

## The Impact of Digitalisation Strategy in Higher Education: Technologies and New Opportunities

Ahmed Jamah Ahmed Alnagrat<sup>1,2\*</sup>, Rizalafande Che Ismail<sup>3</sup>, Syed Zulkarnain Syed Idrus<sup>1</sup>, Uonis Ali  
Imbayah Abukhatowah<sup>4</sup>, and Valarmathie Gopalan<sup>5</sup>

<sup>1</sup>Faculty of Applied & Human Sciences, Universiti Malaysia Perlis, 01000, Kangar, Perlis, Malaysia.

<sup>2</sup>Department of Computer Science & Information Technology, Higher Institute of Science & Technology, Wadi al-Shati, Fezzan, Libya.

<sup>3</sup> Faculty of Electronic Engineering Technology, Universiti Malaysia Perlis, 02600 Arau, Perlis, Malaysia.

<sup>4</sup>Department of Administrative & Financial Sciences, Higher Institute of Science & Technology, Wadi al-Shati, Fezzan, Libya.

<sup>5</sup>School of Electrical & Computer Engineering, Information & Communication Technology, Xiamen University Malaysia, 43900 Sepang, Selangor, Malaysia.

### ABSTRACT

*Over the last 50 years, worldwide education has grown remarkably at all levels. Historically, these expanded education systems have never faced a greater challenge than COVID-19. The governments have forced the university to switch to online learning and virtual education overnights. As a result of COVID-19's disruptions to learning trajectories, institutions, lecturers, and students will continue to seek flexible ways to mitigate damage. The article incorporates a review of academic and policy literature concerning digitalisation and online learning in universities and how digitisation contributes to universities' development. The article outlines several useful strategies and steps to put into words how to develop a strategy for education during COVID-19. In this article, we explore processes, issues, and impacts of the rapid shift to digitalisation in higher education institutions (HEIs). The method has been used through online search in literature using bibliographic databases from the most relevant publications such as Scopus and Web of Science databases examined based on abstract and key words. This article discusses some of the ongoing issues that HEIs faced when they had to rapidly move their teaching online during the pandemic. For most HEIs and organisations across the globe, COVID-19 has accelerated the speed at which digitalisation and digital ways of working and service delivery include new ways of learning and working such as virtual reality (VR) technology. This has led to a recognition of the need for practically focused, effective inclusive digital interventions. The findings of this study indicate that policies and strategies are important for HEIs to overcome the COVID-19 challenges by using digital learning technology to plan and implement strategies for sustaining educational systems.*

**Keywords:** COVID-19, Higher Education, Strategy, University Education, Virtual Reality

### 1. INTRODUCTION

In a globalised economy, digitalisation is transforming the skills that youth and workers must acquire to succeed. Furthermore, it is impacting how students learn and how institutions deliver education. HEIs across the globe are undergoing constant transformation to respond to the needs of societies and labour markets as digitalisation remains a high priority on national, regional and international agendas. Universities should build capabilities that correspond with the digital age to remain relevant (Núñez-Canal et al., 2022). Many trends in education, government, business,

---

\*Corresponding Author: [guma\\_91@yahoo.com](mailto:guma_91@yahoo.com)

and other institutions have been accelerated by the Coronavirus (COVID-19) pandemic, including the rapid expansion of digital services provided by HEIs. This has required a shift from traditional methods of student support, teaching and research to online methods requiring different skills and processes.

HEIs possess the vision, knowledge, and power to lead transformation and initiate change towards into new paradigm. Due to the COVID-19 outbreak, educators are facing a serious challenge. The evolution of education offers an increasingly digital world and provides universities with new design opportunities through digitisation such as the learning process in the classroom (Bogdandy et al., 2020; Kang, 2021). In other words, digital technologies offer new framework possibilities for didactic action and better achievement of educational goals (Davis, 2017). There is huge evidence for the digitisation of learning and teaching notion that to be understood as a comprehensive change process affects various levels. There are some potentially open questions about the validity of change processes and shift universities referring to digital education and recent changes (García-Morales et al., 2021). There has been an inconclusive debate about whether digital learning does not only relate to individual elements in teaching and improves the learning process. Universities have the opportunity to reposition concepts and develop a strategy to work out in the context of digitisation (Kovalchuk & Sheludko, 2019). In education, digitisation is less about improving what is attempt and tested in the analogue world with digital technology (Wekerle et al., 2022).

The available evidence seems to suggest the best way to change education design is to point out and define strategic development goals and exploit didactic digital technology. In this context, one of our objectives is to be ranked high and as one of the top universities in the world, and quality of education must be at the centre of our strategy. Since it determines whether we are included in QS world university rankings. In universities, digital learning is defined as the provision and use of learning materials and tools using digital learning technologies. Another view is a collective term for all forms of media-supported learning by integrating multimedia and communicative technologies. Consequently, it is considered a central component and essential key for innovation in universities. In parallel, digital technologies are modernising approaches to education. Online learning is currently helping people gain a wealth of skills. Consequently, education's general purpose is changing. As part of the educational process in modern institutions of higher education, students are expected to acquire the ability to think independently, acquire information independently and critically evaluate, rather than accumulating and memorising (Kovalchuk, 2016). As a result, graduates can adapt to both the domestic and global labour markets. Over the last few years, general education has developed innovative processes attached to changing emphasis on teaching disciplines. This is done by transferring knowledge and developing the ability to put it into practice.

Digital technologies are actively used in the educational process to solve this problem. For this reason, universities are increasingly relying on digital formats for teaching and learning in the context of training and further education. The article examines whether HEI strategies meet the demands and expectations required to succeed in digital transformation. It will be very interesting to discover what role digitisation strategies can play post-pandemic when it comes to advancing teaching and learning in universities.

