SYSTEMATIC REVIEW

The use of digital technology in health learning during the COVID-19 pandemic: A systematic review

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Abstract

Objective: To investigate reasons, advantages, disadvantages and obstacles in the use of digital technology media for health learning during the coronavirus disease-2019 pandemic.

Methods: The systematic review was conducted from January to February 2022 and comprised search on Google Scholar, ProQuest, PubMed, ScienceDirect and Scopus databases for articles published from 2020 to March 2022 related to the use of digital technology by medical students, teachers and academics. Key words used for the search included digital technology, health learning, health education, COVID-19, COVID-19 pandemic, and coronavirus disease 2019. Main themes were identified which were then grouped into components using Joanna Briggs Institute guidelines and tools.

Results: Of the 128 articles initially found, 10(7.8%) were subjected to detailed analysis. Reasons identified were lockdown and accessibility of flexible learning materials. Advantages were effective time, better effort, saving money, improving technical skills, health security, feasibility, e-learning standardising, dedicated teaching, interdisciplinary collaboration network, creativity, inclusivity and professional development. Disadvantages were inadequate tools, poor internet connection, lack of technical skills, practical in classes, unclear policies, examinations, distribution of grades and limited online exam time. Obstacles included virtual class etiquette disobedience, inadequate interactions, time limitations, infrastructure, distractions, lack of engagement, stress, technical and limited data plans.

Conclusion: Many universities used digital technology in health learning during the pandemic-led lockdowns as it provided greater advantages.

Keywords: COVID-19, Digital Technology, Pandemics, Communicable disease control. (JPMA 73: S-135 [Suppl. 2]; 2023)

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Introduction

On December 31, 2019, coronavirus disease-2019 (COVID-19) was identified and reported by China in its Wuhan city. Only two months later, on March 11, 2020, the World Health Organisation (WHO) declared it a global pandemic, indicating that the virus had spread rapidly throughout the world.[1] Subsequently, almost all countries implemented lockdowns which had an impact on various aspects of life, including the process of teaching and learning in schools, which needed innovation with digital technology systems to facilitate distance learning. Digital technology media, such as computers, smartphone and laptops, enriched with Zoom applications, Google Meet, WhatsApp, Skype, and learning management system (LMS) were very useful for facilitating digital-based learning. Such technology gave high motivation to students to keep learning anywhere and anytime during the pandemic.[2] Until May 22, 2022, WHO notified 522 million cases and 6 million deaths globally, 58 million deaths and 788,157 deaths in Southeast Asia, 6.05 million cases and 156,586 deaths in Indonesia, and 22,913 cases and 131 deaths in Timor-Leste.[3]

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Digital learning applications can facilitate the performance of students to share knowledge with colleagues. Computer information technology (CIT) contributes to improving research skills and technical competence of students.[2] Using digital technology, such as computers, has a significant positive correlation with students' attitudes and self-efficacy (r=0.60, p<0.001).[4]

The current systematic review was planned to investigate reasons, advantages, disadvantages and obstacles in the use of digital technology media for health learning during the COVID-19 pandemic.

Methods

The systematic review was conducted from January to February 2022 and comprised search on Google Scholar, ProQuest, PubMed, ScienceDirect and Scopus databases for articles published from 2020 to March 2022 related to the use of digital technology by medical students, teachers and academics.

The studies included were the ones that focussed on medical students and academics who had used digital technology for learning or teaching purposes during the pandemic. The outcome of the study explained the reasons

for the choice of digital technology as well as the advantages, disadvantages and obstacles of using digital platforms. Cross-sectional, quantitative and qualitative studies published in the English language were included.

Those excluded were studies that did not discuss the use of digital technology in medical education during the pandemic, had no comparative factor, the outcome did not discuss factors related to the choice of digital technology, those that were published before 2020 or published in a language other than English.

Quality appraisal of the included studies was done using the Joanna Briggs Institute (JBI) guidelines and tools (Joanna Briggs Institute & JBI, 2017)[5] the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist[6] and the Population, Intervention, Comparison, Outcomes and Study (PICOS) format (Cumpston et al., 2021).[7]

Details of all the selected articles, like authors, date, methods (design, subject, variable, instrument and analysis) and results, were noted. Main themes were identified and then grouped into four components.

