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Diffusing student performance in using blended learning models in higher learning

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Background: Global education systems underwent a dramatic transformation due to the COVID-19 pandemic, forcing a sudden shift to online and hybrid learning methods. Understanding the long-term impacts of blended learning on student performance and engagement is still essential as educational institutions work through the post-pandemic recovery in countries such as South Africa.
Objectives: The study aims to assess the degree of integration of blended learning into higher education institutions (HEIs) in South Africa post pandemic.
Methods: The study used a systematic literature review (SLR) method, consulting a wide variety of academic publications from Sabinet, Springer, Emerald, Science Direct and Google Scholar, to conduct a critical analysis of blended learning approaches in higher education in South Africa.
Results: Results indicate that addressing structural deficiencies in training, infrastructure, and institutional support is necessary for successful implementation to ensure equitable access, participation, and improve student performance.
Conclusion: The research paper shows how blended learning significantly affects student performance, yielding mixed findings; some report that flexibility and participation lead to better results, while others highlight issues with self-regulation and unequal access to resources. For blended learning to reach its full transformative potential, South African institutions must prioritize comprehensive faculty training, equitable digital access, and targeted support systems that bridge pedagogical and technological gaps, thus creating inclusive and stimulating learning environments for all students.

KEYWORDS

blended learning, COVID-19 impact, information technology, students, performance, post-pandemic education

1 Introduction

An unexpected shift in higher education was brought about by the COVID-19 pandemic, forcing institutions all over the world to quickly implement remote emergency teaching techniques (Hongxu and Isa, 2024). Mphuthi and Tshelane (2023) emphasized that this shift in South Africa's higher education system revealed and made long-standing structural disparities worse, while also opening doors for innovative teaching practices. For this study to address the ongoing issues of access, quality and equity in South African higher education, blended learning models which deliberately blend in-person and virtual learning components have become a potentially revolutionary strategy as institutions now negotiate the post-pandemic environment (Paschal et al., 2024).

A study by Lu and Wang (2022) found that blended learning, which offers flexibility and individualized learning experiences, was already becoming popular as a novel

educational strategy before the epidemic. Hence, disparities in digital access, self-regulation abilities, and instructor readiness were revealed by the abrupt switch to remote emergency learning, although this could have long-term effects on student achievement. On the other hand, the ability of blended learning models to successfully reengage students, close learning gaps, and improve academic achievements must be evaluated by educators and policymakers in the post-epidemic phase (Luvalo, 2024). According to research by Hua and Wang (2023), some students do well in hybrid situations because they have more autonomy; however, others have trouble interacting with others and are not always engaged.

The importance of this study stems from its contextual focus on South Africa's higher education system, which offers unique potential and obstacles for the adoption of blended learning. The study aims to provide a sophisticated understanding of how blended learning might be maximized to improve educational outcomes in resource-constrained situations by examining institutional case studies and student experiences across various universities. Mphuthi and Tshelane (2023) highlight that important insights into the practical realities of adopting blended learning at scale are offered, which is crucial as South African institutions strive to meet the objectives outlined in the Department of Higher Education and Training's Digital Transformation Framework. To contribute to more inclusive and efficient higher education delivery in the post-pandemic era, the research ultimately aims to inform institutional strategies that can maximize the potential of technology-enhanced learning while reducing the risk of further marginalizing underprivileged students.

This study's theoretical framework is based on constructivist learning theory, specifically social constructivism, which highlights how students actively create knowledge through interactions with their classmates, teachers, and surroundings. This approach is supported by blended learning, which combines in-person and virtual cooperation to enable students to participate in purposeful, independent learning while gaining access to tutoring and social interaction (Jansen, 2019). Furthermore, this research is supported by the Community of Inquiry (CoI) framework, which emphasizes the value of social presence, cognitive presence, and teaching presence in blended environments to guarantee collaborative and intellectually engaging learning. The study offers a greater knowledge of how blended learning might improve educational outcomes in South Africa, where resource constraints and a variety of learning requirements necessitate flexible yet organized pedagogical approaches. This is achieved by integrating these theories.

