

# Educational System Resilience during the COVID-19 Pandemic—Review and Perspective

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**Abstract:** The COVID-19 pandemic has disrupted the educational system worldwide because of the restrictions imposed in response to the pandemic for the purpose of impeding the fast spread of the virus. Educational institutions and people around the world worked intensively to create contingency plans that ensured the quality and continuity of the educational system. The ability to cope with the new changes in the educational environment varied since it depended on the available technologies and level of social restrictions, among other factors. This paper aims to investigate the literature on the educational system during the pandemic, with a particular emphasis on (1) the challenges faced by students and educators during the learning process, (2) the strategies used to overcome such challenges, and (3) the roles of educational institutions and parents. Two databases were selected in this review: Scopus and Web of Science. There were five stages in the identification, screening, and assessment of the eligibility of papers, whereby 87 papers were selected to be analyzed. Opportunities to ensure the continuity and quality of learning are highlighted, and a framework is derived from the literature to achieve enhanced and more resilient online educational systems. By including multiple educational levels, potential research gaps can be identified, highlighting the need for further investigation and exploration in specific educational domains—e.g., addressing behavioral, procedural, and technological challenges requires a thorough examination to achieve optimal solutions and implement reforms.



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**Keywords:** educational framework; educational resilience; COVID-19; online learning

## 1. Introduction

Distance learning, online education, remote learning, or e-learning was essential during the COVID-19 pandemic for the continuity of the educational process. Before the pandemic, e-learning was an option for students and educators that was utilized punctually or designed for systematic use in online courses or training or even as part of a planned educational framework, such as in specific lectures without the need for laboratory classes. Despite the critical stage of the pandemic having ceased by the end of 2021, it became necessary to ensure the readiness of the educational process for any disruption and to guarantee its resilience in a new reality that will never return to what it was.

The concept of resilience is a crucial aspect to explore in the context of online education, especially in the wake of the pandemic, which imposed significant changes and challenges on the traditional educational system. Resilience refers to the ability of an educational system to withstand and adapt to challenges, such as a sudden shift to online learning due to a pandemic, and to continue the delivery of high-quality education despite these challenges. While there is a growing body of research on the impact of the pandemic on traditional educational systems and the challenges in the educational field that were faced by educators and students, there is less focus on how educational systems can become more resilient and adaptable to future crises. The literature on the topic of educational resilience

has been addressed extensively [1,2]; however, only a few studies have focused on crisis scenarios [3–5], such as the COVID-19 pandemic, which has affected societies worldwide.

During the global COVID-19 pandemic, online education became an indispensable resource for educational institutions. Indeed, access to digital tools is one of the main enabling factors for resilient learning in educational institutions. As a result, educational institutions have been obliged to evaluate and modify several essential criteria to accommodate this new reality. To address the need for interaction, online education has introduced new channels of communication between students and educators. These channels include video conferencing, online discussion platform boards, and electronic mail. The first criterion used in this research study is the utilization or adoption of new technology [6]. In view of the first criterion, the second criterion is the flexibility or adaptability by which students can personalize their study schedules according to their needs and circumstances by taking advantage of online education's 24/7/365 accessibility of course materials and lectures (new behaviors) [5]. The third criterion is the effectiveness of online education in terms of learning outcomes. Some studies have demonstrated that online education is equally as successful as traditional education in this regard (new procedures) [7–11]. The first criterion can lead to a fourth criterion if the online technology already exists but is under-utilized, whereas it is essential to online education since communication and computing technologies are necessary. The utilization of technologies includes the web-based sharing of course materials; enhanced communication channels, such as Zoom, Google, Meeting, WebEx, and Teams, for synchronous student–educator interactions during classes; and the partial use of asynchronous classes to give freedom to students' schedules, among several other types of adaptations in the educational process relative to the new reality of social distancing resulting from pandemic-related events. These events have forced the exploration of new types of student evaluation and specific schemes for the administration of exams, both midterms and finals. Access to computer technology in the educational process can be an advantage for students who are comfortable with computer technology and have access to a reliable internet connection and computer equipment. However, this reliance on computer technology can also present challenges for those who lack technological skills, computer equipment, or internet connectivity. Finally, accreditation is a crucial consideration in assessing the quality of online education, since it guarantees that the system satisfies the requirements established by the relevant certifying organization. In light of these adaptations, the development of online education during the COVID-19 pandemic has affected a number of factors, enabling educational institutions to adjust to a new reality and offer students new paths to accomplish their educational goals.

At this point in mankind's history, computational tools enabling communication, student evaluation, teaching, etc., have brought about some sort of independence, autonomy, and self-governance, to name a few, in the educational process. Resulting from the social distance requirements in response to the pandemic that aimed to reduce or impede the spread of the virus, the impacts of the COVID-19 virus have affected teaching and learning processes. Every country deployed contingency plans for their students, educators, and institutions (as well as for any personnel) in an attempt to reduce the infected case count and prevent the spread of the COVID-19 virus while maintaining the continuity of the educational process (as in any kind of private or public sector activities). In the current educational stage, after almost three years since the COVID-19 pandemic's beginning (roughly affecting the entire world in the first quarter of 2020), remote learning can still be a solution that can help solve the social distance problem. Digital platforms that were utilized during the pandemic have supported improving the capabilities and skills of students and teachers [12]. E-learning is a tool that ensures the continuation of the educational process in the ongoing facets of the pandemic, in the case of a new social distance mandate, or even as a new educational system to enhance the completeness and robustness of a resilient educational process with or without social distance issues.

Any emergence that is similar to the COVID-19 pandemic and that demands forced social distancing creates critical changes in the teaching and learning environment around the

globe. Moreover, in the case of COVID-19, these circumstances presented many challenges because of the speed of the disease's spread, which caused a lockdown in most countries worldwide. Information, communication, and computing technologies (ICCTs) were the most effective among all the strategies used to secure education. Digitalizing classes in real time, using recordings, or using any other framework have changed many factors in the educational process, such as collaborative working, new teaching capabilities, and expanding learning capacities. According to Westerman et al. [13], digitalization can be defined as the use of different digital devices that can be used to improve services, facilitate trade and activities, and change existing business models to a new, expanded, and extended space. The ability of a resilient learning system to cope with the new challenges in the educational environment can vary from total to partial social distance restrictions.

