

The Capabilities, Challenges, and Resilience of Digital Learning as a Tool for Education During the COVID-19

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Abstract—The current study's objective examines contemporary advancements in learning utilizing digital technology for educational purposes during the recent pandemic outbreak. The study analysed the challenges, capabilities, and resilience of these digital learning environments and the future of digital learning. The PRISM statement is used to select records and assess the final 37 studies for the current investigation. According to the findings, the COVID-19 pandemic posed a significant challenge to educational institutions, and online learning was a challenging work for students and teachers. The availability of a large number of digital learning platforms, on the other hand, considerably mitigates the problem. Students' and teachers' skills and capacities have grown as a result of the learning process utilising digital platforms. The current study's findings show that education in the post-COVID-19 era is heavily reliant on digital sources, and that new technologies greatly enhance the learning process.

Keywords—digital learning, digital platforms, resilience, educational institutes, online learning

1 Introduction

The COVID-19 pandemic has spread throughout the globe, impacting practically all nations and regions. Countries throughout the world warned people to exercise caution. In order to flatten the curve and restrict the spread of the disease, lockdown and stay-at-home techniques have been used [1]. According to Sintema [2], most countries have undertaken lockdown and social separation measures due to the COVID-19 outbreak, which has resulted in the closure of schools, training institutes, and further education facilities. Educators provide quality instruction through various online media, representing a paradigm shift. Despite the difficulties that educators and students confront, online learning, distance learning, and continuing education have effectively combated this

unprecedented global pandemic [3]. Transitioning from traditional face-to-face learning to online learning can be a radically different experience for both students and teachers, but it is one that they must adjust to since there are few or no other choices. The school system and instructors have embraced “Education in Emergency” through various online platforms and are now obligated to adopt a system for which they are unprepared [4].

Consequently, schools must perform remote and digital learning to preserve educational continuity throughout the world. That presented a more significant challenge for policymakers and educators to advance educational activities [4]. Since the technological capabilities were insufficient to manage online, many management issues arose. According to Faridah et al [5], during the Covid-19 period, governments and corporations committed a significant sum to the research and development of digital teaching platforms in a changing learning environment. Many digital teaching platforms and various digital teaching resources have been produced, and universities have been actively using various digital teaching platforms for instruction to enhance student learning outcomes. Aside from that, using digital platforms for remote learning was not straightforward or inexpensive. With so many platforms and online educational resources available, educators and learners—experience regular difficulties when utilizing or referring to them. Many researchers have recognized and emphasized. Accessibility, cost, flexibility, learning methodology, life-long learning, and educational policy are all problems with e-learning [6]. After some time, countries increasingly accepted digital learning and a range of online platforms. Jitsi Meet, Google Meet, Google Classroom, WhatsApp, Zoom, and other online learning tools are used. However, Google Classroom, WhatsApp, and Zoom were the most commonly utilized digital platforms in this survey. During the COVID-19 epidemic, those platforms were most often employed in teaching and learning [7].

The shift from face-to-face to online classes was abrupt and unwelcome. It is valid for all higher education courses and programs, but it is more difficult for teacher education. If the adaptation process in foundational courses required a focus on resources, ways of connecting with students, pedagogical decisions, and so on, the process in practice-based modules, and especially in practicum, was much more demanding and challenging [8]. The COVID-19 scenario necessitates knowledge, abilities, and self-assurance regarding online teaching effectiveness. As one of the most significant categories in teacher competence, students acceptability and learning from home [9]. The teachers and students initially were not aware of the digital platforms enough to handle them properly; to some extent, many parents also lacked the skills and abilities to incorporate digital learning [9]. The current study’s contribution is to examine contemporary advancements in learning utilizing digital technology for educational purposes. During the COVID-19 pandemic, the current research will examine the challenges, capabilities, and resilience of these digital learning environments and the future of digital learning. The purpose is to assess the impact of a recent viral outbreak on online learning platforms and to forecast where digital learning will go in the future.

2 Materials and methods

The PRISMA statement 2015 is used by researchers all around the globe in presenting results and developing research procedures. The SLR is a tool for improving

reviews and meta-analyses [10]. The PRISMA statement template summarises the entire research process for this SLR’s article selection and rejection. The scope of this SLR research is confined to published literature on digital learning during COVID-19. The literature is extracted using Scopus and ‘Web of Science,’ two known databases. Recent reports and editorials on digital learning topics were also included in the research. In the search bar, type in “digital learning” AND “COVID-19.” The database’s total results were 250; the internal search option employs the inner search for enhanced clarity of the effects; the term future is employed. There were 240 results in the database. The disciplines chosen for the current study were social science, business, management, accounting, computer science, and psychology for the other procedure. The total number of subjects chosen was reduced to 166. The final published articles chosen reviews and book chapters were also included for the significant inclusion. Furthermore, reduce the results by selecting just published papers for review, and the publication step is complete. Finally, for the current study, the minimum number of citations for an article must be three times, which brings the 37 studies for review.

