

A Systematic Literature Review of Synchronous E-Learning Challenges in Higher Education Institutions in Developing Nations during the COVID-19 Pandemic

*Tichaona Buzy Musikavanhu - Elizabeth Isabel Scheepers**

Received: February 29, 2024; received in revised form: April 29, 2024;
accepted: April 30, 2024

Abstract:

Introduction: The COVID-19 pandemic has accelerated the transition to online learning, with synchronous e-learning becoming a critical modality in higher education institutions (HEIs) worldwide. This shift, while ensuring educational continuity, has unveiled numerous challenges, especially in developing nations where resources and infrastructure may not adequately support such a rapid transition.

Purpose: This study aims to provide a systematic literature review of the challenges encountered by students in developing nations during the implementation of synchronous e-learning amid the COVID-19 pandemic. It focuses on identifying and analysing technological, pedagogical, infrastructural, socioeconomic, and health-related challenges that have impacted the efficacy of online learning.

Methods: Through a systematic literature review of 43 peer-reviewed studies conducted in developing nations, dated between 2020 and 2022 sourced from the SCOPUS database, this article synthesises findings on the multifaceted challenges faced by HEIs students during the COVID-19 pandemic. The study employs a thematic analysis approach to categorise these challenges and discuss their implications for educational equity, student well-being, and the resilience of higher education systems in developing countries.

Conclusions: The study underscores the need for comprehensive strategies to address the identified challenges, emphasising the importance of infrastructural improvements, pedagogical support, socioeconomic interventions, and health-

* Tichaona Buzy Musikavanhu, Boston City Campus, Department of Marketing and Entrepreneurship, Cape Town, South Africa; tichbuzy@gmail.com; ORCID: 0000-0002-2762-8119

Elizabeth Isabel Scheepers, Boston City Campus, Department of Marketing and Entrepreneurship, Cape Town, South Africa; lizscheepers27@gmail.com; ORCID: 0009-0009-0241-2029

Acta Educationis Generalis

Volume 14, 2024, Issue 3

focused measures. It calls for a collaborative effort among educational institutions, governments, and international organisations to enhance the resilience and inclusivity of e-learning environments, ensuring equitable access to quality education in developing nations during and beyond the pandemic.

Key words: COVID-19, developing nation, synchronous e-learning, higher education institutions; student.

Introduction

The COVID-19 pandemic has precipitated an unprecedented shift in the educational landscape, forcing higher education institutions (HEIs) worldwide to pivot rapidly to online learning modalities (Akhasbi et al., 2021; Ghanizadeh & Yazdi, 2023; Membrillo-Hernández et al., 2021; Merino et al., 2021; Trevisan & De Rossi, 2023; van Wyk et al., 2020). This transition, while necessary, has spotlighted the multifaceted challenges associated with synchronous e-learning (Makruf et al., 2022; Ramirez et al., 2022), particularly in developing nations. These challenges encompass technological, pedagogical, infrastructural, socioeconomic, and health-related dimensions, each contributing to students' complex scenarios. This article aims to provide a comprehensive overview of the challenges students in developing nations encountered during the pandemic.

The rapid adoption of synchronous e-learning, characterised by real-time online teaching and learning activities, has maintained educational continuity during COVID-19 social distancing and lockdown (Koolsriroj et al., 2021; Medeshova et al., 2022). However, this shift has also exposed and exacerbated existing inequalities within the educational sector, revealing significant disparities in access to technology, digital literacy skills, and suitable learning environments (Prabawangi et al., 2021; Tyaningsih et al., 2021). Moreover, the impact of this transition on students' physical and mental health has raised concerns, highlighting the need for a holistic understanding of the e-learning experience during the pandemic (Iatsyshyn et al., 2020; Fernandez et al., 2022).

Amid this dramatic transition, the resilience of educational systems has been tested, particularly in developing nations where digital infrastructure may not be as robust (Holubnychy et al., 2022; Kamba, 2021). The urgency to shift online has precipitated a surge in digital innovation, yet it has also cast a stark light on the chasm between the educational haves and have-nots. This digital chasm extends beyond mere access to hardware and penetrates the realms of quality, content, and delivery of education (Lapitan et al., 2021; Syed et al., 2021; Zainuddin et al., 2022). As HEIs grappled with these immediate concerns, the pedagogical pivot also demanded rapid upskilling of faculty and the development of online curricula that could meet the diverse needs of students

across varying geographical and socioeconomic landscapes. The ad hoc solutions, often adopted out of necessity, presented an array of downstream effects—some beneficial in accelerating educational innovation and others detrimental, potentially entrenching pre-existing educational inequities (Koolsriroj et al., 2021; Medeshova et al., 2022).