Without prior notice and as a forced adoption, students and educators had to adopt and adapt quickly to a new educational environment, and adaptation requires time and effort with respect to emergency changes ranging from physical attendance to online learning. Educators were expected to convert their academic teaching and assessments and achieve educational goals using educational technologies. However, online learning was not sufficient with respect to ensuring the continuity of the learning process. It should have also included students' resilience coupled with certain parental and institutional infrastructure [14], whereby rather than parents and institutes, the preparedness of educators and the behavior of students play a key role in a successful learning process. Therefore, evaluating and understanding the technological skills of students and educators are crucial. It is essential to concede many factors when shifting to e-learning, such as the preparedness, readiness, and promptness of teaching–learning technologies; their utilization; their diffusion; and how they come across the main players (students, educators, institutions, and parents).

In order to achieve optimal solutions and successfully implement necessary reforms, it is crucial to address and overcome behavioral, procedural, and technological challenges. A comprehensive investigation is needed to determine the most effective way to tackle significant research gaps and inconsistencies. Furthermore, further exploration is necessary to comprehend the involvement of educational institutions and parents in the educational process during emergencies. Moreover, fostering collaboration between parents, educators, and educational institutions enriches the learning environment for students amidst changing learning contexts. This study aims to review the literature that covers several themes associated with challenges in education, especially those faced by students and educators in the educational process during the pandemic period and the coping strategies utilized to overcome teaching–learning difficulties. This broader approach allows for a holistic understanding of the educational system as a whole. It facilitates the identification of common trends, challenges, and best practices that transcend specific educational levels.

Additionally, by including multiple levels, potential research gaps can be identified, highlighting the need for further investigation and exploration in specific educational domains. The study also highlights the strategies used to ensure the continuity and quality of the educational process. Furthermore, the literature is organized around four categories (and their combinations) clustered according to the main players of the educational process: students, educators, institutions, and parents.

This paper is a systematic review of the literature that uniquely emerged during the pandemic (COVID-19), at all educational levels worldwide, regarding resilience in education by examining the interplay in words—online, distance learning, and distance education—used during COVID-19 or pandemic events. The review focused primarily on the prisms of students, educators, educational institutions, and parents on associated changes and the new relationship that arose between these parties amidst the transition to emergency remote teaching worldwide. The significance of conducting this review lies in its potential to contribute to understanding the challenges and adaptations faced and carried out by educational systems during COVID-19 as a global crisis. Additionally, a perspective section is given on the topic to evaluate the results of a meta-analysis carried out

on a literature review (90 papers) and to examine the results' interplay with unaddressed challenges and their intensity with respect to the technological, behavioral, and procedural pillars of the educational system.

This work is structured as follows. Section 2 presents the research methodology and the keywords and filters used to select the 90 papers to be reviewed; this is followed by literature classifications in Section 3, where the plots and table of their categories are distributed relative to students, educators, institutions, and parents (besides their combination). Section 4 provides a detailed discussion of the selected papers classified in these groups. Section 5 highlights remarks about the disturbances and challenges and categorizes them into a perspective directed toward the lessons learned and the steps that still have to be overcome in the educational system for an achievable, high-performance resilience state. The conclusions are presented in Section 6.

## 2. Literature Review Methodology

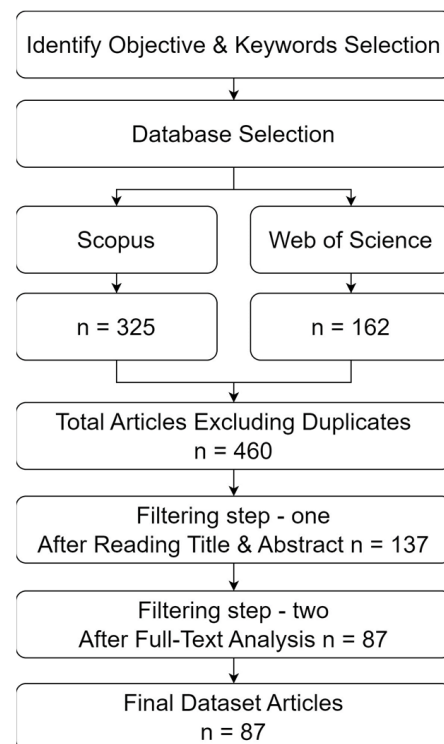
### 2.1. Review Objectives and Strategies

The papers published from January 2020 to December 2022 are reviewed and classified according to the main players in the educational process. The continuation of the current pandemic warrants the need to identify and classify the challenges faced by the teaching–learning community during the remote education process within the framework compounded by educators, students, their parents, and educational institutions. Moreover, the need to evaluate the resilience of the educational system during the pandemic is addressed. Each step faced by any community and the coping strategies implemented to overcome challenges is a lesson that can be implemented by another community member or improved to solve another similar challenge in the educational system during a pandemic event. In this study, the literature is classified into four main categories, and the goal is to identify the main challenges and propose strategies and solutions to circumvent the barriers to a resilient online education.

### 2.2. Literature Review Methodology

This study comprises a literature review of the published papers on the effect of the COVID-19 pandemic in the educational community at all levels (primary, secondary, higher education, etc.) around the world, and it aims (1) to collect information about the challenges faced by the main individuals during the pandemic and (2) to identify the strategies and solutions applied to handle those challenges. The present study adhered to the rigorous PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines [15,16] to ensure transparency and methodological robustness. It involved formulating research questions, conducting comprehensive database searches, applying strict inclusion/exclusion criteria, analyzing and extracting data from selected studies, synthesizing and interpreting findings, and producing a comprehensive review report. The work started with identifying the research objective, as mentioned previously. Five stages were conducted for the identification and screening of the eligibility of studies, as shown in Figure 1, which summarizes the stages of the literature review. The first stage selected the relevant keywords (shown in Table 1) to reflect the objective. In the second stage, two databases were selected: Scopus and Web of Science (WoS). The keywords were specified in the titles and abstracts of the papers and yielded 514 documents—58% from Scopus, 22% from WoS, and 20% from both sources. In the third stage, inclusion and exclusion criteria were applied, as shown in Table 2. Then, a screening step was conducted to remove duplicate papers. The fourth stage comprised in-depth screening by reading the full text of articles to check their eligibility. Finally, in the fifth stage, 87 papers (during the period January 2020 to December 2022) were selected for analyses in this study (key info can be found in Supplementary Materials). This paper focuses on the challenges and opportunities of online education, particularly emphasizing the four main actors involved (students, educators, institutes, and parents), which drove the selection of the relevant literature.

We searched for articles that offered recommendations and insights for enhancing online education in these areas.