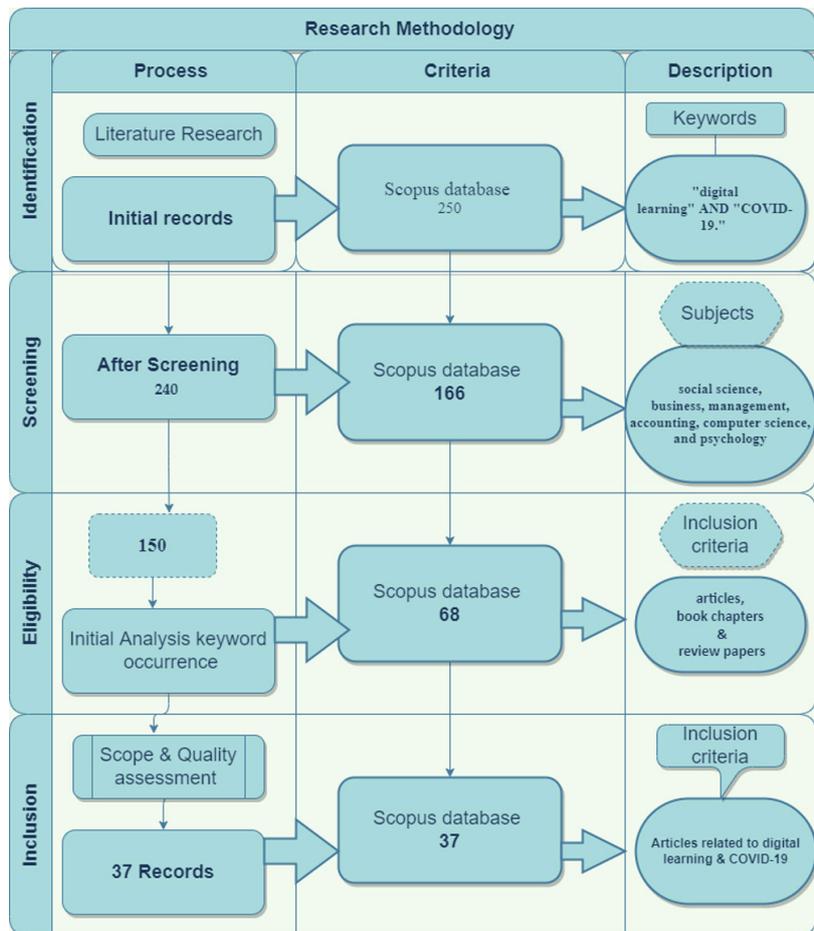


Fig. 1. The PRISMA statement 2015

3 Results

3.1 Descriptive analysis

The subject base is further divided in the final 37 research. The allocation of the research based on topic categories revealed that business, management, and accounting contributed the most, with 12 articles in the current study for evaluation. The second-largest papers, with 9, are from computer science. Social science had the third-highest number of research publications, with seven, environmental science with three, and psychology with six. The findings of the subject-wise selection of articles for the current study are shown in Figure 2.

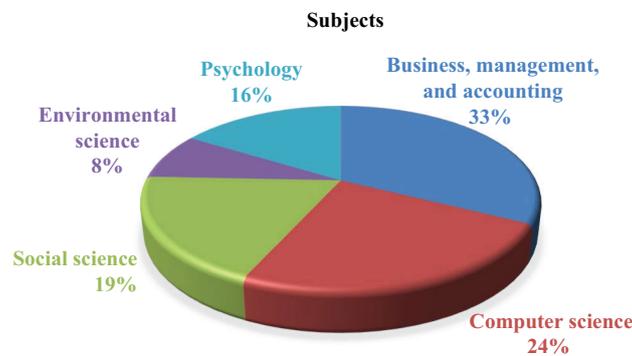


Fig. 2. Distribution of subjects on digital learning

The research focuses on the COVID-19-time frame in which the publications were published. The primary goal of the year-by-year distribution is to figure out how many articles were selected and met the review’s criteria each year. Figure three depicts the literature year base graph from 2020 to 2022. With 17 articles, the year 2021 had the most contributions. The year 2020 is second on the list, with 16 digital learning research publications, while 2022 adds four more. Figure 3 displays the detailed information for articles from different years.