## **2. LITERATURE REVIEW**

### **2.1 Education and COVID-19 Outbreak**

World Health Organisation declared a global pandemic after a new virus (SARSCoV2) and its disease (COVID-19) spread rapidly around the world in the last year. Several countries adopted social distancing rules and stay-at-home measures or lockdowns to reduce the impact of the

pandemic. In addition to disruption in many sectors, these strategies had negative effects on education at all levels. Although the "traditional" (face-to-face) HEIs system was not prepared for the lockdown. Shifting to online education acted quickly and effectively, replacing face-to-face instruction with online classes. COVID-19 has certainly been challenging for education, but it has undoubtedly contributed to the digitalisation of the HEIs system. Over 1.7 billion learners were affected by the pandemic, including 99% of students in low and lower-middle-income countries. Correspondingly, COVID-19 school closures affect 87% of the world's student population (De Giusti, 2020). Distance learning practices are being launched by UNESCO to reach students who are most at risk. In 195 countries, schools and universities have been closed due to the COVID-19 pandemic (UNESCO, 2020). Several studies suggest that remote teaching during a pandemic has a significant role to play (Hughes et al., 2020; Morgan, 2020). Nevertheless, most countries have provided support to teachers and encouraged students to develop their skills via online platforms. A remote strategy for educational continuity requires the availability of resources that can be deployed quickly. Moreover, the range is quite wide in terms of teachers' percentage who allow their students to use Information and Communication Technologies (ICTs) in the classroom.

Distance learning solutions include platforms, educational applications, and tools that are designed to help students and lecturers. In this regard, students can avoid falling behind academically by enrolling in schools that provide massive open online courses, digital learning management systems, and self-directed learning. But in some cases, online education programs are poorly implemented (Morgan, 2015). To avoid this outcome, the International Society for Technology in Education (ISTE) provides guidelines for implementing this type of instruction. A series of recent studies has indicated variations in technology and connectivity available among students. Learners will need to be ready on a variety of levels to teach online remotely during an interruption of in-person instruction. Distance learning is hard for teachers and students in developing countries due to a lack of technology such as internet access, information, and educational materials.

One way to overcome these problems is to use radios, televisions, and online platforms from time to time in developing countries to deliver classes. A solution to this problem is proposed in developing countries that provide textbooks, radios, equipment, and study guides to low-income students. At the start of the academic year in 2020, most developing countries' governments launch a national strategy aimed to enhance the educational process and guarantee continuity of learning. The strategy included remote learning through television, access to digital platforms such as Google, local radio educational programming, and training for teachers to utilise basic ICT skills. This has been widely adopted in the field of education, during the pandemic, television was used to carry on continuity of education.

The problem could be easily tackled by online learning in high education, and schools will be organised systematically to pursue the aspects of technology-based learning. As a result, special arrangements during a pandemic will leave a lasting impression. In this way, all universities will benefit from the mechanisms they have put in place to fulfil their educational and training missions during crises (Daniel, 2020).

## **2.2 Education System Post COVID-19**

Over the past two years, a more general solution has been proposed to prevent the spread of the COVID-19 virus. Clear statements from public governments will be required to raise mass awareness and encourage learners to keep up with the new standards (Ciotti et al., 2020). Many universities have been forced to shift all courses towards online learning and decided to cancel all classes, including all face-to-face classes, laboratories, and other learning activities. During the shutdown, researchers, curriculum designers, education officers, and academic institutions collaborate to transform an educational learning environment. In this context, distance learning,

blended learning, mobile learning, and online learning have been carefully defined by academics, particularly in the field of online and distance learning.

Several studies suggest that researchers and professionals associated with educational technology and instructional design have mostly failed to disseminate the important differences. Previous studies were limited in design strategies and methodologies to recover lost learning beyond COVID-19. Schools and universities that are affected by the COVID-19 pandemic must reorganise to provide students with education in safety space (Alnagrat et al., 2022). This problem is usually overcome by providing all students with Internet access to continue learning and attend classes remotely if appropriate. Additionally, communication will play a crucial role in dealing with this type of situation.

The education system should adopt strategies for teachers and students to respond effectively and efficiently, especially during and beyond COVID-19. This may raise concerns about the education system which can be addressed by planning for a time of crisis when the pandemic ends, which will require students to be flexible and adapt quickly to different learning platforms. Recently, a more general solution has been proposed for developing educational systems, formulating learning strategies, and reforming HEIs for a post COVID-19 period.

One way to overcome this problem is to focus on moving the education system forward through curriculum design, collaborations, talent development, and educational institutions. The didactic design is a central component in the quality assurance of digital and analogue learning opportunities (Kergel & Heidkamp-Kergel, 2020). Accordingly, it is of fundamental importance to give the students tasks that correspond to their previous level of knowledge and are also structured effectively. A major challenge here is to provide a structure to enable individualisation based on learners' level of knowledge or learning needs. Both these works provide a solution to the problem. As part of the didactic design, digital learning motivates learners through comprehensibility of content, solving problems, learning opportunities, feedback, possibility of communication, and collaboration (Aditya, 2021; Lin & Chen, 2017).

Digital learning in education refers to the use of interactive multimedia in the classroom setting and presents several challenges, so universities should design support measures on both a technical and content level (Nadirah et al., 2020). The learning environments and learning processes need to consider organisational design factors. The available evidence seems to suggest that students demand transparency regarding the examinations to be taken, a structured process, and clear communication (Saldanha et al., 2022). The implementation of technical aspects also requires organisational design. In this context, digital learning environments influence learning behaviour based on user-friendliness and functionality (Firat et al., 2018). As a result, students' motivation can also be affected by the technical capabilities of a learning platform.

### **3. METHODS**

In this study, the researcher must rethink various aspects in terms of future directions and strategies to achieve powerful transformations in education. Therefore, we have focused on papers based on a review and analysis of existing literature on digitisation and strategies for HEIs during the COVID-19 pandemic. These solutions are commonly used to help improve educational outcomes for students in universities. In this section, we present PRISMA as shown in Figure 1 which refers to identification of studies regarding to digitalisation and its effects on education during COVID-19 pandemic.