This study explores students' challenges in developing nations as they navigate the new normal of synchronous e-learning. By examining the technological, pedagogical, infrastructural, socioeconomic, and health-related challenges, the research aims to shed light on the comprehensive impact of the COVID-19 pandemic on online education. Additionally, this investigation considers the broader implications of these challenges for educational equity, student well-being, and the future of higher education in a post-pandemic world. Through a detailed analysis of existing literature, this article contributes to the ongoing discourse on enhancing the resilience and inclusivity of online learning environments in developing countries.

1 Methodology

This study conducted a systematic literature review to identify and analyse peer-reviewed journal articles that discuss the challenges students face in synchronous e-learning environments in developing countries during the COVID-19 pandemic. Utilising the SCOPUS database as the primary source for literature, the research deployed a keyword search to ensure comprehensive coverage of relevant studies. The search query was formulated as follows: TITLE-ABS-KEY ("Synchronous" AND student AND "Higher Education*" OR HEI AND covid* OR coronavirus) AND PUBYEAR > 2019 AND PUBYEAR < 2023. This initial search yielded a total of 211 documents.

The criteria were modified to include only full journal articles written in English to refine the search results and ensure relevance to the study's objectives. This refinement was achieved through the following expanded query: TITLE-ABS-KEY ("Synchronous" AND student AND "Higher Education*" OR HEI AND covid* OR coronavirus) AND PUBYEAR > 2019 AND PUBYEAR < 2023 AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English")). This filter reduced the number of documents to 176.

After exporting all records to an Excel spreadsheet for meticulous screening, it was determined that only 67 of these studies were conducted within the context of developing nations, aligning with the focal point of this review. A further screening process led to the exclusion of 109 studies for reasons including irrelevance to the study's thematic focus on synchronous e-learning challenges during COVID-19 or studies not conducted in developing countries. Additionally, seven studies were inaccessible due to the research team's limited

academic affiliations restricting to full article retrieval. Upon a detailed reading and evaluation process, 17 articles were further excluded for not centrally addressing student experiences within synchronous e-learning environments.

Ultimately, 43 peer-reviewed journal articles published between 2020-2022 were used in this study. The methodology adopted for this study ensured the rigor and depth of the literature review and highlighted the specificity of the challenges encountered in synchronous e-learning during the COVID-19 pandemic. This approach underscores the critical need for targeted research that informs policy and practice to support equitable and effective online learning experiences in these contexts.

2 Findings

2.1 Number of studies published from 2020 to 2022

Figure 1 below illustrates the number of yearly studies about synchronous e-learning. In 2020, the graph shows a small number of studies, which suggests that the academic response to synchronous e-learning challenges was still in its initial stages. This could be attributed to the onset of the COVID-19 pandemic, where immediate reactions and adjustments to educational methods were more focused on implementation rather than research. The year 2021 shows a significant increase in the number of studies. This peak reflects a heightened academic interest and a response to the continued impact of the pandemic on education. For 2022, there is a noticeable decrease in the number of studies compared to 2021. Overall, Figure 1. highlights the dynamic nature of academic research on synchronous e-learning during the COVID-19 pandemic.

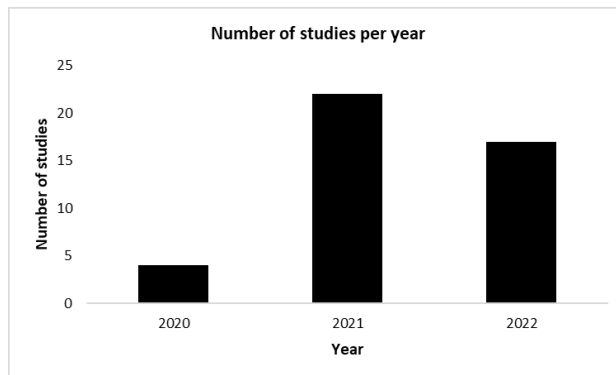


Figure 1. Number of studies per year.

2.2 Number of studies per developing country

Figure 2 shows the geographical distribution and volume of research related to synchronous e-learning challenges in HEIs within developing nations during the COVID-19 pandemic. Notably, Indonesia emerges as the country with the most studies (7), suggesting a significant academic focus that could reflect the country's active response to e-learning challenges during the pandemic. India follows closely with six studies, indicating a similarly robust research interest, potentially correlated with its large higher education sector and population. Moreover, Mexico, South Africa, and Turkey each contribute four studies, a considerable quantity that points to a significant engagement with the topic of e-learning challenges in these regions. Algeria, Colombia, Fiji, Ghana, Kazakhstan, Morocco and Vietnam had the least number of studies (1). The data underscores the need for an in-depth analysis of each country's specific challenges and responses to synchronous e-learning during the pandemic. Understanding these nuances is critical for developing targeted strategies to support effective e-learning implementation and to mitigate the educational disruptions caused by such global health crises.