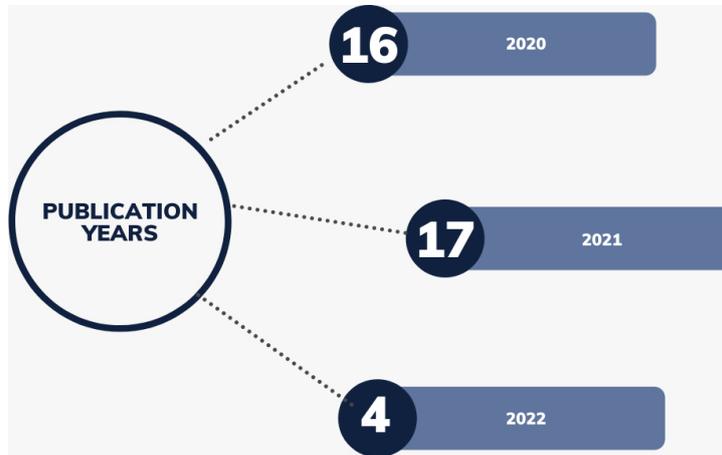


Fig. 3. The distribution of selected articles in the year of publication

Furthermore, the current study’s journal-based publication analysis reveals that Educational Technology Research and Development, Information and Learning Science, Education Sciences, Computers in Human Behavior and Technology, Pedagogy and Education contribute the most articles, each with two studies. Journal of Educational Computing Research, Distance Education, and Sustainability make significant contributions to the field (Switzerland). Figure 4 depicts the findings of the research article chosen from each publication.

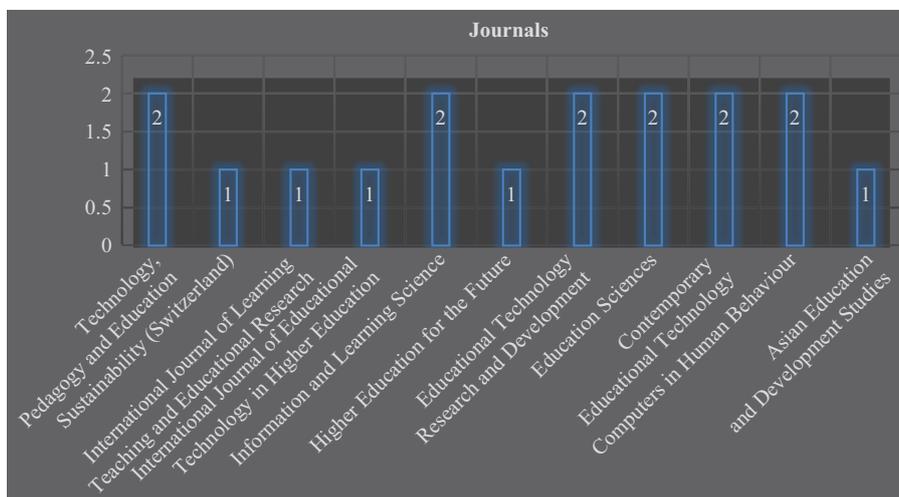


Fig. 4. Extraction of literature from the sources (journals)

4 Classifications of literature

Digital learning is evolving rapidly, and academics are delving deeper into these technological shifts one by one. Several technologies are employed in digital learning; the current study assesses technology utilization for learning and educational purposes. A further categorization of digital learning drives the literature and researcher viewpoint on technology adaption in the tourist sector. Most of the digital technology literature focuses on researchers to create learning environments. The authors employed the keyword clouding technique to find the most common terms used in the research. As previously stated, 54 research were included in the keyword clouding approach in the first stage of the literature review; also, these studies were utilized to identify the literature classes from these keywords, as shown in Table 1.