Results

Of the 128 articles initially found, 10 (7.8%) (Figure). These were done in Pakistan, Brunei, Malaysia, Saudi Arabia, Jamaica, India, Jordan, Nepal, Lebanon and California in the United States.[2,8-15] There were 5(50%) studies using a cross-sectional design, 3(30%) were quantitative, and 2(20%) were qualitative. JBI critical appraisal value ranged between 80-100% (Table 1), indicating eligibility for inclusion. The assessment of all the 10(100%) studies suggested there may be bias, but on a small scale, because they were all clearly designed. However, since most of the data-collection instruments were questionnaires, it was necessary to test their validity and reliability which was mentioned by 1(10%) study. In addition, the readiness or ability of the digital users' learning capacity may have also caused bias during data-collection. Among the studies, 1(10%) study reported having collected data online which could have been shared by a friend or other person while answering the questionnaire received online.

Reasons identified included lockdown and accessibility of flexible learning materials. Advantages included effective time, better effort, saving money, improving technical skills, health security, feasibility, e-learning standardising, dedicated teaching, interdisciplinary collaboration network, creativity, inclusivity and professional development.[16] Disadvantages included inadequate tools, poor internet connection, lack of technical skills, practical in classes, unclear policies, examinations, distribution of grades and limited online exam time. Finally, obstacles included virtual class etiquette disobedience, inadequate interactions, time limitations, infrastructure, distractions, lack of engagement, stress, technical and limited data plans (Table 2).[16]

Table-1: Joanna Briggs Institute (JBI) critical appraisal values he studies reviewed.

Citation	Criteria											Result [n(%)]
	1	2	3	4	5	6	7	8	9	10	11	8/8(100)
Qazi et al., 2020[9]	v	v	v	v	v	v	V	v				9/10(90)
Azlan et al., 2020[10]	v	v	v	v	v		V	v	v	v		7/8(87.5)
Alkhowailed et al., 2020[12]		v	v	v	v	v	V	v				7/8 (87.5)
Shehzadi et al., 2021[13]	v	v	v	v		v	V	v				8/10 (80)
Agu et al., 2021[7]	v	v		v	v		V	v	v	v		8/8 (100)
Alqudah et al., 2020[6]	v	v	v	v	v	v	V	v				8/8 (100)
Subedi et al., 2020[8]	v	v	v	v	v	v	V	v				10/11 (90.90)
Fawaz & Samaha, 2021[11]	v	v	v	v	v	v	V	v	v		v	10/11(90.90)
Al Zahrani et al., 2021[14]	v	v	v	v	v	v	V	v		v	v	10/10(100)
Vilchez et al., 2021[2]	v	v	v	v	v	v	V	v	v	v		8/8(100)

Table-2: Matrices of the studies reviewed.

No	Author and years	Method	Result
1	(Qazi et al., 2020)[9]	D. Cross-sectional S. 320 health students V. COVID-19 Lockdown, Satisfaction of online learning Access and use differences. I. Questionnaire A: SPSS 2.0 for correlation analysis.	There is a relationship between students' satisfaction, access and use of online learning. Bruneians are more satisfied to use online learning (50%) than Pakistanis (35.9%) in urban and rural. Previous experience with the use of online learning Bruneians P=.000), while among friends and family is using online learning (P=.000). Correlation results suggest that access and use factors of online learning were positively associated with satisfaction. Bruneians are more satisfied with internet access (r=0.437, p<.000) and affordability of gadgets (r=0.577, p<.000) as compared to Pakistanis (r=0.176, P<.050) and (r=0.152, p<.050).