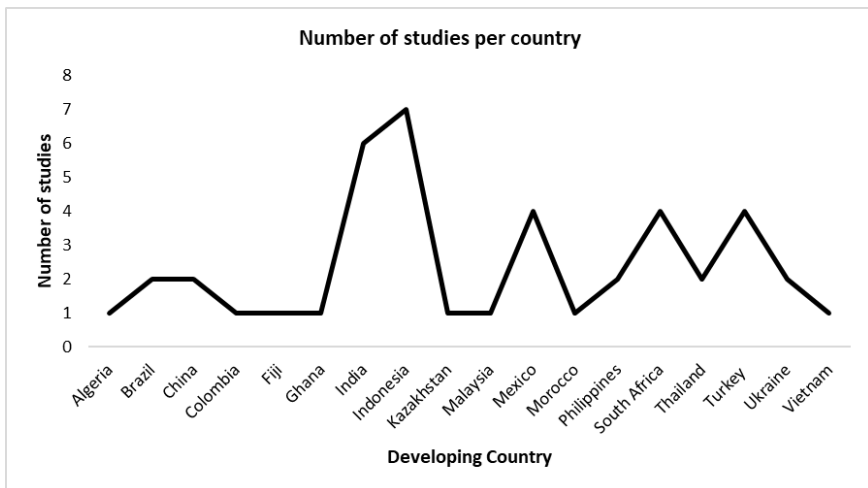


Figure 2. Number of studies per country.

Furthermore, this study has identified a comprehensive range of challenges faced by students, categorised into technological, pedagogical, infrastructural, socioeconomic, and health-related dimensions. These challenges not only hinder

the effective implementation of e-learning but also exacerbate existing inequalities and introduce significant health concerns.

2.3 Technological challenges

2.3.1 Access to devices

A critical barrier identified across various studies is the widespread lack of personal access to essential e-learning tools such as computers, smartphones, or tablets (Zheng et al., 2021; Jiménez et al., 2021; Watanapokakul, 2022). This scarcity of access undermines the foundational premise of synchronous e-learning, which relies heavily on the availability of such devices. Further compounding the issue is the problem of device incompatibility, where students who possess some form of technology find their devices inadequate for engaging with the e-learning platforms and applications mandated by their educational institutions (Tyaningsih et al., 2021; Chikasha, 2022). The inability to access Learning Management Systems (LMS) due to the absence of appropriate electronic gadgets represents a significant hurdle in maintaining the continuity and effectiveness of education during the pandemic (Chikasha, 2022). Moreover, the specific lack of online resources for physical education (PE) highlights a nuanced facet of the broader challenge, pointing to discipline-specific gaps exacerbated by the pandemic (Zheng et al., 2021).

2.3.2 Internet connectivity

The transition to synchronous e-learning in developing nations has brought the issue of internet connectivity to the forefront, revealing it as a critical technological challenge for students during the COVID-19 pandemic. Studies have consistently highlighted that reliable and fast internet connectivity is essential for effective online education delivery. However, the reality for many students in developing nations is a struggle with inconsistent, slow, or expensive internet access, severely impacting their ability to participate in real-time online classes (Prabawangi et al., 2021; Tyaningsih et al., 2021; Watanapokakul, 2022). Technical and financial difficulties were commonly reported among students, with low signal quality cited as a significant barrier to internet access. These technical issues were particularly pronounced in rural and inland areas, where students faced unstable network or signal connections, making online connectivity a persistent challenge (Tyaningsih et al., 2021; Azionya & Nhedzi, 2021). Even with quota assistance provided by some educational institutions, the reach of this support was limited, leaving many students without adequate access to the internet (Tyaningsih et al., 2021).

The issue of internet connectivity was not confined to rural areas alone but also affected students in urban settings and those residing beyond national borders,

indicating a widespread challenge across diverse geographic locations (Chikasha, 2022; Göksu et al., 2021; Merino et al., 2021). The disparity in internet access between urban and rural residents further emphasised the digital divide, with students in rural areas facing more significant obstacles in participating in distance education due to connectivity issues (Göksu et al., 2021; Merino et al., 2021).

The literature consistently identifies inadequate internet access and network issues as major challenges in conducting online learning, with internet connectivity emerging as one of the most significant problems for students attempting to engage in synchronous e-learning (Mandasari et al., 2022; Balderas-Solis et al., 2021). This widespread issue underscores the urgent need for targeted interventions to improve internet access and reliability, particularly in underserved areas, to ensure equitable participation in online education.

2.3.3 Software and platforms

The adoption of e-learning platforms and software is a cornerstone of synchronous e-learning. However, this study reveals that students in developing nations face significant challenges in this area during the COVID-19 pandemic. These challenges encompass difficulties in navigating learning management systems (LMS) such as Moodle and Google Classroom, software licensing and costs issues, and technical support limitations (Tyaningsih et al., 2021; Azionya & Nhedzi, 2021).