**Figure 1.** Literature selection process.

**Table 1.** Keywords used in the selected databases.

Database	Keywords
Scopus	(education) AND (online) OR (distance AND learning) OR (distance AND education) AND (COVID-19) OR (pandemic) AND (resilience) OR (resilient)
WoS	

**Table 2.** Inclusion and exclusion criteria.

	Inclusion	Exclusion
Publication types	Article and conference paper	Books, letters, and notes
Languages	Written in English	Written in other languages than English
Focus of study	Challenges in teaching and learning and related coping strategies during the pandemic	Any challenges not related to teaching and learning

Although many articles were published during the review period that discussed the psychological effects, employment losses, and economic impact of COVID-19 with respect to online education, these topics were deemed outside the scope of this review. Instead, we focused on articles that addressed the challenges and opportunities of online education from the perspective of the main players involved. This was carried out within the scope of educational system resilience and relative to the social distancing issues of any pandemic event faced by Society 5.0 for the first time [17].

By carrying out our review of the relevant literature, we identified several key themes that are associated with online education, such as the significance of student engagement and motivation, the need for effective communication and support systems, and the role of

technology in enhancing the learning experience. By selecting articles that addressed these themes and offered practical suggestions for enhancing online education, we were able to develop a comprehensive understanding of the challenges and opportunities that currently confront online education. This paper focuses on challenges and opportunities in online education, particularly emphasizing the four main actors involved (students, educators, institutes, and parents). We searched for articles that offered recommendations and insights for enhancing online education in these (main actors) areas of action. The research study's meta-analysis is described in the following sections.

### 3. Literature Review Search Results

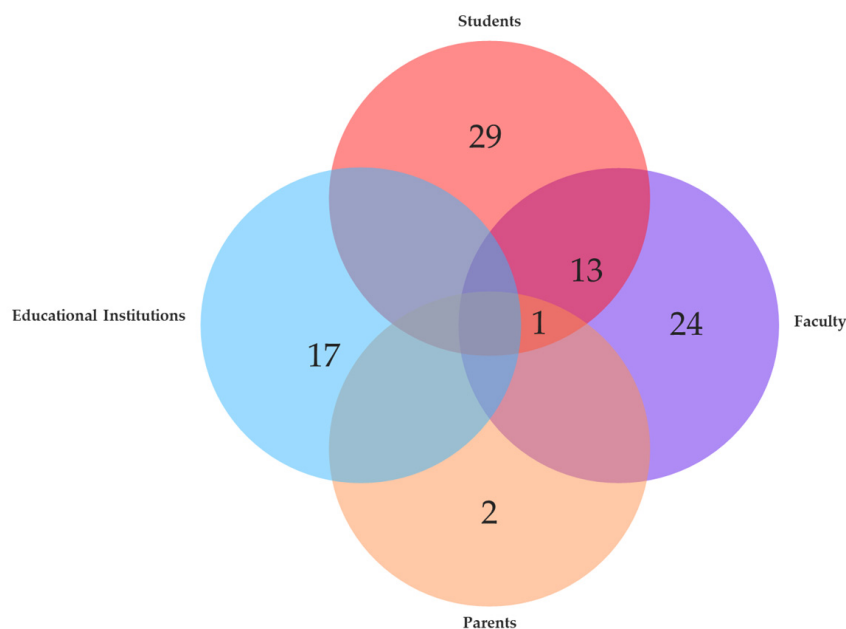
The data collected from the relevant literature comprise a variety of information about the educational process in the current emergency social-distancing period provoked by the COVID-19 pandemic. They include the technology used when urgently shifting the learning environment and the decision strategies used when the stress levels of social distancing were significant in the educational process. Each paper selected from the literature provides an overview of a particular experience. The reviewed articles are categorized into four main aspects related to the educational community: their focus on students, educators, parents, and educational institutions. The literature can be classified based on the following.

#### 3.1. Classification Based on Document Type

Based on the metadata information obtained from the database, the publications can be classified as follows: 86% articles, 10% conference papers, and 4% review papers.

#### 3.2. Classification Based on Document Focus

The selected literature is classified using four major categories that are based on topics of focus, as shown in Figure 2.



**Figure 2.** Publication topic per selected groups.

#### 3.3. Classification of Selected Articles Based on the Study's Focus

This subsection classifies the selected studies from the previous literature review process. Each paper was reviewed and organized using four categories and their combinations depending on the study's focus on the pandemic's effect, as shown in Table 3: students, educators, educational institutions, and parents.



**Table 3.** Literature classifications.

Focus	Articles	%	Publications
Students	29	33%	[18–46]
Educators	24	28%	[14,47–69]
Educational institutions	17	20%	[12,70–85]
Parents	2	2%	[86,87]
Combinations	15	17%	[88–102]

#### 4. Discussions

This section summarizes the main challenges and the elements that played crucial roles in supporting online education during the COVID-19 pandemic and the digital transformation age. Experience shared in the literature focused more on technologies and initiatives that promote resilience as the main enabler of online education, such as institutional programs that provide quick and comprehensive training for educators and any resources that are read and prepared in order to promptly deliver lessons [78]. Furthermore, the main challenges are the adapted curriculum, student assessments, faculty and students' technology skills, public mental health, and family support. A further classification of the main concerns is illustrated in Table 4.

**Table 4.** The main concerns discussed in the literature.

Category	Students	Educators	Educational Institutions	Multi-Category	Parents
% publications	33%	28%	20%	17%	2%
Main concerns	Student's resilience	Faculty's resilience	Coping strategies	Mediating learning process by technology	Parents view on distance learning
	Learning continuity	New teaching experience	Institutions' readiness		
	Student's depression		Best practices		
	Learning habits	Adaptability to new methodology	Advantages of technology	Parental and teachers' participation in the learning process	Resilience at the parents' level
	Satisfaction	Designing service-learning courses			

Table 4 illustrates the concerns addressed by the individuals or categories in the learning environment. Some concerns in today's educational system within a post-pandemic age can be turned from threats to opportunities, and some are still unsolved. From the student's side, their ability to cooperate with each other and engage with community partners was significantly impacted by online education. Some professors reported that their students finished their service projects and discussed factors that contributed to or hindered their accomplishment. To go around the pandemic's limitations, instructors used digital tools and digital resources to increase student engagement, motivation, and academic success. The literature also demonstrates that distance learning is effective and that most students are flexible enough with respect to using different forms of learning. The key findings on the parent's side were that they would have appreciated more guidance from educators with respect to understanding how to support their children in the learning process when they became learning agents themselves.

Several strategies and backup plans have been developed to address challenges during the pandemic. The efforts to enhance educational quality have involved the utilization of innovative hands-on technologies. These include simulations in software as an alternative to laboratory-based experiments, online learning platforms, both synchronous and asynchronous remote learning, undergraduate pathway programs, and various other measures. Due to thorough and well-planned pandemic policies, effective communication, and the provision of support services, educational institutions could retain services, academic con-

tinuity, trust, and resilience. These issues include cybersecurity, formative evaluations on the timing and procedures of remote or even in-person exams (under planned schemes by respecting social distance mandates when partial restrictions were possible), and the value of hands-on or tacit (by experiencing) knowledge with respect to the teaching–learning process throughout the training stage (if provided by the educational institutions).