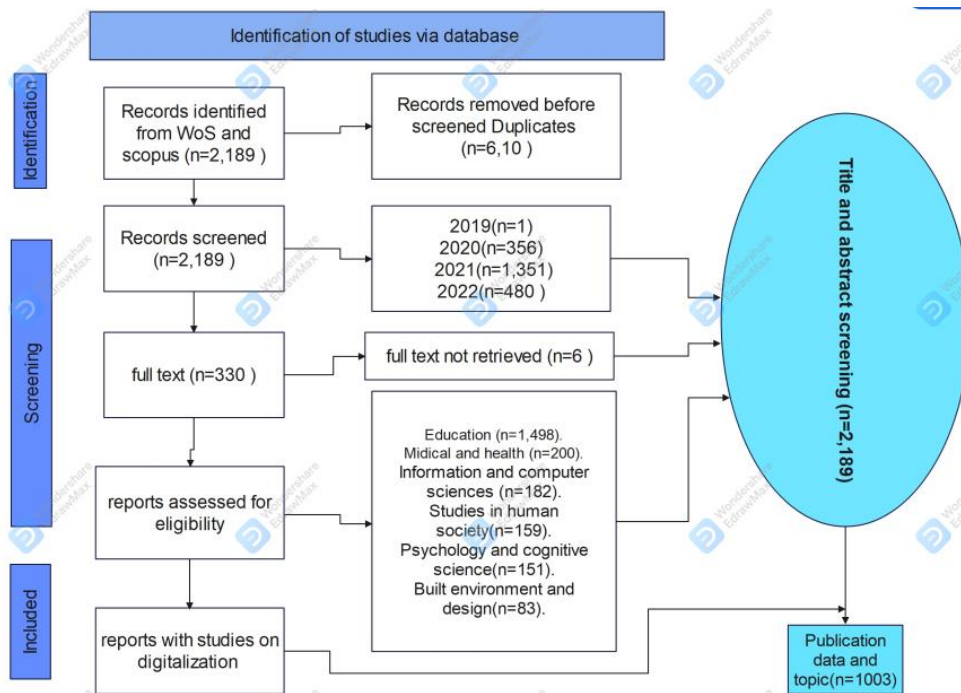


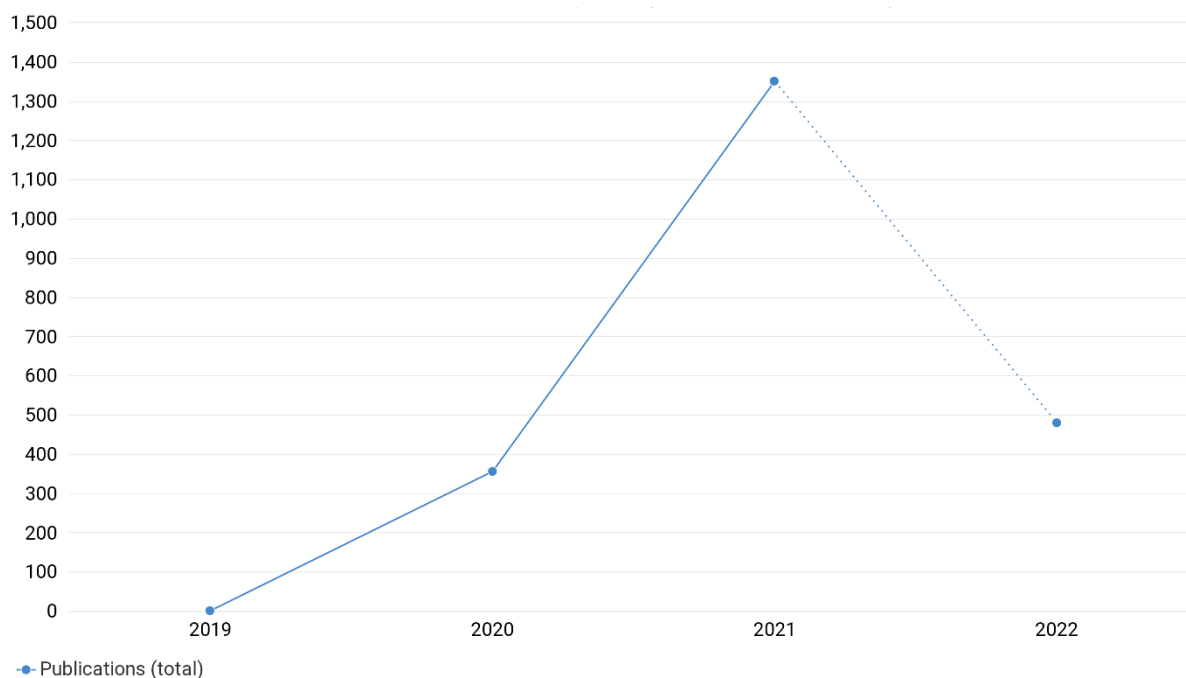
Figure 1. PRISMA Flowchart

### 3.1 Information Sources and Search Strategy

To identify potentially relevant documents, a comprehensive literature search was conducted by the authors in the years of 2019 to 2022 included papers as well as empirical studies by considering relevance in indexing full data including title and abstract in related areas. The search was conducted the main keywords used for the search are followed: Higher Education, Strategy, University Education, COVID-19, and Virtual Reality. The search fields were classified based on the field of research such as education, sustainable development and quality of education. There are approximately 2,188 articles covering the journals' research period from 2019 to 2022 that were included in Scopus databases as shown in Figure 2 which represented and visualisation the number of publications published since 2019 to 2022.

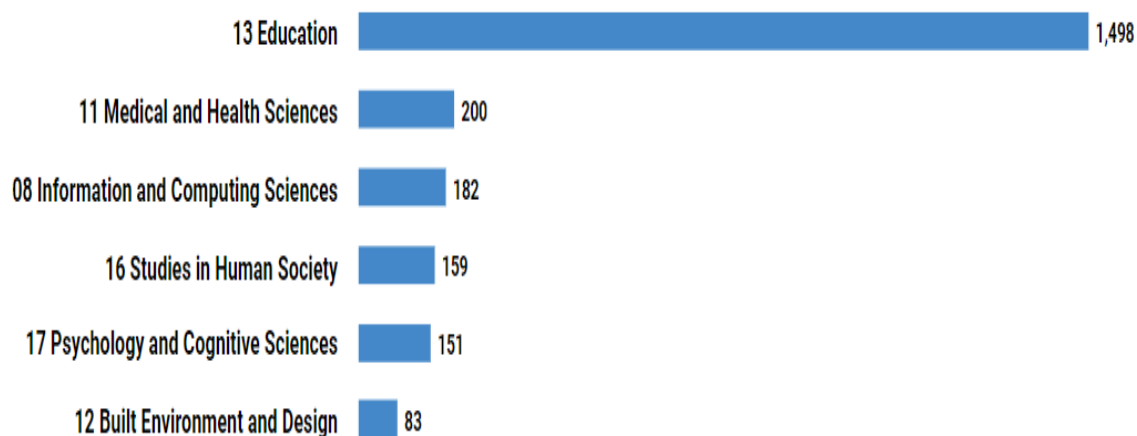
### 3.2 Data Extraction

The data has been collected and extracted from online <https://app.dimensions.ai/>. For all articles, the standard bibliographic information (e.g, title and abstract of the article, year of publication, and journal title), and the exact publication date were extracted. We included papers as well as empirical studies by considering relevance in indexing full data including title and abstract in related areas. In addition, for items included in the systematic review and methodologically relevant information was extracted.