2 Underpinning theories and literature review

2.1 Constructivism

Bada and Olusegun (2015) define constructivism as a phrase that describes the notion that students create their own knowledge; that is, each learner creates meaning on their own and in social contexts. There is no other type of learning except the construction of meaning. This viewpoint has two significant ramifications: first, while considering learning, we must consider the student rather than the subject or lesson that needs to be taught. No knowledge exists apart from the meaning that the learner or community of learners constructs from experience.

2.2 Community of inquiry

This study is supported by the Community of Inquiry (CoI) framework, which emphasizes the value of social presence, cognitive presence, and teaching presence in blended environments to guarantee collaborative and intellectually engaging learning. The study offers a greater knowledge of how blended learning might improve educational outcomes in South Africa, where resource constraints and a variety of learning requirements necessitate flexible yet organized pedagogical approaches. Halverson et al. (2023) emphasize that to provide a meaningful educational experience, blended learning's Community of Inquiry (CoI) framework stresses the integration of three interdependent elements: social presence, cognitive presence, and teaching presence. While instructional presence entails the planning, directing, and facilitating of learning activities, social presence encourages cooperation and connections among students, and cognitive presence encourages critical thinking and knowledge production. In support of the above, Means et al. (2013) postulate that a cohesive and dynamic learning environment that fosters in-depth comprehension and community building is created when CoI uses both online and in-person interactions to improve student engagement. This allows students to engage asynchronously through discussions while still receiving in-person guidance.

2.2.1. Social presence

Zaugg et al. (2021) assert that the ability of students to portray their social and emotional selves within a learning community is known as social presence. This entails fostering a feeling of community and connection between teachers and students in blended learning, whether through in-person or virtual interactions. Thus, building social presence is facilitated by tactics including cooperative projects, icebreaker exercises, and frequent feedback. Students are guaranteed to have meaningful conversations and create a positive learning environment when they are at ease expressing themselves and communicating with their peers.

2.2.2 Cognitive presence

The degree to which students can create meaning through discussion, introspection, and critical thinking is known as cognitive presence. Structured activities like online chats, problem-based learning, and reflective tasks help to promote cognitive presence in blended learning. By asking difficult questions, fostering discussion, and assisting students in their investigation, teachers can foster cognitive presence. Strong cognitive presence ensures that students advance from superficial comprehension to more in-depth knowledge analysis, application, and integration (Veletsianos et al., 2023).

2.2.3 Teaching presence

Bada and Olusegun (2015) elucidate that designing, facilitating, and guiding learning experiences is all part of the instructor's teaching presence. This entails meticulously organizing the course materials, facilitating conversations, giving prompt feedback, and modifying the curriculum in response to the needs of the students in blended learning. While providing latitude for student exploration, the presence of a teacher ensures that the learning process stays goal-oriented and disciplined. A unified and interesting learning environment is created by an effective teaching presence that strikes a balance between direct instruction and chances for student autonomy.

2.3 International views on blended learning post-pandemic

Research indicates that the COVID-19 pandemic has accelerated the development of blended learning approaches worldwide, presenting both benefits and challenges. Effective blended learning necessitates a careful balancing act between digital and in-person components, claim Singh and Thurman (2019). International studies by Bozkurt et al. (2020) point to increased accessibility and flexibility as major advantages; however, they also point out issues with digital equity and student motivation. These international results offer crucial background information to analyze the South African experience.

In comparison to other nations, South Africa presents particular educational issues that make the study of blended learning more crucial. South Africa faces severe inequalities in access to technology, particularly in rural and underprivileged areas, whereas many industrialized countries have robust digital infrastructure, extensive internet connectivity, and well-resourced schools.

This study is critically important as it examines how blended learning, might assist reduce educational disparities in South African higher education exacerbated by the COVID-19 pandemic. Globally, the pandemic caused disruptions to educational systems, but in South Africa, where socioeconomic conditions, digital infrastructure, and historical inequalities in educational access still exist, the effects were more acute.

This study is important for the reason that it demonstrates how blended learning, which combines traditional in-person instruction with online learning, can help close these inequalities and ensure that all students have equitable access to high-quality education.