#### *4.1. Challenges Faced by Educational Institutions*

In Jordan, a lack of accessible technology, inadequate internet connectivity, and unpleasant learning settings were students' main obstacles in rural and impoverished locations [18]. Extrapolating from this observation, the same effect could be observed in locations with a similar deficit in these resources.

Oliveira et al. [88] discussed how COVID-19 promoted the use of emergency remote education for students and instructors in higher education. Because of the pandemic, several universities and colleges were obliged to implement new teaching strategies for the remote education method. This circumstance necessitated understanding how technology impacted the teaching experience and how teachers and students reacted to the pandemic. The authors examined how teachers and students were influenced by technology with respect to the enhancement of learning during the early stages of the pandemic. The research results reveal that the pandemic affected the usage of remote learning technologies in education, the teaching experience, the use of educational platforms, and the adaptation of the people relative to it. Due to the emergency social distancing scenario, there were varying adverse outcomes in the educational process, such as a lack of training with respect to using technology and difficulties in controlling online evaluation fraud. However, the benefits of utilizing educational platforms far outweighed the adverse effects of adapting to them, even in cases where their adoption was forced. For example, the learning process continued, and most learning objectives were met despite all the restrictions.

Similarly, Koh and Daniel [103] examined the strategies used by higher education institutions to maintain educational continuity during the COVID-19 pandemic via online teaching and learning. Their review identifies eight strategies used by lecturers and students, including online access, positive coping strategies, learning access equity, classroom replication, online practical skills training, online assessment integrity, student engagement, and online participation strategies. The findings suggest that developing online competencies and adaptability is critical for higher education institutions to navigate different online teaching and learning modalities during the pandemic.

The literature reports that time management and improving digital skills are critical to academic success. Tobar et al. [28] concluded that most medical students gave positive feedback about workshops and their experience and skills learned during this pandemic lockdown. On the other hand, Kapasia et al. [30], when assessing the learning status of undergraduate and postgraduate students during COVID-19, found that despite the high level of digital platform utilization, many students faced considerable challenges in their online studies, such as poor connectivity to the internet and a lack of electricity in remote areas.

Furthermore, the existing literature stresses that proper infrastructure should be available to educational institutions for future health emergency situations that demand a digital learning process (or during any type of lockdown or demanded social distance mandates). Thus, there is a need to ensure adequate funding for improving the educational system and providing capacity development training to the stakeholders of educational institutions. Interventions should be conducted using a targeted and customized approach to create a positive impact among students from the vulnerable sectors of society. At this critical period, educational institutions could adopt open-source digital learning and learning management systems to conduct online learning. As a result, vital multi-prolonged strategies are urgently needed to build a resilient educational system that will develop skills for young minds' employability and productivity.



Although remote learning in most educational institutions was successful, some issues still require creative thinking and more investigation. It is crucial that educators work closely with partners (technology developers for example) to find effective methods and facilitate interaction with students in remote learning, although the solution may vary from one educator to another [32]. Ideally, to promote quality and timely input for the educational processes' needs, the knowledge provided using online platforms must be uniform among educators and students. It is important to accept that in an online teaching situation, everything takes much more time than in face-to-face classes since it is perceived that efficiency is not the same. Therefore, time management is essential since it affects the content and activities intended for each teaching session.

Many educational institutions have imposed quarantine restrictions that limit the professional development of capabilities (capacity of the abilities), such as dental training. Prieto et al. [94] looked at the viewpoints of students and faculty at a Chilean dental school during the pandemic. The key issues were changes in private life balance, concerns about professional abilities when using digital platforms, individual and collective learning experiences, and uncertainty about the future. Students most often discussed (1) needed improvements in the online educational process (mainly influenced by the need for in-person abilities to be trained), (2) virtual learning adaptation via digital services, (3) personal relationships that would sustain a network during and after graduation, and (4) fear about future employment due to the possible lack of practical experiences.

#### *4.2. Resilience in the Educational Environment*

In the current situation caused by COVID-19, it is essential to maintain learning continuity despite the educational system's challenges. Consequently, educational institutions should develop coping strategies to respond quickly and cost-effectively to a crisis and ensure the continuity of high-quality educational services via adjustment and adaptation. In this context, resilience is posed as the ability of the education institution to resist a disruption and/or recover quickly to the normal condition while ensuring services of the same quality. Therefore, any development directed toward the precise level of service or the elements of the educational system's resilience in technologies and procedures (the non-behavioral pillars)—which involves the preparedness, readiness, and promptness of designs, operations, and controls in organizations (or on a personal scale, such as for educators)—is paramount for the continuity and sustainability of educational institutions. In this manner and for the sake of growth and long-term stability, cases in educational institutions demonstrate that they have learned—from experiences such as COVID-19 and previous events—how to cope with disruptions by anticipating and providing an effective reaction to changes in the learning environment [70]. Also, as a safeguard, cases of the total shutdown of the educational process during the COVID-19 lockdown period have been reported, as is the case of the state of Kuwait [71].

Resilient responses that allowed the utilization of available resources with minimal control rules, enabling more information processing, were more likely to result in a positive transformation. With productive reactions, an organization emerges from adversities as more strengthened, resilient, and prepared. Such an unprecedented event may guide resources and efforts in the educational process toward innovation and capability based on technological evolution, psychological adaptation, etc. [70].

Crick et al. [19] observed two main factors that most helped learners during the pandemic. The first factor is the online learning method, which is reflected in the work–study–life balance, and whether learners express positive impressions of the learning method in a blended (in-person and online) or solely online fashion. The second factor is the institutional efforts to support online learning and how students were able to configure their study environment. Findings from a preliminary study on undergraduate computer science degrees in a U.K. university explored the impact of learner resilience under enforced online learning during the pandemic. The biggest challenges for a first-year undergraduate in computer science were (1) managing mental health issues, (2) maintaining motivation and

focus, and (3) a lack of face-to-face learning and social contact. In addition, a resolution of learning process issues is needed, which includes improving willpower and determination, making a proper work schedule, maintaining minimal contact with friends and family, and accessing academic support.

Despite the challenges caused by global impacts and the educational institution's response to online learning, students were still optimistic. They formed independent study groups, became self-directed, discovered their strengths, and increased efficiency [23]. Students appreciated online learning flexibility, which gave them extra time by avoiding commuting to the educational centers. In this way, in order to provide resilience and successful academic adaptation during the pandemic, educational institutions should evaluate students' studying habits, such as priority recognition and time management [28]. Clum et al. [99] found that contingency plans for institutional support systems and instruction significantly influence educational institutions' capacity to be resilient.