**Figure 2.** Number of Publications Published from 2019 to 2022 (<https://app.dimensions.ai/>)

The total number of publications in 2019 was 1, while in 2020 were gradually increased during a period of rapid change and growth of research to 356 articles. In 2021, research published considerable 1,351 articles; while in 2022 the publication was 480 articles. These publications were checked in the original databases to ensure that legitimate entries were not discounted, and the remaining incomplete entries were removed. The number of publications and a deeper understanding of the process of each research category are shown chart in Figure 3.



**Figure 3.** Research Categories Chart Involves the Classification of Publications

In Figure 4 research categories classification of publications illustrates this by selecting search fields that provide the highest descriptive value which represents education.

Category	Fields of Research
13 Education	1,498
1303 Specialist Studies In Education	1,456
1302 Curriculum and Pedagogy	613
1301 Education Systems	16
1399 Other Education	3

**Figure 4.** Research Categories Classification of Publications

This research aimed to discover how to utilise digitalisation during the pandemic and how to deal with challenges. In this context, it is worthwhile to consider identification of scientific products is important because we can examine the effects of the epidemic on education and physical environments at universities.

#### 4. FINDINGS

The findings in this study are presented in seven sections, with each section's results and details outlined. We conclude with a discussion and conclusion on the main challenges to implementing digitalisation in the field of education. Additionally, we present XR technologies challenges as interactive tools in training, education, teaching and learning.

##### 4.1 Higher Education Strategy

The technology preparedness component is essential and crucial for many strategic plans. Student Outcomes, Pedagogy, Student Life, Planning and Governance are all driven and enabled by technology. While campuses actively invest time, energy, and money into these initiatives. Yet, we found many fails to supply the explicit focus on technology that would drive these initiatives forward at a rate commensurate with their importance to future success, stability, and resilience. Most institutions that have strategic plans indicate that institutions with plans created before 2020 likely face a huge gap in technology due to COVID-19. The gap between pedagogy and technology widened over time. In 2020, the institutional strategic plans revealed a big gap between pedagogy and technology initiatives. The gap has widened, likely due to the upcoming expiration of plans at the end of 2022. When strategic plans are broken down by the capacity of students in the university. One way of recovering from this problem could be a sharper focus on larger universities documenting plans for technological growth and infrastructure. In line with previous studies, investing in technologies that support blended learning and student experience will be critical.

Most of the research in this field is aimed to solve a problem. Consequently, in plans created in 2020-2022, we find the pedagogy/technology gap grew, with smaller institutions 13 % points behind larger ones in developing strategic plans that admit technology. Concerning the role of information technology is rapidly evolving from a cost component into a key contributor to student enrollment, retention, persistence, and outcomes. At this moment in time, a common strategy was used to invest in technologies and infrastructure. The main advantage is to enable student outcomes, it has significant benefits in terms of modernising an institution and reducing the need to disinvest in resource- and time-consuming operations.

In light of current financial constraints, the chief financial officer (CFO) needs to balance and fund innovation that will improve student outcomes and educational return on investment (ROI).

Therefore, the institution's capacity to modernize is dependent on disinvesting in time and resource-hogging operational tasks as well as reinvesting in infrastructure and technologies that increase student outcomes. According to some studies (Ellis et al., 2020; Sarbunan, 2020), a successful transition to online education requires a high level of adaptability, which involves technical and pedagogical assistance, as well as elements for monitoring and evaluating participants. In addition, there is a need for universities to respond to the needs of students, given that online education is a challenge in itself, offering new possibilities for collaboration, training, and communication for the lecturer (Tamah et al., 2020).

Several studies have shown that teachers are concerned about online education, not just with their personal lives, which in the case of a pandemic translates into uncertainty about the safety and health of their families, but also with the impact on their professional lives as educators, and needing support in the use of new educational resources (Trikoilis & Papanastasiou, 2020). Most universities had their online educational platforms when the COVID-19 pandemic was declared, and digitalisation is not a new thing in higher education. However, the digital transformation of HEIs cannot be reduced to online education since online education refers to a variety of educational tools and means, as well as the internet (Adedoyin & Soykan, 2020). There is some evidence that innovation, internet accessibility, and technology growth have contributed to the increased motivation for online education (Wang et al., 2018), while others have argued that the sustainability of online education depends on maintaining direct relationships between students and teachers (Joshi et al., 2020). A recent study distinguished between planned, appropriate online education and courses are taken in response to a disaster (Hodges et al., 2020). Due to the contrast between emergency distance learning and effective and quality online education, researchers referred to online education during the pandemic as 'emergency distance learning'.

#### **4.2 The Impact of COVID-19 Pandemic on the Education System**

Nowadays, the COVID-19 outbreak affects universities, students, and lecturers. Furthermore, laboratories internship and excursions were restricted by academic administration. A survey conducted by (Tadesse & Muluye, 2020) finds that students exhibit high levels of anxiety, depression, and stress during university closures. In this context, employing psychologists in college students may assist educational institutions by enhancing community healing, enhancing learning, and facilitating the recognition of shared including individual trauma (Lawson et al., 2019). As a result, students and teachers return to university and begin to experience the long-term impacts of COVID-19-related traumas, it is an important mitigation and recovery strategy which will be highly respected by all segments of society.

Currently, shifting from face-to-face learning to online distance learning (ODL) platforms is a good opportunity for instructors, students, and their families. Consequently, by introducing online learning platforms such as Google Classroom, Zoom, FlipGrid, Blackboard, Buncee, Edmodo Coursera, TronClass, Udemy, EDx, WeChat group, online training, and collecting information about all courses (Zhu & Liu, 2020). The problem with such an implementation is that families, students, and teachers in developing countries have difficulty using computers as well as other IT equipment at home. The main practical problem that confronts us is the shortage of funds, skills, ICT infrastructure, internet connection, and educational resources, lecturers, students, families, and governments are finding it difficult to shift from face-to-face classes to online learning (Basilaia & Kvavadze, 2020).