Table 1. Keyword occurrences and relevance score

Term	Occurrences	Relevance Score
access	17	0.7822
addition	13	0.9992
article	23	0.6352
aspect	20	0.5786
author	11	0.6514
case study	14	0.7653
change	25	0.3201
concept	19	0.3262
condition	15	0.9589
context	26	0.6077
country	20	0.3331
course	27	0.4628
crisis	23	0.7589
data	39	0.5552
design methodology approach	10	6.1647
digital learning environment	16	0.7483
digital platform	10	0.8732
educator	13	0.8258
effect	25	0.5307
end	12	0.6538
face	28	0.578
faculty	15	1.2126
field	11	0.438
future	11	0.5311
government	11	1.2167
higher education	31	0.4522

(Continued)

Table 1. Keyword occurrences and relevance score (*Continued*)

Term	Occurrences	Relevance Score
higher education institution	12	1.8057
home	11	1.2705
implementation	20	1.0673
implication	21	1.3188
information	16	1.2286
institution	26	0.7932
instruction	16	1.0244
knowledge	13	0.736
lack	13	0.9721
learner	17	0.3723
learning process	13	0.5791
online teaching	15	0.4796
order	12	0.8636
originality value	10	6.1647
outbreak	15	0.781
participant	17	0.7985
pedagogy	16	1.2493
perception	16	1.2586
place	16	1.1522
practice	30	0.5709
problem	16	1.7127
questionnaire	22	0.5834
relationship	15	1.0791
resource	27	0.5828
response	30	0.539
school	40	0.5872
term	14	0.5754
world	21	0.8941

Through content analysis, the literature was further assessed for research categorization. The content categorization of published articles is investigated using the VOS Viewer tool. Data networks are built using cluster-linked ideas. Recent research has confirmed that the author keywords used in the databases' indexation approach for publications are also helpful for bibliometric analysis, which is used to investigate the types of research topics [11]. As a result, we employed both sorts of keywords for the co-occurrence study within the scientific subject of digital learning. The study contained 37 records, and the data yielded 54 keywords. The first yellow cluster represents higher education, digital learning, and online teaching methodology. Digital platforms are in blue, while research on the learning process is grey. Figure 5 indicates the text frequency co-occurrence.

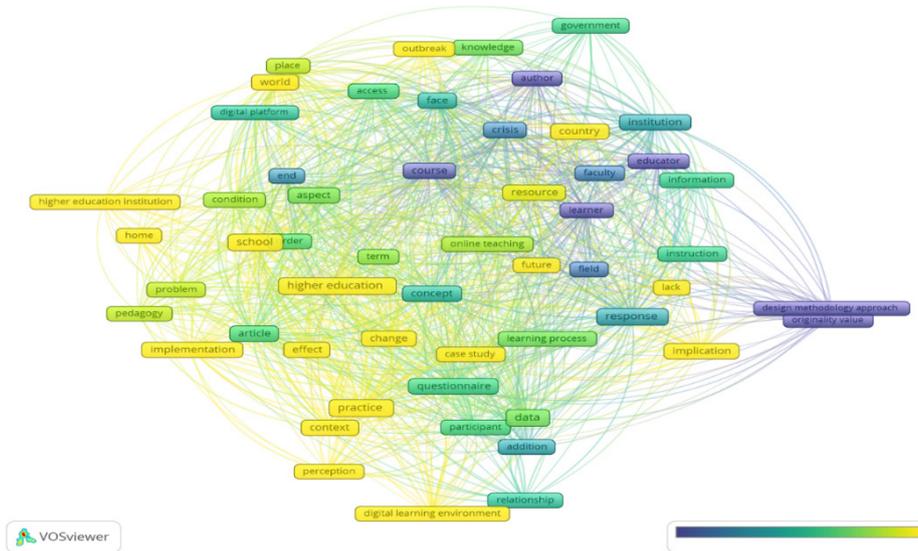


Fig. 5. Research classifications using the text network technique

5 Classification of literature

5.1 Digital learning environment

The motivation for increased use of technology in educational institutions often revolves around improving student learning experiences and supporting the development of digital literacy, critical thinking, cooperation, and other 21st-century abilities [12]. The relevance of digital learning and learning platforms has increased dramatically because of the COVID-19 pandemic. The introduction of an online classroom setting, completely unforeseen, is causing a rapid transformation in all education sectors. It revealed that students and teachers had limited opportunities to adjust to a new environment with more impact than face-to-face contact. As a result, the teachers faced several difficulties collaborating with students in an online setting [13]. The digital environment was a new challenge for students and educationalists regarding skills and capabilities. According to Aditya [14], regardless of educational policy, it is no longer accurate to say that most teachers lack sufficient technical skills because educators today are always eager to learn something about advanced technologies in digital learning and a slew of innovations in integrating digital learning technologies have been introduced. The findings of [15] more professional development opportunities should be implemented, faculty should be given more time to focus on integrating technology into their classrooms, and IT support systems should be improved to ensure teachers do not deviate from more sound, blended-learning practices, according to the researchers.