Shefaly et al. [104] consolidated evidence on the experiences of nursing undergraduates and faculty members navigating remote and online education during COVID-19 using a systematic review and meta-synthesis analysis. Their review identified the overarching meta-theme of "Remote and online education: a rollercoaster ride," along with three main meta-themes, highlighting the need for institutions to establish hybrid education as the new normal to support the continuity of learning and optimize learning outcomes. The study underscores the importance of prudence in organizing and delivering a curriculum, teaching, well-being, and the clinical attachment contingencies of healthcare courses with respect to improving the navigation of remote and online education. Furthermore, Keener et al. [94] examined nursing students' resilience and quality of life (QoL) during the COVID-19 outbreak. The QoL of nursing students was positively impacted when they were well prepared for online learning and for experiences in using the given technologies. The results also showed that the QoL improved when students had a designated home workspace (segregated from the living family space and silent, as an example) and were well prepared (trained with minimum knowledge on how to use tools) for online learning.

#### *4.3. Digital Transformation in the Learning Process*

In response to the restrictions in the learning process, digital transformation capabilities are necessary to enhance online activities at all educational levels. Nevertheless, there are many challenges to a complete transformation of digital learning. Without needing to investigate or perform any sort of surveying or analytical thinking, the main obstacle to the spread of resilient online education was equipping students (or even educators) with the necessary resources to facilitate (or even promote) the online learning process. This includes providing adequate or minimal levels of information on communication tool capabilities and computing technologies such as hardware (computers), software (for online communication), pervasive internet connectivity, etc.

Despite the needed information, communication, and computing technology (ICCT) resources, another issue—considered as the biggest bottleneck for remote learning using online channels—was a curriculum that should have been consolidated to increase the following aspects. First, enhancing students' skills and knowledge regarding software and tools is essential. This entails improving their preparedness and readiness by enhancing the available resources, capacities, and capabilities of both students and educators. Second, frameworks related to the pandemic scenario or any contingency mode [24] should be developed, since educators should consolidate their program planning against various emergencies (such as pandemics, disasters, mega-events, etc.) that may impede in-person gatherings without affecting students' willingness to sustain learning at an efficient pace. In this way, students and faculty can be prepared for the outcomes and ripple effects of these emergency periods, which they might have to face again.

Nwati and Thuthukile [25] summarized their reflection on final-year pre-service social science teachers during the pandemic with respect to four significant issues: (i) core subject content knowledge, (ii) academic advising, (iii) pre-service-teacher preparedness and

readiness to teach, and (iv) the implications of teachers' readiness and preparedness to teach after the pre-service stage. In addition, the study showed that the content knowledge received in core subjects during the pandemic was inadequate. Nevertheless, this did not dilute their enthusiasm with respect to becoming professional teachers.

UNESCO [105] expressed concerns and discussed the educational processes' efficiency and resilience during the first academic year of the pandemic. Also, by examining the school's future, educational outcome, and exam method assessments, they reported that 58 out of 84 countries had rescheduled or postponed student exams. At the same time, some countries introduced alternative methods, such as home-based or online examinations, and some held in-person exams (respecting the restrictions of social distancing), while other countries canceled examinations. Practically all face-to-face learning processes and assessments were initially suspended in universities from mid-2020 to mid-2021. To ensure that students graduated on time with degrees of assured quality, different technological solutions were discussed with respect to exams, and they were discussed by considering the health protection of students and examiners.

Cernicova-Buca and Dragomir's [26] findings indicate that students were not ready to shift to online education at a cognitive level during emergency online education. The mixed perception can be explained because of the unexpected characteristic of the learning activity, which shifted abruptly to online processes without preparation. For the first time, courses, such as laboratory-based classes, practical exercises, and seminars, went online, and all assessment activities were transferred from face-to-face practice to the virtual environment. All stakeholders were confused as the duration of emergency remote education was difficult to predict. Students faced many challenges when adapting to new online tools and the uncharted environment from the point of view of the educational process. Chen et al. [106] found that curriculum rigor, the field of study, educators' competency, and technology effectiveness all influence student satisfaction during online learning.

Conway et al. [33] discovered that most first-year medical students in the newest cohort were satisfied with their online education experience. Some advantages of online education include increased learning flexibility by attending online classes and reducing commute time. Also, using chat options offered by remote lectures to ask or answer questions increases effective participation. In addition, online education allowed them to view classes at any time, at their own pace, and at a point in time when they felt most productive. Learning objectives and outcomes were fully met despite challenges and differences in education environments and varying student skills [96].

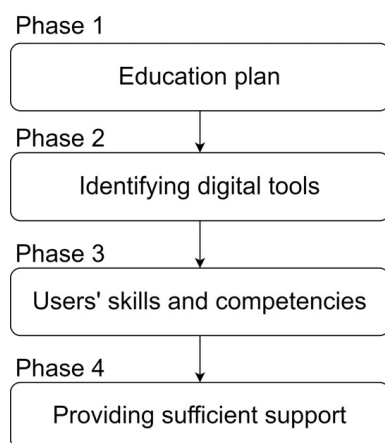
Main et al. [89] explored how the shift from an offline to an online program was received and how satisfied users were with it. Reliable data were gathered using course registration data and questionnaires, and the finding showed that online courses were much more successful than face-to-face training. Participants reported a greater degree of contentment. This indicates that the program's planning, partnerships, and other measures were correct for the online program's transition. In summary, there is a market and a high level of customer satisfaction for online learning; participants have the ability to transfer information and exhibit successfully induced behavioral change. For instance, starting in 2020, Zoom, a communication channel corporation, experienced tremendous growth. Zoom's revenue climbed by 169% annually in the first fiscal quarter, which was impacted by the pandemic; during the next quarter, it increased by 355%. Additionally, with low customer turnover, 81% of that revenue came from new client subscriptions [107].

The primary key to success in the educational process is to ensure that the original pedagogical goals are delivered, even if they are achieved using different methods [32]. Pedagogical goals should be stated clearly, and time management is also crucial since activities take a long time when delivered virtually. In addition, educators can communicate regularly with their students to meet educational objectives and provide feedback on students' projects. Furthermore, they can ensure that students have accessible and fair chances with respect to accessible technology during and between virtual broadcasts.