#### **4.3 Higher Education in the Digital World**

Digitalisation has been permeating every aspect of academic life and university strategy for decades. Education departments, institutions, providers, and policymakers face a challenge as a result of the digitalisation of education. As higher education ecology changes, digitisation must be understood in the context of social change (Ellis & Goodyear, 2019). As stated by (Kezar, 2014),



digitisation reduces institutional boundaries in universities and integrates global actors into university systems. In recent years, several universities have sought to develop a digital strategy for learning laboratories experiment. During the pandemic, universities had to switch into distance learning in a very short time. In response to the urgency of the external circumstances, digital media were used almost everywhere.

There is now growing evidence that the health situation in the not-too-distant future will allow at least partial returns to the lecture halls. The strategic foundations drive how to respond to emergencies and how experience plays into the future of strategic discourses. The infrastructure was further expanded and classroom learning has been converted to emergency remote learning surprisingly quickly and extensively (Hodges et al., 2020). Several university lecturers have adapted teaching methods to new learning technologies and have worked hard to become familiar with them. Furthermore, scientists in the field of e-learning have been working toward this aim for years with varying degrees of success.

The role of digitisation strategies in education has made it clear that digitisation not only affects the individual teacher in the individual design of their teaching but also means an organisational change process that requires several measures at different levels (Qizi, 2021). Digitisation at universities involves more than introducing new tools and methods, but it also impacts the entire university system. In the digital age, digitisation should not be taken for granted as an end in itself. To achieve their strategic goals, universities need to pursue digitalisation strategy work along with university identity and reputation. Unfortunately, university development is becoming increasingly aware that projects and associated investments are not making sufficient contributions as they are not embedded in a comprehensive strategy.

#### **4.4 Higher Education in the Context of Digitisation**

Digitisation has often been claimed to be affecting higher education. However, there is no evidence to support these claims. In practice, it has now been proven based on a variety of research experiences that digital elements in the university are not implemented simply by providing the necessary technology (Whitelaw et al., 2020). There is often talk about the effects of digitisation on higher education. There is not much supporting evidence currently for some of these theories. In practice, based on numerous project experiences, it has now been shown that the implementation of digital elements in the university does not take place through the mere provision of the appropriate technology (Omar & Almagthawi, 2020). The problem could be easily tackled by introducing new technologies and teaching methods as just one aspect of digitisation at universities (Castañeda & Selwyn, 2018). Furthermore, it affects the entire university, so a multi-layered package of measures is required, which should be based on didactic considerations. Digital platforms are being introduced and anchored in learning to facilitate the development of educational content and instructional methods in the context of digitisation. Universities should design and develop frameworks that allow teachers and students to use digital learning.

The impact of digitisation on universities has been discussed in the literature, mostly in a controversial discussion of whether digitisation will lead to an improvement or deterioration in HEIs (Kerres, 2020). The digitalisation of higher education does not necessarily lead to positive or negative outcomes. This may seem to be a relief or a disappointment. Considering them as a field of design allows them to provide opportunities for change. Universities should be aware of what perspectives they should seek and how they can exploit the opportunities of digitalisation.

#### **4.5 COVID-19 Pandemic Turning Point**

Despite decades of digitalisation efforts at universities, the pandemic represents a turning point. University teaching can take place for a long time without the presence of individuals, which

creates new conditions for strategic discussion in future. Numerous empirical studies have been conducted on the effects from different perspectives. In this context, researchers have found that online course has been able to continue running in university during the spring of 2020 despite moderate organisational difficulties (Karapanos et al., 2021). Furthermore, while online learning platforms provided flexibility, learners every once in a while, missed out on touch with lecturers and fellow students.

The present studies (Mulders & Krah, 2021) note that students show wide differences in their preferences regarding synchronicity, self-structure, collaboration, and digital analogue components. On the other hand, the significant differences in lecturers are also generally satisfied with the increasing digitisation of the teaching process. As a consequence, it is recommended to increasingly rely on blended learning formats in the future. There is a lot of heterogeneity in student experiences. There has been much research on lecturer training that has found students can organise their learning processes, but their learning processes are superficial. During the course, students went through a new normal after emerging from the crisis. Nevertheless, a more precise analysis of these special teaching-learning circumstances is necessary to counteract these rather superficial reflections. The post-pandemic strategies in universities are used to shape the digitisation of learning and training.

#### **4.6 Strategies for Digitising Learning and Teaching**

In recent years, universities have been recommended to strategically operate digitisation in learning and teaching. National and state initiatives are requiring universities to develop digitalisation strategies to address societal or political challenges. Over the last few years, universities have increasingly taken up the task of developing strategies in which they describe their digital transformation goals. The authors show that the change in the ecology of higher education affects a multitude of dimensions and that digitisation must be understood as part of further processes in social change (Ellis & Goodyear, 2019). There is sufficient information presented (Kezar, 2014), digitisation helps to soften the organisational boundaries of the individual universities and to consider the global network of actors and their implications for the university system. However, cultural and social differences in the organisation of higher education, including digitisation, must be taken into account (Chankseliani & McCowan, 2021; Sayaf et al., 2021; Weerts et al., 2014).

A sustainability-oriented strategy for the digitisation of studies and teaching affects at entire university. In this regard, the existing activities in the field of digitisation must be made visible, bundled, communicated, and linked to overarching institution goals. As a part of a general modernisation trend, universities are pursuing the digitisation of learning and teaching (Colombari & Neirotti, 2021). A digitisation strategy geared towards modernisation focuses on optimising processes using digital learning. It is essentially about automating processes using digital technology and simplifying them or putting them together more efficient. University actors are seeking to develop the facility's unique characteristics and make sure that they differentiate themselves from other (competing) providers such as virtual laboratories.

Digital learning technology in the pandemic is being used largely to provide location-independent learning beginning in April 2020. As a result of the escalating external circumstances, there was hardly any time for strategic and conceptual considerations. In the first week of the lockdown, university operations were converting completely to digital learning because of social distancing measures and safety. The pandemic as an external circumstance left few alternatives than the emergency remote teaching mode. In the long term, the pandemic will probably have a limited impact on online learning in the context of digitisation. A growing number of university actors now recognise the importance of a more dedicated approach to digitisation. Pandemics are not just a characteristic of the pandemic time, but also further social, economic, and political development in the transition to the digital era.