One of the key issues identified is the usability of e-learning applications. Students encountered frequent errors with applications due to high traffic volumes, forcing them to switch to alternative platforms. This disrupts the learning process and adds to the cognitive load on students who must adapt to new interfaces and functionalities (Tyaningsih et al., 2021). The bandwidth-intensive nature of video components in e-learning was another significant hurdle, leading to disconnections and a compromised learning experience. This issue underscores the need for bandwidth-efficient e-learning solutions to deliver quality education without requiring high-speed internet (Chikasha, 2022).

Technical issues with LMS software, including glitches and functionality problems, have been reported to affect the user experience, negatively affecting student frustration. Moreover, some students incurred unplanned expenses due to these glitches, highlighting the financial impact of software challenges on learners. The study also points to the problem of device compatibility with educational software. While some institutions offered free access to software like Office 365, the effectiveness of such initiatives was limited by students' devices' capability to support these applications, particularly in terms of RAM requirements (Azionya & Nhedzi, 2021).

Furthermore, the findings suggest that technical issues and usability problems are exacerbated when students rely on mobile devices for distance learning. The limited screen size, processing power, and storage capacity of mobile devices can pose additional challenges in accessing and participating in online courses, affecting the overall effectiveness of e-learning (Göksu et al., 2021).

2.4 Pedagogical challenges

The shift from traditional face-to-face (F2F) learning to online formats during the COVID-19 pandemic has introduced significant pedagogical challenges for students in synchronous e-learning environments, particularly in developing nations.

2.4.1 Adapting learning methods

A substantial challenge identified is students' difficulty learning practical and clinical work online. Disciplines that traditionally rely heavily on hands-on experience, such as physical education, laboratory-based sciences, vocational training, Information Technology, and Chemical Engineering, have been particularly impacted. Students expressed that online learning platforms and methods do not adequately replicate the F2F learning experience necessary for acquiring practical skills (Prabawangi et al., 2021; Zheng et al., 2021; Chikasha, 2022; Iatsyshyn et al., 2020).

The transition to online learning has led to an increased workload, with students reporting excessive assignments that overwhelm their capacity to manage time and maintain academic performance (Prabawangi et al., 2021; Tyaningsih et al., 2021). Furthermore, students highlighted the lack of human and social elements in real-time online lectures, contributing to feelings of isolation, disinterest, and a challenging learning climate (Chikasha, 2022; Zhang & Wu, 2022). The absence of adequate lecturer support and structured guidance in asynchronous settings has exacerbated these challenges, with students struggling to adapt to the 'absence' of the lecturer and the unique demands of self-directed learning pathways (Chikasha, 2022; Merino et al., 2021).

Pedagogical challenges were further compounded by technological and connectivity issues, with students facing difficulties attending live online sessions due to data consumption concerns, unreliable networks, and poor connectivity. These technical barriers hinder students' ability to engage in synchronous e-learning and sustain uninterrupted connections, significantly affecting their overall learning experience (Azionya & Nhedzi, 2021).

2.4.2 Student engagement

Another significant pedagogical challenge identified in the transition to synchronous e-learning during the COVID-19 pandemic is maintaining student

engagement in a virtual environment. The absence of physical presence, a hallmark of traditional classroom settings, has led to a notable decrease in the spontaneity and interaction essential for a vibrant learning atmosphere.

Students have experienced a marked decline in concentration during online meetings, with the high degree of distractions at home, such as noise and the lack of supervision, making it challenging for them to maintain academic integrity (Prabawangi et al., 2021). The shift to remote learning has decreased attention spans, with students struggling to focus, especially during demanding classes (Merino et al., 2021).

The shift to online learning has significantly limited student-to-student and lecturer-student interactions. In many cases, synchronous learning has seen minimal engagement, with students reporting that interaction in real-time lectures was very limited. Factors contributing to this include disabled audio and chat functions during lectures, preventing meaningful exchange and collaboration among students and between students and lecturers (Chikasha, 2022; Mandasari et al., 2022). The lack of direct lecturer-student engagement and the challenges in using platforms like Zoom for interactive sessions have exacerbated this issue, leading to isolation among students (Mandasari et al., 2022; Zhang & Wu, 2022).

2.4.3 Assessment and feedback

A recurrent theme across several studies is the overwhelming number of assignments students must complete across various courses. The high volume of assignments has been reported to cause increased stress and reduced student motivation (Tyaningsih et al., 2021). This issue is compounded by the difficulties in assessing speaking performances and providing feedback through online platforms, which adds to the complexity of the learning environment (Kusumawati, 2020).

The task of assessing student learning and providing timely feedback has proven to be more challenging in an online setting (Jiménez et al., 2021). The inherent limitations of remote assessments, such as ensuring academic integrity and fairness while delivering meaningful feedback, necessitate new approaches and tools (Iatsyshyn et al., 2020). The excessive number of class activities mentioned by some students exacerbates the situation by making it difficult for them to grasp the topics fully, further highlighting the need for a balanced approach to online coursework (Merino et al., 2021).