Educators have been through enormous challenges presented by COVID-19. They converted their classrooms using distance learning as quickly as possible while maintaining the same level of learning quality [47]. Despite the preparedness of the educational institute (by offering needed resources), some instructors and classes were not ready to deal with the situation [49]. Instructors had to quickly change their teaching methods to meet the needs of a new, rapidly evolving group of students (the online students) without any training or preparation. In fact, the most significant effect was how the instructor's creativity potential is trusted, which enabled instructors to develop their own educational framework and gave them the freedom to construct their methodology, particularly with the assistance of their organizations.

In a Filipino junior high school, Miguel et al. [90] stated that classroom management had significant consequences due to the pandemic in the educational sector. In addition, the study provided a practical example that evaluated children's perspectives regarding parental involvement. Furthermore, it examined how students coped with the transition when the 2020–2021 academic year started following almost seven months of being sequestered at home because of the pandemic. In their research study, from eight classrooms in a school grade, the authors randomly selected ten parents and their respective children to participate in the study. Additional questions were also asked relative to the professors in charge of that class. The most significant parental involvement was providing proper physical space and emotional assistance during this period. First, parental participation continued child education and helped in the adaptation to in-home learning. Second, it allowed parents to (1) check children's offline and online channels, (2) explain teachings using the teaching–learning process, and (3) build communication channels with the child to better understand topics at home. This process proved that parents and educators deliberately came up with strategic methods to continue students' learning experiences at home.

Digital innovations during emergency periods have a vital role in learning systems at all educational levels; this is because remote learning tools and methods were unprecedentedly and forcefully adapted (three to four semesters from the beginning of 2020 to 2022). From the literature review proposed in this paper, a framework to support the adoption and adaptation of digital innovations in educational systems was designed. The framework defines the main stages involved in implementing digital education, as summarized in Figure 3, and it incorporates significant contributions and provides insights on the essential transformation stages in digital education, which are crucial to notice.



**Figure 3.** Digital education framework based on meta-analysis literature.

These stages are as follows:

- Phase one: Development of an educational plan

Determine the transformation strategy considering the capacity and capability by selecting the effective learning scheme between a technology-enhanced hybrid or online

learning model. Then, identify the educational service that will be provided, such as the online class and the approved assessment method. Learning outcomes should be determined to design suitable curricula for the selected learning model.

- Phase two: Identification of digital tools

Identify the needed technology regarding each educational process, e.g., if it is based on laboratory classes, team groups, individual exercises, etc. Matching the right technology to the defined strategy is crucial to achieving a high-quality learning process.

- Phase three: Users' skills and competencies

Develop educator and student skills and build up relevant experience. In addition, all related parties that will be part of the learning process, such as parents and assistant educators, depend on the learning strategy.

- Phase four: Supportive resources

Provide sufficient technical support for the used technology to all users, such as contracting companies that are specialized in training remote learning and can provide technical support for the used tools.

This educational framework identifies the main stages for digital transformation in the educational process within the context of published studies in this domain during the COVID-19 pandemic. It also emphasizes that digital education can potentially occupy an advanced position in improving the educational environment despite the need for social distance. This can become a transition to the next generation of education only if the framework of the steps, tools, needed resources, trained personnel, and so forth is properly planned and controlled with respect to both generalized and specific educational perspectives. For the former (in the general case), such a framework is a base that suits primary, secondary, and high-level educational environments. For the latter (in the specific scenario), an atypical design of a high-performance education is necessary to handle the particularities of disabilities in students, laboratory-based classes, and mental distress. In addition, psychological support to motivate teaching–learning building block models can improve the quality of digital educational systems. Ideas with respect to crowdsourcing models and platforms [108,109] and collective intelligence schemes [110] that create synergy among students—the bright competitive side that these models, platforms, schemes, etc., can promote—may be a shortcoming relative to constructing a certain level of learning independence among students.

#### 4.4. Family Support in the New Educational Environment

The pandemic caused depression among students worldwide and created the need to assess depression levels and consequently design coping approaches to reduce the depression effect on students. The spread of depression was slightly lower among medical students, and coping strategies mediated the relationship between depression and educational resilience during the pandemic [20]. In southwestern China, Wang et al. [31] revealed that significant changes in learning patterns and social life cause mental stress and students face inevitable challenges; this was evident among medical undergraduates. The stressors under the pandemic situation were classified into the following stages. First, health-related aspects and psychosocial issues were shown as the main stressors. Second, online learning behavior, specific individual characteristics, and the online learning environment play essential roles in medical students' perceived stress. These results can be considered when constructing online learning courses during public health emergencies and can be considered as a reference for helping faculties in coping with students' problems and reducing stress levels.

It was difficult for families and teachers to facilitate children's distance education when schools were shut down due to COVID-19. The choice of school structure influences the school's capacity to develop home–school collaboration [111]. Some school structures have a reduced capacity for building the collaborative partnerships needed to engage parents in



the learning process, whereas some school structures matched the capacity with learning demand. COVID-19 has significantly impacted the global education system, resulting in widespread learning loss among students. Uğraş et al. [112] reviewed 33 articles published between 2020 and 2023 and found a significant increase in early childhood learning losses, with specific demographic groups experiencing more loss than others. The study highlights the need for targeted interventions to address the unequal impact of the pandemic on students' educational outcomes.

Koskela et al. [87] looked at the parents' views on adapting to the rapid remote schooling transition from a sustainable education viewpoint. An online questionnaire for parents was used to perform the study in the spring of 2020 during the onset of the pandemic. Theory-driven content analysis was used to assess the data. Because of the research study, parents were concerned about their children's education and well-being, as well as their daily routines and the way they used new technologies in education. In addition to facing rapid change, schools, teachers, and social networks played critical roles in helping the students' families when coping with the challenges caused by the pandemic.

In another study, Daniela et al. [86] summarized parental perspectives regarding distance learning and the potential challenges. Primary quantitative data were collected from parents who participated in the study. The result showed that 377 parents reported receiving sufficient information to support their children in distance learning, while 238 said that they had not obtained sufficient information. This means that more support from the educational system, institutes, and administrative staff is required, and it was concluded that, in general, parents supported their children in this crisis. However, this was primarily based on the need to use the new digital technologies in the learning process because students are at risk of not receiving the necessary support. Moreover, this would cause a more significant educational gap if the parents do not use or are not familiar with new learning technology methods.

## 5. The Perspective View and Remarks on Educational System Resilience

Table 5 shows the main challenges that were found in the literature and how they were tackled. On the one hand, there is no ideal solution for the addressed challenges; rather, there are solutions among these challenges (classified as technological, behavioral, or procedural) that can be improved and become a new opportunity in educational settings. On the other hand, there is a need to resume and reform some issues that should be deeply addressed in order to find the best solution, as discussed in the following paragraphs.