#### 4.7 The Current and Future Adoption of Virtual Reality in Education

Since civilisations began, the transfer of knowledge has been a top priority for societies, and education is the foundation of a thriving society (Oluga et al., 2014). The goal of knowledge transfer is to make it easier, faster, and more effective. Digitalisation is transforming our lives, so the education sector must incorporate technology into learning. The process of developing learning and teaching in a world increasingly shaped by digitisation offers universities a wide range of options. Digital technologies offer the potential for better achievement of pedagogical goals from a pedagogical perspective (Alnagrat et al., 2014). Universities today are called upon to strategically operate digitisation in the context of learning and teaching to develop infrastructure. A sustainability strategy affects the entire organization in the context of digitisation and university development. To do this, the existing activities in the field of digitisation in learning and teaching need to be made visible, bundled and communicated. It is critical to link these activities to university priorities and higher-level goals.

Today, extended reality (XR) such as virtual reality (VR), and augmented reality (AR) technologies are worth observing in the coming years because they are accelerating education at the cutting edge (Alnagrat et al., 2021). Hybridisation in HEIs includes consideration of the potential of XR. Future XR adoption will be less reactive and more strategic for these institutions. Implementing VR in education will empower teachers, students, and learning solution providers in overcoming obstacles. However, it helps to understand complex information and acquire the required skills. In addition, it provides unique and engaging ways by presenting an interactive form of lessons for students during the educational process with exceptional experiences. VR and AR have the potential to improve student engagement, which has become one of the most discussed topic issues in digital learning (Childs et al., 2021).

In recent years, VR technology has developed rapidly, and it has also been integrated into many fields, including education. Technology presents an opportunity to enable better learning in the age of digital devices. The evolution of education seems to have taken a logical step forward by introducing VR. The benefit of VR in education, students can benefit from VR in terms of knowledge and interaction. VR education has the potential to transform the way of educational information. It works by generating a virtual environment and allowing users to not only by consider but also interact with it. Integrating an immersive VR app will increase the enthusiasm of learners toward learning. Rather than sitting through a dull lesson in a classroom, learners can become active participants in real life. VR allows students to interact with objects, and teachers in a new way (Raja & Priya, 2021).

HEIs are expected to adopt XR both as a response to broader market growth and as a strategic priority (Chan et al., 2022). XR will be implemented successfully by aligning with institutional missions and building partnerships with faculty. Despite this, there is growth for XR in higher education as these technologies become more accessible, more affordable, and more widely used in our everyday lives. HEIs will have expanded opportunities to align XR capabilities with their strategic priorities as use cases for XR become more apparent; for this reason, there will be an increased need for faculty buy-in and resource investments. XR technologies are being adopted by many institutions, though mostly for isolated purposes. According to the majority of survey respondents, 39% have adopted XR for a few specific projects at an institution as shown in Figure 4. The majority of respondents reported at least some level of XR adoption at institutions, with 12 % reporting adoption across multiple departments and for diverse purposes. Among respondents, 40% indicated that their institutions' XR adoption has increased as a result of the COVID-19 pandemic, which may have affected the current exploration and use of XR in higher education.

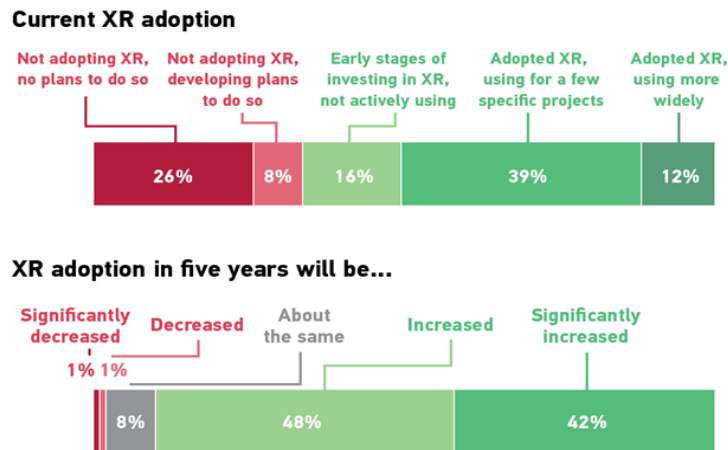


Figure 4. Levels of XR Adoption

Today, we cannot stop XR adoption, regardless of our wishes. Over the next five years, 90% of respondents expect the adoption of XR technologies will increase somewhat or significantly at the institution. There is a strong preference for immersive technologies both among institutions adopting XR and among institutions that do not plan to adopt XR, hinting at a blend of passive and active shifts in how XR is adopted over the coming years. XR will continue to gain ground in many institutions as market and demand increase and these technologies become more commonly embedded in our shared social and educational experiences. Additionally, students will demand on these technologies be available during college. The use of emerging technologies should increase as the technologies become more ubiquitous in our society. Institutions will start integrating XR into their plans and strategies more as a result of intentional actions and investments they are already making. The adoption of XR is being planned by committees and working groups.

## 5. CONCLUSIONS

In our daily lives and work, digital technologies are continuously evolving and becoming more and more integrated. The results of our study indicate that digitalisation has a direct and indirect impact on tertiary education. In this paper, we also sought to identify how universities responded to the COVID-19 pandemic. As a result of lack of interaction, especially with teachers, students feel isolated, as they spend more time at home and in front of the computer, and because of the pandemic, they feel isolated socially. In terms of teaching, an appropriate system would be a hybrid one, that would emphasise the benefits of online education as an important, and also complementary, tool that would help teachers in face-to-face interactions, with the need for adapting teaching methods to students' needs.

In light of the special circumstances since the outbreak of the pandemic, an increased willingness to change can be noted. It is widely acknowledged that the university system is to be developed in the future by digitisation. Meanwhile, concerns have been raised about the possibility of the framework conditions changing suddenly, which could lead to a halt in development. In the university environment, both political decisions and pandemics have direct effects on the structure. To achieve qualitative further development, it is critical to focus on the necessary conditions including technology, organisational, socio-cultural, and economic importance. For sustainable development, public policies in education should also consider investments in digitalisation and new technologies in e-learning, so that public expenditures in these areas increase.

The initial results indicate that most universities with elaborate digitisation strategies have been relatively successful smoothly in transitioning to emergency distance learning. In this regard, it

was helpful that a well-developed technical infrastructure already existed. universities which had already begun a strategic discourse on digitisation of education and learning were able to increase and expand their support structures and exchange mechanisms based on appropriate. On this matter, a few strategic decisions were made in advance that prepared us very well for this moment - and not even strategic decisions were made, technical decisions were simply made, software purchased, training courses already prepared and carried out, which then became more relevant (Chandra Sekaran et al., 2021). In the sense that it was planned for a possible future, which then came about immediately. Based on these findings, public intervention and better funding are needed at all levels of education, but for higher education especially. This is in line with the economic literature which emphasises the positive role of education on the economic growth of sustainable development.