Furthermore, in developed countries such as the United States, the United Kingdom, and parts of Europe, blended learning has gained widespread acceptance as a sustainable paradigm that provides flexibility and individualized learning experiences (Sanders and Mukhari, 2024). Therefore, to guarantee smooth integration, numerous institutions have invested in hybrid classroom technologies, teacher training, and digital infrastructure. However, Janse van Rensburg and Oguttu (2022) argue that critics counter that, since pupils from low-income families sometimes lack access to reliable gadgets and Internet connectivity, an over-reliance on digital tools could exacerbate educational disparities. Despite these reservations, politicians are concentrating on bridging the digital divide while maintaining the advantages of hybrid instruction, and blended learning is increasingly viewed as the way of the future in many areas (Karassellos, 2024).

Jansen (2019) noted that to facilitate blended learning, countries such as the US and the UK, have sophisticated learning management systems (LMS), fast internet, and comprehensive teacher preparation programs. However, in many locations, South Africa lacks these fundamental components, which results in unequal implementation. For blended learning to be successful in South Africa, funds must be allocated for dependable internet access, reasonably priced gadgets, and training in digital literacy for teachers and students. In contrast to nations like Canada or Australia, where these resources are already standardized, blended learning's potential is still constrained in the absence of these (Halverson et al., 2023).

Meanwhile, a study by Vidergor et al. (2017) further highlights that East Asian nations like China, South Korea, and Singapore have adopted a blended learning strategy that is more tech-driven and regimented. These countries quickly expanded AI-powered learning platforms, virtual classrooms, and real-time analytics to track student success, since they already had a strong digital ecosystem. Lim and Graham (2021) further postulate that strict quality control procedures have also been implemented by governments to guarantee that online learning satisfies national requirements. However, discussions about striking the right balance have been sparked by worries about screen usage, student mental health, and the decline of in-person social contacts. Global perspectives on blended learning are still diverse in general, reflecting varying technological, cultural, and economic environments. However, there is growing agreement that the pandemic has irrevocably changed education, making blended learning a crucial, albeit always changing aspect of international teaching approaches (Zaugg et al., 2021).

On the contrary, due to inadequate infrastructure and unequal distribution of resources, emerging economies have had more difficulty implementing blended learning (Sanders and Mukhari, 2024). As a result, the acceleration of online learning platforms have been slow in countries such as South Africa, Nigeria, and India, among others due to inadequate internet connectivity, power outages, and a lack of reasonably working gadgets (Anthony et al., 2022). In support of the above, Mphuthi and Tshelane (2023); Mzimela and Moyo (2024) assert that despite efforts by the government to increase broadband coverage and distribute tablets, development is still sluggish. Some educators in these areas support a well-rounded strategy that occasionally alternates in-person instruction with low-tech options (such as radio-based lessons and offline digital content). Many people believe that blended learning is a necessary evolution despite the challenges, as long as teacher training and investments in digital equity are given top priority.

2.4 Cultural and structural difficulties in Hong Kong and South Africa

According to Jansen (2019), the legacy of apartheid in South Africa has led to ongoing disparities in access to resources, infrastructure, and high-quality education. In a similar vein,

Hong Kong's colonial past and current political unrest have influenced the city's educational system, resulting in unequal educational possibilities and a fragmented sense of national identity (Jung et al., 2021). Inequalities in education are made worse by the high levels of socioeconomic inequality in both areas. Furthermore, the 11 official languages of South Africa present difficulties for standardized curricula due to cultural variety, and the bilingual (Cantonese and English) educational system in Hong Kong exacerbates conflicts between local and global identities (Lo and Chan, 2022). Moreover, to overcome these limitations, an English language teacher used creative methods to make sure that "teaching was not dull" by implementing scaffolding techniques and interactive communication strategies to enhance the online learning environment.

To lessen these difficulties, institutional support is essential. Through infrastructural investment and policy reforms, government programs like the National Development Plan (NDP) in South Africa seek to alleviate educational inequality (Department of Basic Education, 2020). However, bureaucratic inefficiencies continue to cause implementation gaps. The government of Hong Kong has modernized education by implementing digital frameworks, but stability has been threatened by political instability and swift policy changes (Kong et al., 2021). Universities and non-governmental organizations (NGOs) in both areas have stepped in to offer further assistance, like digital resource distribution and teacher training. Examples of how public-private partnerships might improve educational access include Hong Kong's e-Learning Consortium and South Africa's Click Learning program (Jahoor et al., 2020; Kong et al., 2021).