However, the obligation to immediately shift to an online form creates several challenges for school officials, teachers, and students [16]. Managing logistical difficulties, such as the interplay between the school's unified regulations and the autonomous arrangements of teachers and pupils, was one of the challenges school administrators

faced due to the COVID-19 outbreak [17]. According to N. Khan & Qureshi [18], teachers experienced challenges due to a lack of technological and pedagogical support and familiarity with using internet resources regularly. Teachers must give direction and support to students to help them navigate the online learning environment independently. In addition to this, higher education is seeing a growing move to online learning, which has prompted concern and anxiety among many teachers who lack the necessary skills, resources, and pedagogic acumen [19]. The findings of Bhardwaj et al [20] concluded that the transition to online learning had gone well. To improve the effectiveness of online teaching. It has also been advised that actions be taken to reduce anxiety and promote active involvement by learners. That indicates that the number of people who utilize online education is growing, and the digital learning environment is resilient for students and educationalists. Table 2 illustrates the information of authors, segmentations, settings, and citations of the record included for the current study.

Table 2. Records illustrated in digital learning environment

Authors	Year	Cited By	Segment	Settings
Scully D., Lehane P., Scully C.	2021	8	educational institutions worldwide	digital competence
Sawangchai A., Prasarnkarn H., Kasuma J., Polyakova A.G., Qasim S.	2020	8	higher education	E-learning of entrepreneurs
Aditya D.S.	2021	5	educational setting	human resources and infrastructure
Shamir-Inbal T., Blau I.	2021	6	teachers' pedagogical strategies	Hebrew-speaking and Arabic-speaking schools
Colpitts B.D.F., Smith M.D., McCurrach D.P.	2020	3	digital divide	IT platforms
Fulton C.	2020	13	higher education	e-guests
Engerman J.A., Otto R.F.	2021	3	university teachers'	design work
Bhardwaj P., Gupta P.K., Panwar H., Siddiqui M.K., Morales-Menendez R., Bhaik A.	2021	5	student engagement	deep learning

5.2 Digital platforms

The use of technology in learning, such as gamification, apps, and gadgets, is not a new concept. The use of digital technology, social media, and virtual worlds has considerably helped me learn. True, instructors should pay more attention to technology in their classrooms since it affects distance learning [21]. According to Njoki [22], one of the major issues during online teaching was technology, including hardware, software, and internet access. 10% of students reported they did not have access to high-speed internet, which resulted in 5% of students missing courses due to internet outages. The availability

of digital learning tools promptly was also a big concern. In terms of financial prospects, educational establishments wanted simple platforms to use and access [23]. During the savior COVID-19 pandemic, several new innovative software like Zoom, Google Meet, Cisco Webex, and Microsoft Teams emerged. In most parts of the world, the learning process has become more straightforward and relaxed for students and teachers [24]. Although, the availability of many digital platforms has some other challenges associated in terms of digital skills both for students and teachers. Teachers and students have likely adapted to a more or less emphasized digitalization strategy and infrastructure of their institution during regular onsite teaching in higher education settings, meaning that good quality on the spot teaching is possible even when not all opportunities for digital teaching are available [25].

However, students’ use of digital technology is critical since it became essential for studying during the epidemic. Furthermore, the necessity for digital equipment at home rose during the pandemic, but technological needs may have increased as well; for example, video conferencing requires more complex technology than viewing a digital document [26]. The findings of Cullinan et al [27] suggested that skill gaps were also considerably seen during online learning utilizing digital platforms, indicating that not only at the teacher and student levels but also at the parent level, where parents’ digital abilities were insufficient for students at the school level. Furthermore, the availability of digital platforms is a critical challenge in terms of the digital divide. Many education institutions in developing nations lack access to the internet and technology necessary to conduct instructional operations during a pandemic breakout [28]. Furthermore, during pandemic outbreaks, internet platforms played a critical role in continuing education initiatives, and many new digital resources are now available for learning online. Table 3 illustrates the information of authors, segmentations, settings, and citations of the record included for the current study.