In the recent past, switching to remote learning in an emergency was common in all universities, and reports were made of a high level of agility and willingness to cooperate on the part of those involved within their institutions as well as across universities. During a pandemic, it becomes clear that there is a significant learning effect in the usage of digital technology. It was much less frequent to see didactic breakthroughs that also included a shift in mindset. A long-term strategic perspective was not taken into account when decisions about digitisation in the context of teaching and further education were made during the pandemic. They were mostly concerned with keeping the operation running.

## REFERENCES

- Adedoyin, O. B., & Soykan, E. (2020). Covid-19 Pandemic and Online Learning: The Challenges and Opportunities. *Interactive Learning Environments*, 1–13.
- Aditya, D. S. (2021). Embarking Digital Learning Due to COVID-19: Are Teachers Ready?. *Journal of Technology and Science Education*, 11(1), 104–116.
- Alnagrat, A. J. A., Ismail, R. C., & Idrus, S. Z. S. (2021). Extended Reality (XR) in Virtual Laboratories: A Review of Challenges and Future Training Directions. *Journal of Physics: Conference Series*, 1874(1), 012031. <https://doi.org/10.1088/1742-6596/1874/1/012031>
- Alnagrat, A. J. A., Ismail, R. C., & Idrus, S. Z. S. (2022). *Design Safety Training Using Extended Reality Tracking Tools in Semiconductor Fabrication Laboratory Furnace* (pp. 1041–1046). Springer Singapore. [https://doi.org/10.1007/978-981-16-8129-5\\_159](https://doi.org/10.1007/978-981-16-8129-5_159)
- Alnagrat, A. J. A., Zulkifli, A. N., & Yusoff, M. F. (2014). Evaluation of UUM Mobile Augmented Reality Based i-Brochure Application. *International Journal of Computing, Communication and Instrumentation Engineering*, 2(2), 92–97. <https://doi.org/10.15242/IJCCIE.D0814014>
- Basilaia, G., & Kvavadze, D. (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. *Pedagogical Research*, 5(4).
- Bogdandy, B., Tamas, J., & Toth, Z. (2020). Digital Transformation in Education during COVID-19: A Case Study. *2020 11th IEEE International Conference on Cognitive Infocommunications (CogInfoCom)*, 173–178.
- Castañeda, L., & Selwyn, N. (2018). More than Tools? Making Sense of the Ongoing Digitisations of Higher Education. In *International Journal of Educational Technology in Higher Education* 15(1), 1–10. SpringerOpen.
- Chan, V. S., Haron, H. N. H., Isham, M. I. B. M., & Mohamed, F. Bin. (2022). VR and AR Virtual Welding for Psychomotor Skills: A Systematic Review. *Multimedia Tools and Applications*, 81(9), 12459–12493. <https://doi.org/10.1007/s11042-022-12293-5>
- Chandra Sekaran, S., Yap, H. J., Musa, S. N., Liew, K. E., Tan, C. H., & Aman, A. (2021). The Implementation of Virtual Reality in Digital Factory- A Comprehensive Review. *The International Journal of Advanced Manufacturing Technology*, 115(5), 1349–1366.
- Chankseliani, M., & McCowan, T. (2021). Higher Education and the Sustainable Development Goals. *Higher Education*, 81(1), 1–8.
- Childs, E., Mohammad, F., Stevens, L., Burbelo, H., Awoke, A., Rewkowski, N., & Manocha, D. (2021).

- An Overview of Enhancing Distance Learning through Augmented and Virtual Reality Technologies. *ArXiv Preprint ArXiv:2101.11000*.
- Ciotti, M., Ciccozzi, M., Terrinoni, A., Jiang, W.-C., Wang, C.-B., & Bernardini, S. (2020). The COVID-19 Pandemic. *Critical Reviews in Clinical Laboratory Sciences*, 57(6), 365–388. <https://doi.org/10.1080/10408363.2020.1783198>
- Colombari, R., & Neirotti, P. (2021). Closing the Middle-skills Gap Widened by Digitalisation: How Technical Universities Can Contribute through Challenge-Based Learning. *Studies in Higher Education*, 1–16.
- Daniel, J. (2020). Education and the COVID-19 Pandemic. *Prospects*, 49(1), 91–96. <https://doi.org/10.1007/s11125-020-09464-3>
- Davis, N. (2017). *Digital technologies and change in education: The arena framework*. Routledge.
- De Giusti, A. (2020). Book Review: Policy Brief: Education during COVID-19 and beyond. *Revista Iberoamericana de Tecnología En Educación y Educación En Tecnología*, 26, 110–111.
- Ellis, R. A., & Goodyear, P. (2019). *The education ecology of universities: Integrating learning, strategy and the academy*. Routledge.
- Ellis, V., Steadman, S., & Mao, Q. (2020). Come to a Screeching Halt: Can Change in Teacher Education during the COVID-19 Pandemic be Seen as Innovation? *European Journal of Teacher Education*, 43(4), 559–572.
- Firat, M., Kılınç, H., & Yüzer, T. V. (2018). Level of Intrinsic Motivation of Distance Education Students in e-Learning Environments. *Journal of Computer Assisted Learning*, 34(1), 63–70.
- García-Morales, V. J., Garrido-Moreno, A., & Martín-Rojas, R. (2021). The Transformation of Higher Education after the COVID Disruption: Emerging Challenges in an Online Learning Scenario. *Frontiers in Psychology*, 12, 196.
- Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020). *The difference between emergency remote teaching and online learning*.
- Hughes, M. C., Henry, B. W., & Kushnick, M. R. (2020). Teaching during the Pandemic? An Opportunity to Enhance Curriculum. *Pedagogy in Health Promotion*, 6(4), 235–238.
- Joshi, O., Chapagain, B., Kharel, G., Poudyal, N. C., Murray, B. D., & Mehmood, S. R. (2020). Benefits and Challenges of Online Instruction in Agriculture and Natural Resource Education. *Interactive Learning Environments*, 1–12.
- Kang, B. (2021). How the COVID-19 Pandemic is Reshaping the Education Service. *The Future of Service Post-COVID-19 Pandemic, Volume 1*, 15–36.
- Karapanos, M., Pelz, R., Hawlitschek, P., & Wollersheim, H.-W. (2021). Hochschullehre im Pandemiebetrieb: Wie Studierende in Sachsen das digitale Sommersemester erlebten. *Medienpädagogik: Zeitschrift Für Theorie Und Praxis Der Medienbildung*, 40, 1–24.
- Kergel, D., & Heidkamp-Kergel, B. (2020). *E-Learning, E-Didaktik und digitales Lernen*. Springer.
- Kerres, M. (2020). Bildung in der digitalen Welt: Über Wirkungsannahmen und die soziale Konstruktion des Digitalen. *Medienpädagogik: Zeitschrift Für Theorie Und Praxis Der Medienbildung*, 1–32.
- Kezar, A. (2014). Higher Education Change and Social Networks: A Review of Research. *The Journal of Higher Education*, 85(1), 91–125.
- Kovalchuk, V. (2016). High Education System Challenges in the Context of Requirements of Labour Market and Society. *Scientific Letters of Academic Society of Michal Baludansky*, 88–90.
- Kovalchuk, V., & Sheludko, I. (2019). *Implementation of digital technologies in training the vocational education pedagogues as a modern strategy for modernisation of professional education*.
- Lawson, H. A., Caringi, J. C., Gottfried, R., Bride, B. E., & Hydon, S. P. (2019). Educators' Secondary Traumatic Stress, Children's Trauma, and the Need for Trauma Literacy. *Harvard Educational Review*, 89(3), 421–519.
- Lin, M.-H., & Chen, H. (2017). A Study of the Effects of Digital Learning on Learning Motivation and Learning Outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(7), 3553–3564.
- Morgan, H. (2015). Online Instruction and Virtual Schools for Middle and High School Students:

- Twenty-First-Century Fads or Progressive Teaching Methods for Today's Pupils? *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 88(2), 72–76.
- Morgan, H. (2020). Best Practices for Implementing Remote Learning during a Pandemic. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 93(3), 135–141.
- Mulders, M., & Krah, S. (2021). Digitales Lernen während der Covid-19-Pandemie aus Sicht von Studierenden der Erziehungswissenschaften: Handlungsempfehlungen für die Digitalisierung von Hochschullehre. *MedienPädagogik: Zeitschrift Für Theorie Und Praxis Der Medienbildung*, 40, 25–44.
- Nadirah, N., Asrifan, A., Vargheese, K. J., & Haedar, H. (2020). Interactive Multimedia in EFL Classroom: A Study of Teaching Reading Comprehension at Junior High School in Indonesia. *Journal of Advanced English Studies*, 3(2), 131–145.
- Núñez-Canal, M., de Obesso, M. de las M., & Pérez-Rivero, C. A. (2022). New Challenges in Higher Education: A Study of the Digital Competence of Educators in COVID Times. *Technological Forecasting and Social Change*, 174, 121270.
- Oluga, S. O., Ahmad, A. B. H., Alnagrat, A. J. A., Oluwatosin, H. S., Sawad, M. O. A., & Muktar, N. A. B. (2014). An Overview of Contemporary Cyberspace Activities and the Challenging Cyberspace Crimes/Threats. *International Journal of Computer Science and Information Security*, 12(3), 62.
- Omar, A., & Almaghthawi, A. (2020). Towards an Integrated Model of Data Governance and Integration for the Implementation of Digital Transformation Processes in the Saudi Universities. *International Journal of Advanced Computer Science and Applications*, 11(8), 588–593.
- Qizi, U. S. B. (2021). Digitisation Of Education At The Present Stage Of Modern Development Of Information Society. *The American Journal of Social Science and Education Innovations*, 3(05), 95–103.
- Raja, M., & Priya, G. G. (2021). Conceptual Origins, Technological Advancements, and Impacts of Using Virtual Reality Technology in Education. *Webology*, 18(2).
- Saldanha, D. M. F., Dias, C. N., & Guillaumon, S. (2022). Transparency and Accountability in Digital Public Services: Learning from the Brazilian Cases. *Government Information Quarterly*, 101680.
- Sarbunan, T. (2020). *The Documentary of COVID-19 Education Journey (The Scenario to the Further Scene of Education)*.
- Sayaf, A. M., Alamri, M. M., Alqahtani, M. A., & Al-Rahmi, W. M. (2021). Information and Communications Technology Used in Higher Education: An Empirical Study on Digital Learning as Sustainability. *Sustainability*, 13(13), 7074.
- Tadesse, S., & Muluye, W. (2020). The Impact of COVID-19 Pandemic on Education System in Developing Countries: A Review. *Open Journal of Social Sciences*, 8(10), 159–170.
- Tamah, S. M., Triwidayati, K. R., & Utami, T. S. D. (2020). Secondary School Language Teachers' Online Learning Engagement during the COVID-19 Pandemic in Indonesia. *Journal of Information Technology Education: Research*, 19, 803–832.
- Trikoilis, D., & Papanastasiou, E. C. (2020). The Potential of Research for Professional Development in Isolated Settings during the COVID-19 Crisis and Beyond. *Journal of Technology and Teacher Education*, 28(2), 295–300.
- UNESCO, U. (2020). COVID-19 educational disruption and response. *UNESCO*.
- Wang, P., Wu, P., Wang, J., Chi, H.-L., & Wang, X. (2018). A Critical Review of the Use of Virtual Reality in Construction Engineering Education and Training. *International Journal of Environmental Research and Public Health*, 15(6), 1204. <https://doi.org/10.3390/ijerph15061204>
- Weerts, D. J., Freed, G. H., & Morphew, C. C. (2014). Organisational Identity in Higher Education: Conceptual and Empirical Perspectives. In *Higher education: Handbook of theory and research* (pp. 229–278). Springer.
- Wekerle, C., Daumiller, M., & Kollar, I. (2022). Using Digital Technology to Promote Higher Education Learning: The Importance of Different Learning Activities and Their Relations to Learning Outcomes. *Journal of Research on Technology in Education*, 54(1), 1–17.

- Whitelaw, S., Mamas, M. A., Topol, E., & Van Spall, H. G. C. (2020). Applications of Digital Technology in COVID-19 Pandemic Planning and Response. *The Lancet Digital Health*, 2(8), e435–e440.
- Zhu, X., & Liu, J. (2020). Education in and After COVID-19: Immediate Responses and Long-term Visions. *Postdigital Science and Education*, 2(3), 695–699.