A study by Jahoor et al. (2020), postulate that with a particular focus on South Africa, socioeconomic disparities and infrastructure constraints present obstacles to the spread of blended learning. Since a significant portion of students lack dependable devices or internet, many SA learning institutions find it difficult to successfully employ blended models, which exacerbates performance gaps. Halverson et al. (2023), further adds that international frameworks highlight blended learning's revolutionary potential, However, SA's unique situation need specific solutions, such as hybrid models that provide offline access and more government funding for digital equity. SA's policies can benefit from Hong Kong's comparative insights, but they must give special attention to resolving its unique problems to ensure that blended learning improves rather than exacerbates student performance gaps. By explicitly defining global patterns, comparative assessments, and obstacles unique to SA, policymakers can create actions that are more focused and successful.

Digital literacy and flexibility have a significant impact on the efficacy of blended learning approaches in Hong Kong and South Africa. Digital inclusion in South Africa is hampered by low internet penetration and expensive devices, especially in rural regions (Isaacs, 2020). On the other hand, blended learning is supported by Hong Kong's strong digital infrastructure, but adoption is slowed by instructors' opposition to pedagogical reforms (Lam and Yang, 2025). While Hong Kong's e-Learning Pilot Scheme concentrated on student adaptability, South Africa's ICT4RED project enhanced the digital abilities of rural instructors, highlighting the necessity for regionally specific digital training programs (Mthethwa et al., 2023). These examples show that effective blended learning requires not just technology but also pedagogical approaches that are sensitive to cultural differences and ongoing institutional support.

2.5 Higher education in South Africa

The South African higher education system presents particular difficulties in adopting blended learning. According to Czerniewicz et al. (2020), over 60% of students experienced connectivity issues as a result of the pandemic, exposing severe digital disparities. The triple challenges of poverty, unemployment, and inequality in the nation have a direct effect on the access of students to digital resources (Department of Statistics South Africa, 2021). A study conducted by Mzimela and Moyo (2024) highlights how blended learning outcomes are still influenced by historical differences between historically disadvantaged and historically privileged institutions.

According to Halverson et al. (2023), since the COVID-19 pandemic, South Africa's higher education system has experienced substantial change, especially with the introduction of blended learning, a hybrid approach that combines online and in-person training. Before the epidemic, most institutions relied heavily on conventional in-person instruction. However, as many students from underprivileged backgrounds lacked reliable internet access, digital equipment, or appropriate learning spaces, the abrupt transition to remote learning revealed glaring disparities. Bervell and Arkorful (2020) further add that using systems like Moodle and Zoom, which were quickly adopted by universities such as the University of Johannesburg and the University of Cape Town and other higher learning institutions for remote emergency teaching, was not a smooth transition. The urgent need for more equitable digital solutions is highlighted by the fact that while some students and educators adjusted successfully, others had trouble with connectivity and lack of in-person interaction.

A study by Mahaye (2020) emphasizes that universities in South Africa are increasingly adopting blended learning as a sustainable strategy after revealing how it can improve accessibility and flexibility. Through programmes such as the NSFAS digital learning scheme, the public and commercial sectors have made investments in improving digital infrastructure. This has been achieved by increasing broadband access and providing students with computers to accommodate students in places with poor connectivity. Several universities have also created offline-friendly options, such as interactive SMS-based learning aids and downloadable lecture materials (Namyssova et al., 2019). However, challenges such as opposition from teachers using conventional approaches and reservations about the quality of online tests still exist. Additionally, even with efforts by mobile networks to provide zero-rated educational websites, the high cost of data continues to be a barrier.

2.6 Performance of students in blended settings

According to a study by Ngwenya et al. (2023), courses that used well-designed blended approaches had higher pass rates. On the other hand (Letseka et al., 2023), showed that students