Table 3. Records illustrated in digital platforms

Authors	Year	Cited By	Segment	Settings
Amin F.M., Sundari H.	2020	12	remote teaching	digital learning system
Marshall D.T., Shannon D.M., Love S.M.	2020	20	English learners	remote instruction
Abburu R., Praveena M., Priyakanth R.	2021	3	Virtual labs	lab simulation
Njoki P.N.	2020	6	remote instruction	Remote teaching
Molise H., Dube B.	2020	3	Emergency online teaching	WhatsApp group
Cullinan J., Flannery D., Harold J., Lyons S., Palcic D.	2021	5	higher education	internet connectivity
Akcil U., Bastas M.	2021	6	digital citizenship	higher education
Eberle J., Hobrecht J.	2021	4	online teaching	disruption

5.3 Learning processes

During the coronavirus crisis, education may have benefited from better and more digital education solutions; hence, it is essential to consider what role digital technology should play in the future of education [29]. Governments and educational institutions have been using distant learning systems to promote online instruction and distribution of learning materials, including delivering content, supporting teachers, offering guidance to families, and managing connectivity issues [30]. However, there is a risk that a new sort of digital gap may emerge since students will require computers, tablets, or phones and an internet connection to take advantage of online coursework [18]. According to Mok et al [31], due to the change to online learning, instructors and students now have access to a digital learning environment. The emergence of digital learning platforms gives students an easy way out during the pandemic who have access to digital devices and Internet connectivity. Furthermore, online learning has enhanced competency among youngsters and made them more skilled in “Word Docs, PPTs, and Excel sheets,” claim researchers who believe online learning may improve student competency. Assignments put students’ learning to the test; thus, professors encourage them to submit their work in various formats depending on the subject’s requirements [32]. Table 4 illustrates the information of authors, segmentations, settings, and citations of the record included for the current study.

Table 4. Records illustrated in digital learning process

Authors	Year	Cited By	Segment	Settings
d’Orville H.	2020	23	Resilience	international collaboration
Mok K.H., Xiong W., Bin Aedy Rahman H.N.	2021	7	higher education	university leaders and instructors
Kessler A., Barnes S., Rajagopal K., Rankin J., Pouchak L., Silis M., Esser W.	2020	9	remote online offerings	organizational structure
Pokhrel S., Chhetri R.	2021	95	Education system	learning spaces
Bond C.E., Cawood A.J.	2021	7	3D spatial thinking skills	geoscience field skills
Khan M.A.	2021	3	e-learning	virtual assessment
Shehzadi S., Nisar Q.A., Hussain M.S., Basheer M.F., Hameed W.U., Chaudhry N.I.	2021	21	information and communication technology (ICT)	

However, due to the COIVD-19 pandemic, the learning process is now mostly reliant on digital learning procedures, and students returning to school carry more excellent knowledge and abilities with them. They are now heavily involved in the process of technological adaption [33]. According to M. A. Khan [34], many startups are already active in online education, and the future of education relies heavily on digital learning. Teachers and students at all levels of education, from elementary to higher education, are familiar with the online learning process. Future education will include face-to-face

instruction in classrooms and online educational institutes as an essential component of the education system [35]. Moreover, students' self-regulation is an essential aspect of their learning processes. As a result of digital learning, students can identify components of student support applicable not just in times of crisis but also in establishing a strong learning culture.

6 Conclusion

During the recent outbreak of COVID-19, the current study's goal was to examine the challenges, capabilities, and resilience of digital learning processes. For the inclusion and exclusion of records from the Scopus database, we used the PRISMA statement. Final records were chosen using specific selection criteria that followed the components of the PRISMA statement. VOSViewer also utilized the data to ensure that the authors' keywords and software selections were the same. The author's conclusions were comparable, and the study also determined the key terms occurrence relevance score. Furthermore, the literature classification is based on the content analysis and occurrence of the data. The three primary streams are recognized from the literature, and the discussion is based on the study findings.

Moreover, the COVID-19 pandemic tests countries' ability to continue education operations. Initially, it appeared difficult to continue education procedures owing to a lack of digital resources, skills, and infrastructure [36]. The digital startups responded quickly to the issue and provided many materials in a short period to help students advance their education activities online from home. Students and teachers have to understand the limits of digital platforms to understand how to use digital resources effectively [37]. The requirement to switch to an online form right once presents a variety of difficulties for school authorities, instructors, and students. One of the obstacles school administrators encountered due to the COVID-19 epidemic was managing logistical difficulties, such as the interplay between the school's uniform norms and the independent arrangements of teachers and students [38]. Despite the numerous problems digital learning presents, students and instructors are adopting it as the pandemic progresses. Many digital platforms, including Zoom, Google Meet, WebEx, and Microsoft Teams, have been developed to help students and instructors improve their digital capabilities worldwide

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