Technical challenges, including unreliable networks and poor connectivity, have been identified as significant barriers to conducting online assessments effectively. These issues hinder the ability to complete assessments and impact the evaluation process's fairness and integrity (Azionya & Nhedzi, 2021). Moreover, students have expressed frustration and feelings of helplessness

regarding the assessment criteria and requirements, indicating a gap in communication and understanding between educators and learners. This gap can disadvantage students, underscoring the importance of clear guidelines and support (Azionya & Nhedzi, 2021).

2.5 Infrastructural challenges

2.5.1 Electricity and power supply

The unreliable electricity supply is a significant infrastructural challenge impacting synchronous e-learning during the COVID-19 pandemic in developing nations. Students and educators have faced considerable disruptions due to frequent power outages, severely affecting participation in synchronous online sessions and the completion of assignments and examinations (Azionya & Nhedzi, 2021; Chikasha, 2022).

In South Africa, the connectivity issue was exacerbated by electricity load shedding, particularly during the winter months. Network interruptions posed significant challenges for online learning activities, with students often attempting to upload assessments multiple times. Sometimes, these assessments would remain pending for extended periods, causing considerable stress and uncertainty (Azionya & Nhedzi, 2021; Chikasha, 2022). The situation was further complicated by the national electricity service provider, Eskom, conducting rolling blackouts to stabilise the national power grid. Such measures meant that lectures, assessments, or consultations scheduled during blackout periods were inaccessible to many students, preventing their participation or completion of assessments (Azionya & Nhedzi, 2021).

These challenges highlight the critical dependence of synchronous e-learning on reliable electricity and internet infrastructure. The frequent electricity drops experienced by students not only disrupt the learning process and underscore the broader infrastructural inadequacies developed nations face in implementing effective online education (Watanapokakul, 2022).

2.6 Socioeconomic challenges

2.6.1 Economic barriers

The transition to synchronous e-learning during the COVID-19 pandemic has brought to light significant socioeconomic challenges, particularly economic barriers that exacerbate existing inequalities in access to education. A paramount concern among students from developing nations has been the prohibitive costs associated with online learning, including the expenses for devices, data plans, and electricity (Chikasha, 2022; van Wyk et al., 2020).

The need for specific software to perform certain online activities has been highlighted as a considerable financial burden. Additionally, internet access costs

represent a significant financial strain for students, particularly those from low-income families. The high expenses associated with maintaining a stable internet connection for online learning have been noted as a substantial obstacle, with some students describing it as an insurmountable barrier to their educational pursuits (Prabawangi et al., 2021).

The prohibitive data costs emerge as a common theme among students, especially those who do not qualify for government bursaries or bank loans due to their household income falling into a financial gray area. This situation places them in a dilemma between the inability to afford the necessary resources for online learning and the lack of eligibility for financial assistance (Azionya & Nhedzi, 2021). Furthermore, students in rural areas face the compounded challenge of low bandwidth, which affects the quality of their online learning experience and adds to the cost burden due to the need for higher data consumption to compensate for poor connectivity (Rahman, 2022).

2.6.2 Digital divide

The digital divide presents a profound socioeconomic challenge in the context of synchronous e-learning, particularly in developing nations. This divide not only pertains to unequal access to technologies (first-level digital divide) but also extends to the disparities in the development of relevant skills needed for effective internet navigation, information literacy (second-level digital divide), and the varied benefits of technology usage according to socioeconomic status (Azionya & Nhedzi, 2021). The pandemic has exacerbated these divides, revealing stark inequalities in access to education facilitated by digital means.

Monetary constraints further contribute to this divide, with many families in developing countries unable to afford data packages due to decreased incomes during COVID-19 (Prabawangi et al., 2021; Tyaningsih et al., 2021). In South Africa, students reported difficulties adapting to the online environment, highlighting a general lack of digital literacy. Challenges included problems uploading assessments in the correct format to learning management systems and navigating these platforms effectively. The diversity in the virtual spaces created by different lecturers for various purposes added to the confusion and complexity of the online learning environment (Chikasha, 2022).

Rural areas, in particular, suffer from a lack of technological development, significantly limiting access to online education. This issue is not isolated to any single region but is a common problem across many developing countries (Fernandez et al., 2022; Rahman, 2022). The shift to online learning has intensified pre-existing inequalities, with students from disadvantaged backgrounds or those with special educational needs facing additional barriers in accessing and participating in online learning (Iatsyshyn et al., 2020).

South Africa's situation exemplifies how income and wealth inequalities can further accentuate digital divides, making it one of the most unequal societies globally regarding access to digital resources. The lack of material access, involving physical access to the internet, and the costs associated with hardware, software, and service represent a commonly mentioned aspect of the digital divide (Azionya & Nhedzi, 2021). Additionally, insufficient technical know-how among students has been identified as a significant challenge in the effective implementation of online education (Rahman, 2022).