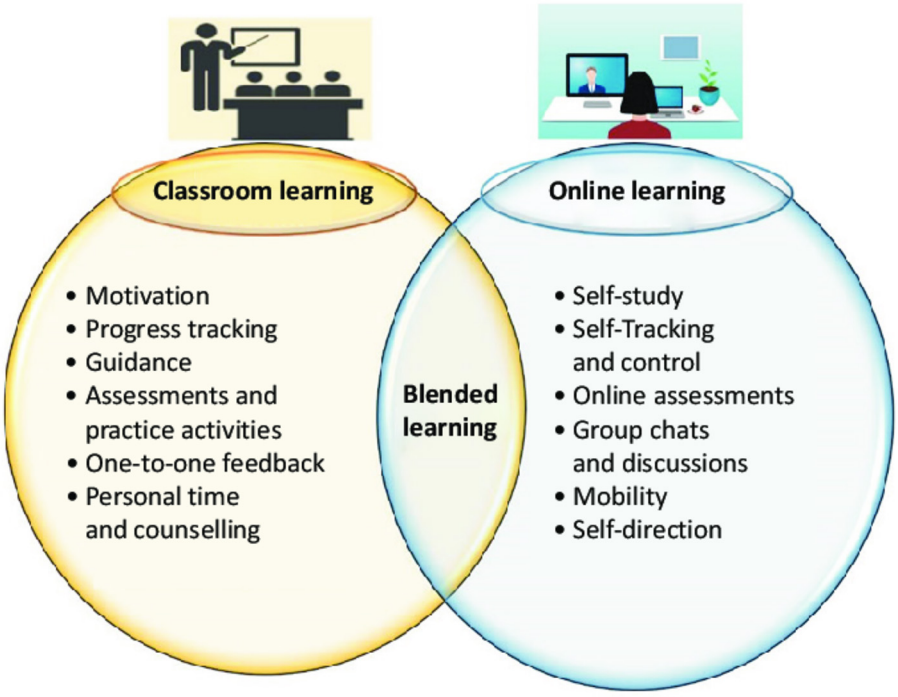

FIGURE 1
Designing instructions for blended eLearning. Source: (Ashipala et al., 2024).

without digital access performed worse. These differences imply that the success of blended learning is highly context-dependent and is influenced by student readiness and institutional resources. The research by Dube (2021) found three major obstacles to participation, socioeconomic pressures, pedagogical limitations, and technological limitations. However, research conducted by Winberg et al. (2022) showed that focused interventions such as loan programmes for devices or training in digital literacy can greatly increase levels of involvement. For South African contexts, the idea of "inclusive engagement" Gachago et al. (2024) has become essential.

Figure 1 provides a thorough visual approach for methodically creating lessons that are suited for mixed learning settings. Drawing from the research of Ashipala et al. (2024), it depicts a multi-phase, cyclical procedure that starts with fundamental actions like requirements analysis and learning aim setting. It then goes into how to incorporate instructional methodologies, create content for online and in-person modalities, and carefully choose technology to support learning. Phases devoted to implementation, followed by stringent evaluation and feedback mechanisms, mark the model's conclusion and highlight how good instructional design is iterative. By utilizing the advantages of both traditional and digital delivery techniques, educators and designers may build seamless and successful blended learning experiences with the use of this framework.

In light of this, students' performance in blended learning environments in universities has produced a variety of results, indicating the potential of the model and its ongoing difficulties (Bada and Olusegun, 2015). Positively, research shows that students who participate in blended learning combines online courses with in-person interactions, frequently exhibit increased adaptability, self-directed learning abilities, and access to a wider variety of resources (Halverson et al., 2023). According to some universities, blended learning programmes improve student engagement, especially when they make good use of interactive digital resources such as discussion boards, video lectures, and real-time feedback systems. The independence of the online learning components has benefited high-achieving and self-motivated students by allowing them to review content at their own pace and gain a deeper comprehension of challenging subjects (Maphalala and Adigun, 2021).

Smith and Hill (2019) found that one critical concern is the performance gap that still exists between students of different socioeconomic backgrounds. As well as inadequate home study conditions, inconsistent internet connection, and a lack of personal gadgets are some of the obstacles that under-resourced learners must overcome to succeed in blended learning environments. These students are likely to lag in online courses, resulting in poorer overall academic achievement compared to their counterparts who have greater access to digital resources, according to Mhlanga (2021). Furthermore, some students find it difficult to maintain motivation or feel alone due to the decreased possibility of face-to-face interaction with instructors and fellow students. These differences highlight the need for focused assistance to level the playing field, including academic mentorship programmes, digital hubs on campus, and subsidized data (Mahaye, 2020).