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Table-2: *continued from previous page*

No	Author and years	Method	Result
2	(Azlan et al., 2020)[10]	D. Cross-sectional S. Postgraduate Medical and Physics students in university, 11 people. V. Medical and Physics education, e-learning, virtual learning COVID-19. I. Questionnaire A. descriptive analysis	Students prefer face-to-face physical teaching, able to adapt to new norms of e-learning, 60% of students agreed to record lectures and view videos of practice sessions. Aspects of practical and clinical experience can never be replaced. e-learning provides a lot of flexibility. Finds it difficult to focus due to distraction, lack of involvement and mental stress, poor internet connectivity and limited data plans.
3	(Alkhowailed et al., 2020)[12]	D. Descriptive cross-sectional S. Undergraduate medical students n=674 V. Digitalization, e-learning medical education, online Project Base Learning (PBL), virtual classroom. I. Questionnaire A. Descriptive analysis	The students were satisfied with the overall shift into this collaborative e-learning environment and the new successful procedures of virtual sessions. The digital learning tools facilitate the performance of the students and their peer sharing of knowledge. The role of informatics computer technologies was evident in promoting the students' research skills and technical competencies.
4	(Shehzadi et al., 2021)[13]	D. Cross-sectional S. Students of public and private health universities (n=374). V. Coronavirus, information and communication technology, E-service quality, E-information quality, E-learning, E-word of mouth, Student satisfaction, University brand image. I. Questionnaire A. Partial Lead Square- Structural Equation Model (PLS-SEM)	Findings revealed that Information Communication Technology (ICT), e-service quality and e-information quality positively contributed toward students' e-learning, which ultimately leads to create positive e-word of mouth and students' satisfaction. Meanwhile, results also identified that e-word of mouth and student satisfaction lead to generate a positive brand image of universities.
5	(Agu et al., 2021)[7]	D. Qualitative S. Students of nursing education. V. COVID-19, developing country, effect, nursing education. I. guideline A. Thematic analysis	Conventional learning methods were converted to virtual methods and clinical practice suspended for students' protection. Caribbean and some developing country can be affected by financial, political and other factors, in aspects of information technology infrastructure development, and inequalities in access to technology between rural and urban residents. Internet signal accessibility and reliability in several places have impact of carrying out nursing learning process during COVID-19 lockdown.
6	(Alqudah et al., 2020)[6]	D. A cross-sectional survey S. 23 academic ophthalmologists working at six medical schools in Jordan. V. E-learning COVID-19, ophthalmology undergraduate Jordan. I. Questionnaire A. Statistical analysis IBM SPSS statistics software (v.21).	Twenty-two respondents out of 23 academic ophthalmologists (95.5%) stated that the flexibility of e-learning in terms of time and place is the main advantage, while 77.35% stated that lack of skill is the main obstacle to using e-learning, 86.4% were not satisfied with e-learning as a teaching and learning method, 54.5% recommended integrating e-learning into the curriculum and 13,6% prefer to increase the training period, 31.8% say that their schedule is so tight that it doesn't allow them to do more campus assignments.
7	(Subedi et al., 2020)[8]	D. A descriptive cross-sectional online survey. S. Nursing teachers and students (104 teachers, 1012 students) respondents from 13 different nursing colleges of Nepal. V. Impact of e-learning, nursing students, teachers. I. Questionnaire A. Data were entered into SPSS and descriptive. analysis.	About 42.3% of teachers got disturbed during doing their online class causes by the electricity and 48.1% by internet problems. About 63.2% mentioned students were affected by electricity, 63.6% internet problems; 64.4% of them had their own internet access during the online classes period. As many as 64.3% of students used their data pack to support the online class and 58.4% used own mobile phone to support the learning process.
8	(Fawaz & Samaha, 2021)[11]	D. Quantitative cross-sectional. S. 520 undergraduate university nursing students. V. e-learning, COVID-19, depression, stress. I. Questionnaire. A. Used SPSS version 22 for analysis descriptive and inferential statistics.	The online learning had an impact on depression and anxiety in undergraduate students. It was detected a significant correlation between students' satisfaction and prevalence of depression, anxiety and stress.