2.6.3 Household environment

The household environment has emerged as a critical factor influencing students' ability to engage effectively in synchronous e-learning during the COVID-19 pandemic. Crowded living conditions and noise pollution within the home and from surrounding areas, particularly in high-density residential areas and informal settlements, have significantly impacted students' learning experiences. These conditions have made it difficult for students to participate in synchronous lectures, forcing them to rely on recorded lectures, which they often have to access late at night when their surroundings are quieter (Tyaningsih et al., 2021; Chikasha, 2022).

Additionally, the shift to online learning has exacerbated the challenge of balancing academic and domestic responsibilities, with women, in particular, facing lower levels of motivation to join online courses due to increased familial and domestic duties during the pandemic. This disparity underscores the gendered impact of the pandemic on education, where students, especially women, struggle to juggle their academic obligations with increased household responsibilities (Göksu et al., 2021).

Students living in poverty and informal settlements face especially dire conditions, characterised by overcrowding, poor living conditions, lacking basic amenities like water and sanitation, and sometimes electricity. These environments, often densely populated and plagued by high levels of violence and crime, create non-conducive study environments that severely hinder students' ability to participate in live, scheduled contact sessions and maintain focus during their studies (Azionya & Nhedzi, 2021).

The diverse socioeconomic backgrounds of students have led to varied complaints about distractions within their home environments. Interruptions and home responsibilities have heightened the inability of affected students to fully participate in synchronous learning activities, with many lamenting the lack of a quiet and private space to study and engage in class activities (Azionya & Nhedzi, 2021).

2.7 Health challenges

Synchronous e-learning during the COVID-19 pandemic has also posed significant health challenges for students. Students have reported experiencing various physical health issues, including tired and sore eyes from prolonged screen exposure and back pain from extended periods of sitting in front of laptops (Tyaningsih et al., 2021; Balderas-Solís et al., 2021). The increased workload, characterised by many assignments, has also led to sleep deprivation among students, further exacerbating their physical health challenges (Tyaningsih et al., 2021).

Mental health and emotional well-being have been significantly impacted by online learning. The constant struggle with network connectivity, especially during assessments and examinations, has caused considerable stress and anxiety among students (Chikasha, 2022). The necessity for some students to use internet cafes, malls, or other people's homes for internet access introduced additional stress, particularly concerning COVID-19 transmission risks (Chikasha, 2022).

A notable sense of isolation was experienced by students engaged in synchronous learning, attributed to the lack of lecturer-student and student-student interaction and collaboration. The absence of video components in online learning, necessitated by data limitations, further exacerbated feelings of isolation, making students feel alone and disconnected in virtual classrooms (Chikasha, 2022; Fernandez et al., 2022).

Research indicates significant positive correlations between stress, anxiety, depression, and distance learning motivation, suggesting that students may experience heightened levels of these mental health issues in the context of distance education during a pandemic (Göksu et al., 2021). The compounded effects of isolation, increased screen time, and the overall stress of the pandemic situation contribute to feelings of anxiety, depression, and burnout (Iatsyshyn et al., 2020).

Conclusions

This study has provided a systematic literature review of the challenges encountered by students in developing nations during the transition to synchronous e-learning amid the COVID-19 pandemic. The analysis has delineated these challenges into five primary categories: technological, pedagogical, infrastructural, socioeconomic, and health-related. The technological challenges highlighted issues related to access to devices, internet connectivity, and the usability of e-learning platforms (Tyaningsih et al., 2021; Chikasha, 2022). Pedagogically, the shift to online learning has revealed significant gaps in student engagement, the adaptation of teaching methods, and the effectiveness of assessment and feedback mechanisms (Zheng et al., 2021; Prabawangi et al., 2021). Infrastructurally, the unreliable electricity supply

emerged as a critical barrier (Azionya & Nhedzi, 2021), while socio-economically, the digital divide and economic barriers have exacerbated existing educational inequalities (Azionya & Nhedzi, 2021; Prabawangi et al., 2021). Health-related challenges, particularly those concerning mental well-being and physical strain, have underscored the need for a more holistic approach to online education (Göksu et al., 2021; Iatsyshyn et al., 2020).

The implications of these findings are profound, calling for a concerted effort from policymakers, educational institutions, and international organisations to address these multifaceted challenges. There is a critical need for strategies that mitigate the immediate impact of these challenges and lay the groundwork for a more resilient and equitable educational landscape in the post-pandemic world. This includes investments in technological infrastructure to ensure widespread access to reliable internet and digital devices, pedagogical reforms to enhance online teaching and learning practices, infrastructural improvements to guarantee stable electricity supply, and socioeconomic interventions to bridge the digital divide and alleviate economic burdens on students and their families.