**Table 5.** Disturbances and challenges.

Challenges	Students	Educators	Educational Institutions	Parents
Obtain the right technology			↑	
Behavior during online classes	↑↑●	↑↑●		↑●
Examination method	↑↑●	↑↑●	↑↑	
Difficulty in using technology	↑	↑		↑

Note: ↑: need to improve; ↑↑: need to create; ●: human behavior.

COVID-19 created a unique opportunity with respect to using digital transformation innovations that reinforce the teaching and learning system's core value, serving the educational field globally. Technological solutions that were used to support the transition to online learning during the pandemic were critical for building resilience and adapting to the new system. These solutions comprised more than just using digital communication tools; they were essential in enabling educators, students, and parents to quickly adapt and respond to the challenges posed by remote learning. This includes educational system platforms, which are a source of lectures, file databases, software for taking exams with or without the combination of synchronous and asynchronous tasks or evaluations, etc.



The use of technology was addressed intensely in the literature, along with privacy, user experience, reliability, available platforms, and resilience (measures or maneuvers with respect to how to adopt and adapt to the new educational scenario). Technology also incorporates user experiences and how they (the users covered in this paper (students, educators, parents, and educational institutes)) were able to figure out a proper method of evolving in a remote learning environment.

Behavioral issues toward using technology for remote learning are crucial challenges that have to be solved in e-learning. Student behavior during online classes and online examinations is addressed in the literature. It is perceived among educational professionals or peers that there is still space for improvement, and this scenario needs to be addressed more lucidly. Students should receive critical instructions in order to be aware of their responsibility with respect to attendance, attention, and participation during online classes. In contrast, the resilient behavior of educators during the pandemic and their behavioral adoption or adaptation were influenced by their stress levels. Muangmee et al. [113] examined students' behavior toward e-learning tools during COVID-19 by using the unified theory of acceptance and use of technology 2 (UTAUT2) as a lens. The study found that students' intention to use e-learning tools is positively influenced by various factors, including performance and effort expectancy, social influence, facilitating conditions, hedonic motivation, learning value, and social distancing. Furthermore, the paper observed that students experienced difficulties when familiarizing themselves with technology, leading to issues such as computer-based anxiety and a fear of technology.

Additionally, the results highlighted that COVID-19 brought about extremely challenging circumstances for students who had to conform to societal requirements when using online resources for education. A lack of motivation was also identified as a challenge faced by some students when using e-learning tools. Additionally, Rosli et al. [114] conducted a systematic review of the technology acceptance model (TAM) in the context of higher education during the COVID-19 pandemic. Their review reveals gaps in current knowledge, such as limited attention to internal motivation and the need to explore lecturers' perspectives on TAM. Furthermore, it presents future directions for TAM research, emphasizing the importance of qualitative and mixed methods approaches and the exploration of emerging technologies like advanced communications systems and artificial intelligence (AI).

Obrad [48] found that the level of resilience displayed by educators during the shift to e-learning was influenced by the amount of stress they experienced, and educators who experienced higher levels of stress may have had a more challenging time in adapting to the new e-learning environment and may have exhibited fewer resilient behaviors than those who experienced lower levels of stress. According to this, educators' stress levels should be adequately managed by their educational institutions, which can help reduce stress levels and positively affect their behavior. Stress in educators may be intrinsically related to the level of efficiency in the teaching–learning process and uncertainties with respect to the duration of social distancing. Also, the lack of interaction between teachers and peers due to remote learning environments is another challenge for some learners during this period.

Educational procedures should be adapted to teaching and learning global trends. Over the course of the pandemic, there was an explosion in the pace of using e-learning, which represents a new complex method in teaching and learning processes. During the pandemic, e-learning implementation was limited because it focused on developing coping strategies to ensure the continuity of educational processes. Education policymakers should actively start working toward developing policies and associated procedures for digitalized education in order to provide a clear definition of utilization rules and regulatory measures that need to be monitored. This is intended to support the needed accreditation for this type of educational strategy. In this sense, the pandemic created a unique opportunity that allows the reinforcement of the educational system's procedures, and it will have core values that benefit learners, providing global collective benefits and creating a teaching and learning environment without borders regardless of space and

time. With respect to the former, space, education can be provided from any location with internet access during remote learning in both synchronous and asynchronous modes. In the latter, time, the asynchronous (lessons as recorded classes) mode can be considered in the educational strategy.

Parents had to become agents of e-learning during the pandemic and could provide the needed support to their children and fill the learning gap. This situation is welcomed in a general case. Still, it depends on the parents' ability to adapt to several factors, such as technological skills and whether they have enough devices for their children. Daniela et al. [86] reported that parents pointed out that the tasks assigned to the students were complex, and their children could not complete them without proper support from their parents in the first place. This confirms the parent's need for support during e-learning. Parental learning with respect to the tools used to assist their children should be promoted by educational institutions, in alignment with governmental procedures and rules (may be tailor-made for the COVID-19 disease locally).

The literature illustrated how students and educators reacted to most challenges by effectively responding to the learning environment's changes in order to ensure educational continuity. Students frequently voiced concerns about how their new educational environment using the web, communication channels, and online/offline learning (not in person) negatively affected their learning capacity, particularly regarding their ability to focus on tasks when doing homework. Students were expected to attend classes online from their dorm rooms at university residences, from relatives' or friends' houses, or sometimes from their home countries at their parents' houses while educational institutes were closed. One significant challenge was concentrating on learning or tasks while studying alone in a non-educational setting. This was partly because of environmental distractions when they were not in the class. Still, it was also because they tended to multitask during online lectures: for example, cooking at home or looking after children.

Most educators have overcome changes in paradigms, such as when educators implement new teaching approaches using the available technologies. Even now in this post-pandemic stage, educators work to understand the potential of the resources at their disposal. They are not afraid to look for and use technological solutions that, prior to the virus, were considered ancillary; during the pandemic, they were required to teach synchronous and asynchronous classes, share content, correct homework, respond to student questions, and exchange knowledge. Online evaluation needs to be improved to satisfy educators (and even students) using the evaluation methods. Furthermore, the educators should be confident and be assured of proper evaluation methods considering the basic characteristics (fairness, problems that are solvable within the designated time, with or without open books or consultation, and isolated tasks or group tasks). The creativity of the educational or teaching-learning strategy in this unprecedented pandemic (and its inherent social distance effect) was the main constraint in such a tumultuous period.

