K., & Ganne, P. (2021). A survey of e-learning methods in nursing and medical education during COVID-19 pandemic in India. *Nurse Education Today*, *99*, 104796. https://doi.org/10.1016/j.nedt.2021.104796

Soni, V. D. (2020). Global impact of e-learning during COVID 19. *SSRN Electronic Journal*, *12*(1), 1-12.

Subedi, S., Nayaju, S., Subedi, S., Shah, S. K., & Shah, J. M. (2020). Impact of E-learning during COVID-19 pandemic among nursing students and teachers of Nepal. *International Journal of Science and Healthcare Research*, *5*(3), 68-76.

Sun, H. L., Sun, T., Sha, F. Y., Gu, X. Y., Hou, X. R., Zhu, F. Y., & Fang, P. T. (2022). The influence of teacher-student interaction on the effects of online learning: Based on a serial mediating model. *Frontiers in Psychology*, *13*, 779217. https://doi.org/10.3389/fpsyg.2022.779217

Tavangarian, D., Leypold, M. E., Nolting, K., Roser, M., & Voigt, D. (2004). Is e-learning the solution for individual learning? *Electronic Journal of E-Learning*, *2*(2), 273-280.

Turnbull, D., Chugh, R., & Luck, J. (2021). Transitioning to e-learning during the COVID-19 pandemic: How have higher education institutions responded to the challenge? *Education and Information Technologies*, *26*(5), 6401-6419. https://doi.org/10.1007/s10639-021-10633-w

Vitoria, L., Mislinawati, M., & Nurmasyitah, N. (2018). Students' perceptions on the implementation of e-learning: Helpful or unhelpful? *Journal of Physics: Conference Series*, *1088*(1) 012058. https://doi.org/10.1088/1742-6596/1088/1/012058

Zhang, Y., Fang, Y., Wei, K. K., & Wang, Z. (2012). Promoting the intention of students to continue their participation in e-learning systems: The role of the communication environment. *Information Technology & People*, *25*(4), 356-375. https://doi.org/10.1108/09593841211278776

Appendix 1

Quality Criteria Checklist

No.	Quality Criteria
1	Does the study clearly address the research problem?
2	Are the objectives of the research clear?
3	Is the research methodology (approach, method, participants, instruments data collection procedures, data analysis) clear?
4	Are the analyses of data sufficiently rigorous?
5	Are the findings stated clearly?