Moreover, the health-related challenges associated with synchronous e-learning demand attention to students' physical and mental well-being, emphasising the importance of integrating health-conscious practices into online learning environments. This comprehensive approach is essential for fostering an educational ecosystem that is responsive to the challenges posed by the pandemic and resilient in the face of future crises.

The COVID-19 pandemic has acted as a catalyst, accelerating the adoption of synchronous e-learning across developing nations and unveiling significant challenges that hinder equitable access to quality education. Addressing these challenges requires a multifaceted approach encompassing technological enhancements, pedagogical innovations, infrastructural upgrades, socioeconomic supports, and health-focused interventions. The lessons learned during this period must inform the evolution of online education, ensuring that it becomes a more inclusive, effective, and sustainable modality for learners around the globe.

References

- Akhasbi, H., Belghini, N., Riyami, B., Benitto, M., & Gouttaya, N. (2021). Moroccan higher education at the time of Covid-19: Issues and challenges: A case study among master students business administration at IGA Casablanca. *International Conference on Computer Supported Education, CSEDU - Proceedings*, 2, 73-85. <https://doi.org/10.5220/0010438700730085>
- Azionya, C. M., & Nhedzi, A. (2021). The digital divide and higher education challenge with emergency online learning: Analysis of tweets in the wake of the COVID-19 lockdown. *Turkish Online Journal of Distance Education*, 22(4), 164-182.

Acta Educationis Generalis
Volume 14, 2024, Issue 3

- Balderas-Solís, J., Roque-Hernández, R. V., Salazar-Hernández, R., & López-Mendoza, A. (2021). Experiences of undergraduates' emergency remote education in Mexico. *Cogent Education*, 8(1). <https://doi.org/10.1080/2331186X.2021.2000846>
- Chikasha, J. (2022). Learning online amid COVID-19 pandemic: Exploring students' lived experiences. *Multidisciplinary Journal of Educational Research*, 12(2), 198-220. <https://doi.org/10.4471/remie.9710>
- Fernandez, C. J., Ramesh, R., & Manivannan, A. S. R. (2022). Synchronous learning and asynchronous learning during COVID-19 pandemic: A case study in India. *Asian Association of Open Universities Journal*, 17(1), 1-14. <https://doi.org/10.1108/AAOUJ-02-2021-0027>
- Ghanizadeh, A., & Yazdi, M. M. (2023). Resilience in virtual education: Designing and validating a scale in higher education. *ExELL*, 11(2), 172-197. <https://doi.org/10.2478/exell-2023-0011>
- Göksu, İ., Ergün, N., Özkan, Z., & Sakız, H. (2021). Distance education amid a pandemic: Which psycho-demographic variables affect students in higher education? *Journal of Computer Assisted Learning*, 37(6), 1539-1552. <https://doi.org/10.1111/jcal.12544>
- Holubnycha, L., Besarab, T., Pavlishcheva, Y., Kadaner, O., & Khodakovska, O. (2022). E-learning at the tertiary level in and after pandemic. *Acta Paedagogica Vilnensia*, 48, 47-60. <https://doi.org/10.15388/ActPaed.2022.48.3>
- Iatsyshyn, A. V., Hubeladze, I. H., Kovach, V. O., Kovalenko, V. V., Artemchuk, V. O., Dvornyk, M. S., Popov, O. O., Iatsyshyn, A. V., & Kiv, A. E. (2020). Applying digital technologies for work management of young scientists' councils. In *Conference: 8th Workshop on Cloud Technologies in Education* (pp. 124-154). Retrieved from <http://ceur-ws.org>
- Jiménez, H. G., Casanova, M. A., Finamore, A. C., & Simões, G. (2021). Sentiment analysis of student surveys - A case study on assessing the impact of the COVID-19 pandemic on higher education teaching. In *The 11th International Conference on Educational Data Mining* (pp. 353-359). Retrieved from <https://educationaldatamining.org/edm2021/>
- Kamba, R. K. (2021). Teaching through a Pandemic: Classes of Khallikote University go on air and online. *Library Philosophy and Practice (e-Journal)*, 1-12. Retrieved from <https://digitalcommons.unl.edu/libphilprac>
- Koolsriroj, U., Diteeyont, W., & Sutthinarakorn, W. (2021). Transforming learning activities at the faculty of education during the COVID-19 situation. *AsTEN Journal of Teacher Education*, 1, 1-1.
- Kusumawati, A. J. (2020). Redesigning face-to-face into online learning for speaking competence during COVID-19: Esp for higher education in Indonesia. *International Journal of Language Education*, 4(2), 276-288. <https://doi.org/10.26858/ijole.v4i2.14745>
- Lapitan, L. D., Tiangco, C. E., Sumalinog, D. A. G., Sabarillo, N. S., & Diaz, J. M. (2021). An effective blended online teaching and learning strategy during the COVID-19 pandemic. *Education for Chemical Engineers*, 35, 116-131. <https://doi.org/10.1016/j.ece.2021.01.012>