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Table-2: *continued from previous page*

No	Author and years	Method	Result
9	(Al Zahrani et al., 2021)[14]	D. Quantitative study S. 1288 medical students from Saudi Arabia. V. E-learning experiences, medical profession college students, COVID-19 pandemic. I. Questionnaire A. SPSS ver.25.0 and descriptive statistical analysis	About 1288 respondents, 58.2% agreed that they had enough information related to online learning, 48.1% received adequate guidance; 42% technical support; 35.4% were satisfied with hardware and internet access; 40.8 % agreed they gained a good understanding of their courses' learning outcomes; 30.0% agreed that the quality of the online teaching was similar with conventional; 56.1% agreed that the online learning method is unsuitable for medical sciences studies. Advantages of e-learning are flexible accessibility of learning materials; time, effort, and money saving; acquire and improve technical skills through self-study; safety in health; shamelessness in interactions; and better academic performance. Disadvantages were lack of equipment in facilitating online teaching and learning; poor internet connection; lack of skills of teachers and students while using digital technology; inadequate practicum; the absence of clear policy standards and exams; sharing of grade; and limited time for online exams.
10	(Vilchez et al., 2021)[2]	D. Qualitative study S. 19 physical education teachers and 21 school health experts in California. V. Physical education, distance learning, best practices. I. Guideline interview. A. Thematic analysis.	Results found four major themes as: 1) participants felt that high quality physical education used in distance learning was both critical and possible; 2) strategies pointing for creating a high successful distance learning environment included personalization issues, creativity, and inclusiveness; 3) resources: professional development, administrative support, equipment; 4) lesson plans.

COVID-19: Coronavirus disease-2019, Information Communication Technology (ICT), Partial Lead Square- Structural Equation Model (PLS-SEM): , Project Base Learning (PBL): .

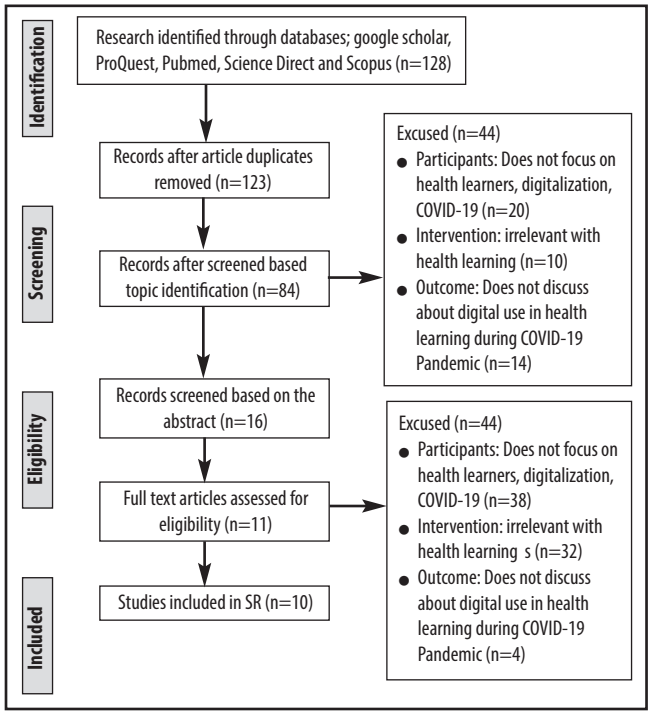

Figure-1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart.

Discussion

Digital applications used in the learning process generally had three main reasons; obligation to follow government decision, flexibility offered by digital technology, and protection against COVID-19. This reflected in the studies analysed.[8,9]

The current review identified 5 major advantages of using a digital learning system; flexibility in terms of time and place, effective time utilisation, saving money, decreased risk of accident, and health security.[10] A study[8] stated that digital learning decreased the risk of accident, because people did not have to travel from home to college to access learning activities.

However, it is not as smooth as one may expect, and while digital learning has flexibility, it also has weaknesses, like lack of participants' engagement during the learning process and the consequent mental stress.[11]

The current review identified 10 distractions in the use of digital technology for distance learning.[8,12]

Conclusion

Many universities used digital technology in health learning during the pandemic-led lockdowns as it provided greater advantages. However, there were disadvantages and obstacle as well that need to be addressed for optimising the experience.

Limitation: The current literature review was not registered with the Prospective Register of Systematic Reviews (PROSPERO), which is a limitation.

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