Parents have fragmented roles in the new educational environment, with remarkable challenges observed among the main players. Information on this could not be comprehensive since the topic lacks thorough literature coverage. Only 2% of the studies in the literature were about parents' role in the educational environment during the pandemic. At the household level, parents highlighted the value of directing themselves toward problem solving in order to handle homeschooling. Parents had to respond swiftly to circumstances that required previous e-learning knowledge and needed the ability to manipulate or assess educational channels, which are variable among parents. For example, this includes scheduling family time, handling the chaos of setting up remote employment and remote learning, or—if both parents have jobs outside of the home—supporting the child's learning at home via distance learning. Also, parents were advised to set up their schedule so that it accommodates all children if their family has numerous children [79]. While some families appeared to suffer, hustled all the time, and complained about their children's inability to study in a quiet environment at home, other families found scheduling to be innovative with respect to establishing regular routines and unambiguous norms. To offset physically

passive distance schooling via information, communication, and computing technology (ICCT) using gadgets (e.g., computers and tablets), parents concentrated on setting meal-times and paying attention to outside activities and exercise. More research is needed to discuss balance with respect to family life while attending a remote school. Also, various memory aids were employed to organize and support the kids' daily activities. Therefore, the performance of children and young people in school depends on the involvement of families in their education. Some critical elements for successful parental engagement and efficiency in supporting students' education during online education, as suggested by the literature, include having high expectations for learning, communicating about pedagogical activities, and promoting study and reading habits.

During the COVID-19 pandemic, several universities were compelled to switch from face-to-face learning to the online delivery of academic activities. Therefore, educational institutions went through a radical re-evaluation of how they delivered learning systems and the educational life of students; these are both constantly influenced by sociocultural, technical, and environmental changes, leading to the construction of resilient learning systems.

Educators and parents play a vital role in the student's educational success; therefore, their relationships should converge. This connection is further intertwined with the function of educational institutions, which (as expected) must provide the framework for learning and teaching under the unusual social distance scenario. By examining the literature on the educational system's participants, we can better understand the challenges and opportunities associated with online education and the methods that can improve the overall learning experience. The lack of research on this relationship should be remedied because investigations on this topic would effectively enhance collaboration between these two actors. This collaboration can result in outcomes such as increased academic achievement, enhanced social-emotional development, and decreased behavioral problems among students. Additionally, effective communication and engagement between educators and parents can (a) cultivate a positive learning environment, (b) boost student motivation, and (c) foster a sense of community within the school. Therefore, educational institutions must establish policies and practices that support and facilitate collaboration between educators and parents in order to maximize student achievement.

Furthermore, the current literature appears to have a gap with respect to examining the specific relationship between parents and educational institutions in the context of online education. While some studies have explored the perspectives and experiences of parents and educational institutions separately, there seems to be a lack of research that investigates the interactions and collaborations between these two important actors in the online educational system. Therefore, there is a need for further research that investigates this relationship and highlights its potential impact on the overall online educational landscape. The relationship that exists between parents and educational institutions is absolutely necessary for the development of successful online education. It is well established that parental involvement in student education is correlated with better academic outcomes, and the same remains true for the online learning process. Engaged parents can offer emotional and academic support, monitor their child's progress, and advocate for their requirements. Educational institutions are responsible for engaging with parents and providing them with the necessary resources and support to ensure their child's success in online education. This can include regular communication channels between parents and educators and workshops and training sessions for parents to understand the online learning environment and to have access to academic support services (when needed).

## 6. Conclusions

In summary, the existing literature emphasized that COVID-19 and the lockdown have caused major disruptions to the learning process. As a result, most educational institutions have moved to online education. Furthermore, the pandemic has affected how distance learning technologies have been utilized in the educational process. Specifically, the use of information, communication, and computing technologies (ICCT) platforms (trained,

tested, followed, etc.) has been affected, individuals adapted to the unprecedented social distance scenario at a global scale within a highly connected society, and the event can be compared to the advent of the internet (1980)—previously the so-called Industry 4.0 age (2012). Because of the emergency remote circumstance, the educational process had a variety of outcomes. Many strategies were implemented by educators (teachers, faculties, instructors, etc.), and while isolated (on their own), the students' abilities had to be counted on in order to adapt to the rapidly changing educational environment (when continuing with the learning process was mandatory regardless of the social distance mandates of COVID-19). This paper explores the educational experiences during this never-before-seen transformational period (within the digital and digitalization ages of Industry 3.0 and Industry 4.0, respectively) by discussing many themes: the challenges faced by educators and students and the coping strategies that the educational institution utilized. In particular, this study discussed the integrated role of parents in supporting child education.

This study highlights the importance of prioritizing educational improvement as a public asset, preventing a generational catastrophe in the preparedness of professionals, and ensuring sustainable educational resilience and recovery (with respect to its resilience). Because of COVID-19, the technologies used in digital learning have advanced and reached new levels that have never been experienced before, so educational institutions should take advantage of this, regardless of whether COVID-19 restrictions end. E-learning commitment affects the level of satisfaction, which, in turn, can positively and significantly influence students' e-learning behavior [115]. Therefore, topics in addition to technological issues and psychological and behavioral problems with respect to the better utilization of e-learning resources must be addressed as well. For example, can we control (in remote learning channels) the period of time during which students can use remote learning channels on the computer? From this, other implications that are out of the scope of this review and perspective study can emerge, such as concerns about privacy and the exposition of particular personal learning efficiency states in a collective intelligence scenario.

Supporting and encouraging educational institutions to adopt and adapt to technology will allow them to (1) become more resilient, inclusive, and equitable; (2) improve the learning process with respect to its general and specific purposes; and (3) build partnerships and innovations that can be catalyzed beyond the pandemic. In the educational system, it is essential to note that success in facing all threats constitutes the achievement of learning continuity. Therefore, the critical lessons that resulted from the attempts to overcome all challenges raised by the pandemic should not be ignored or lost. They should be improved, used, and translated into actions that are directed toward building resilience and implementing organizational strategy changes; advanced technologies can be used to implement organizational strategy changes in order to turn all traditional challenges and barriers into opportunities, and a framework for the concept of digital education in times of crisis can be formulated.

Although most educational institutions overcame teaching and learning online challenges during the transformation, providing an online support desk is still a challenge. Also, extensive investigation is needed to determine the best way to address the significant gaps and discrepancies that have been found in the research area; more in-depth studies are required to show the role of educational institutions and parents in the educational process during emergency periods. In addition, collaboration between parents, educators, and educational institutions enhances the students' learning environment during transformations in the learning environment.

The utilized technology went beyond just providing basic digital communication capabilities and played a vital role in ensuring the continuity of education during a difficult and unprecedented time. Such a new perspective on using technologies in the educational system will go beyond this initial snapshot. This perspective will provide a fuller and more in-depth use of novel technologies in education and follow global digital migration trends from in-person to remote learning.

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