Acta Educationis Generalis
Volume 14, 2024, Issue 3

- Makruf, I., Rifa'i, A. A., & Triana, Y. (2022). Moodle-based online learning management in higher education. *International Journal of Instruction*, 15(1), 135-152. <https://doi.org/10.29333/iji.2022.1518a>
- Mandasari, B., Rido, A., & Kuswoyo, H. (2022). Using zoom meeting platform as a synchronous online learning tool in EFL classroom at Indonesia tertiary level: A literature review. In *19th International Conference on Cognition and Exploratory Learning in Digital Age* (pp. 291-294).
- Medeshova, A., Kassymova, A., Mutalova, Z., & Kamalova, G. (2022). Distance learning activation in higher education. *European Journal of Contemporary Education*, 11(3), 831-845. <https://doi.org/10.13187/ejced.2022.3.831>
- Membrillo-Hernández, J., García-García, R., & Lara-Prieto, V. (2021). From the classroom to home: Experiences on the sudden transformation of face-to-face bioengineering courses to a flexible digital model due to the 2020 health contingency. *Advances in Intelligent Systems and Computing*, 1329, 488-494. https://doi.org/10.1007/978-3-030-68201-9_48
- Merino, D. E., Mondragón, D., Antonio, L., Corona, C., Aldana-Pérez, C. A., Chong-Quero, J. E., Chong-Quero, J. E., Esqueda-Merino, D., & Calvillo-Corona, L. A. (2021). "Speed-dating" as a learning method in online synchronous classes. In *22nd Working Conference on Virtual Enterprises* (pp. 674-682). https://doi.org/10.1007/978-3-030-85969-5_63i
- Ramirez, M. A., Punongbayan, J. K. P., & Revilla, J. K. P. (2022). Evidence of productivity recovery among undergraduate industrial engineering students during the Covid-19 pandemic in the Philippines. *Global Journal of Engineering Education*, 24(2), 88-94.
- Prabawangi, R. P., Fatanti, M. N., & Ananda, K. S. (2021). After a year of online learning amid the COVID-19 pandemic: A survey of Indonesian undergraduate students' opinions and behaviors. *Asian Journal of University Education*, 17(4), 418-431. <https://doi.org/10.24191/ajue.v17i4.16211>
- Rahman, A. (2022). Mapping the efficacy of artificial intelligence-based online proctored examination (OPE) in higher education during COVID-19: Evidence from Assam, India. *International Journal of Learning, Teaching and Educational Research*, 21(9), 76-94. <https://doi.org/10.26803/ijlter.21.9.5>
- Syed, K., Kandakatla, D., Yadav, R., & Himasagarika, R. (2021). Responding to COVID-19 and transitioning to online learning: Evaluation of an institution wide capacity building efforts on technology-enhanced learning. *Journal of Engineering Education Transformations*, 34.
- Trevisan, O., & De Rossi, M. (2023). One year later: Digitalised higher education in pandemic times. An international study of higher education faculty's response. *Research on Education and Media*, 15(1), 64-71. <https://doi.org/10.2478/rem-2023-0009>
- Tyaningsih, R. Y., Arjudin, Prayitno, S., Jatmiko, & Handayani, A. D. (2021). The impact of the COVID-19 pandemic on mathematics learning in higher education during learning from home (LFH): Students' views for the new normal. *Journal of Physics: Conference Series*, 1806(1). <https://doi.org/10.1088/1742-6596/1806/1/012119>

Acta Educationis Generalis
Volume 14, 2024, Issue 3

- van Wyk, B., Mooney, G., Duma, M., & Faloye, S. (2020). Emergency remote learning in the times of covid: A higher education innovation strategy. In *Proceedings of the European Conference on E-Learning, ECEL, 2020-October* (pp. 499-507). <https://doi.org/10.34190/EEL.20.120>
- Watanapokakul, S. (2022). Blended online learning: Perceptions and experiences of EFL university students and teachers. *REFlections*, 29(1), 60-87.
- Zainuddin, Z., Farida, R., Keumala, C. M., Kurniawan, R., & Iskandar, H. (2022). Synchronous online flip learning with formative gamification quiz: Instruction during COVID-19. *Interactive Technology and Smart Education*, 19(2), 236-259. <https://doi.org/10.1108/ITSE-01-2021-0002>
- Zhang, K., & Wu, H. (2022). Synchronous online learning during COVID-19: Chinese university EFL students' perspectives. *SAGE Open*, 12(2). <https://doi.org/10.1177/21582440221094821>
- Zheng, W., Ma, Y. Y., & Lin, H. L. (2021). Research on blended learning in physical education during the COVID-19 pandemic: A case study of Chinese students. *SAGE Open*, 11(4). <https://doi.org/10.1177/21582440211058196>