2.7 Effects of asynchronous learning and recorded lessons

Student participation and academic achievement have been greatly impacted by the move toward recorded lessons and asynchronous learning environments. Although these tools are flexible, research shows that how they are used determines how effective they are. Students in online and blended learning contexts did marginally better than those in traditional face-to-face training, according to a study by Means et al. (2013). This suggests that well-structured asynchronous learning can improve results. However, Martin and Bolliger (2018) observed that asynchronous conversations and pre-recorded lectures may result in lower participation if not reinforced with interactive features. They also noted that student involvement frequently decreases in the absence of synchronous interaction. Institutions should encourage teachers to include interactive elements, like conversation starters or embedded quizzes (Shadiev and Yang, 2020), to keep students interested.

2.8 Support systems and institutional readiness

The importance of institutional support for blended learning success is emphasized in the literature. Although policy guidelines are provided by Department of Higher Education and Training (2021), implementation varies greatly. Research by Bozalek and Ng'ambi (2015) demonstrates how UCT staff development initiatives improved the quality of blended learning. On the other hand, research conducted in rural campuses by Muhuro and Kangethe (2021) indicates persistent difficulties with basic infrastructure, indicating the necessity for unique implementation strategies.

Additionally, a study conducted by Lazar et al. (2020) maintains that strong support networks and institutional preparedness are essential for the effective adoption of blended learning in South African higher education institutions. Although several academic institutions have achieved notable progress in adjusting to hybrid teaching approaches, others still face structural obstacles that impede efficient delivery. Therefore, the effectiveness of blended learning is greatly influenced by important support systems, including student support services, digital literacy instruction, and IT infrastructure (Jowsey et al., 2020). Therefore, by training instructors on digital tools and giving students round-the-clock access to online resources, universities with established e-learning centers like Stellenbosch University and the University of Cape Town have been able to make the change more seamless. However, institutions with limited funding, especially those in rural areas, sometimes lack the essential technical infrastructure, which disadvantages both teachers and students. For many, the potential of blended learning lies untapped in the absence of dependable internet connectivity, modern software, and sufficient gadgets (Al-Maroof et al., 2022).

Furthermore, services for student support are just as important for guaranteeing participation and achievement in mixed settings. As a result, initiatives like peer mentorship programs, online tutoring, and virtual therapy have been implemented by numerous South African colleges to assist students who are struggling academically and emotionally with hybrid learning (Dwivedi et al., 2019). The University of Johannesburg, for instance, has adopted a "Digital First" approach that includes subsidized Internet bundles, loaner laptops, and technical support helplines. Gaps still exist in spite of these initiatives, especially for low-income children who might find it difficult to learn on their own or who might not have access to peaceful study areas (Mhlanga et al., 2022).

Additionally, Ngwenya et al. (2023) highlight that there is a significant range in faculty preparedness; some lecturers have adopted cutting-edge teaching strategies, while others are still averse to change because of their excessive workloads or lack of preparation. To give teachers the pedagogical and technological know-how required to create successful blended learning programs, institutions must place a high priority on continual professional development.

In support of the above, Mali and Lim (2021) assert the importance of institutional preparedness, which necessitates sustainable funding sources and deliberate policy alignment in addition to infrastructure and training. Although it offers a framework for digital education, the South African government's National e-Learning Strategy has not been uniformly implemented by all institutions. As a result, budgetary restrictions, red tape, and conflicting priorities frequently impede progress. Therefore, universities should form specialized task forces for blended learning, work with partners in the commercial sector to invest in technology, and create backup plans in case of connectivity disruptions to improve preparedness (Mhlanga et al., 2022). The broad adoption of mixed approaches can also be promoted by academic departments that cultivate an innovative and adaptable culture. The lessons learnt during the epidemic have emphasized the importance of resilient and flexible educational systems, even though difficulties remain. South African institutions can harness blended learning to increase access, quality, and equity in higher education by strengthening their institutional capacity and support networks (Anthony et al., 2022).

3 New research gaps and best practices

Context-specific blended learning models are being developed by South African academics. Veletsianos et al. (2023) indicated that the 'physical approach' consists of the ability to blend digital and physical components, which shows potential. However, there are still many unanswered questions about discipline-specific modifications, long-term performance patterns, and viable finance methods for blended learning in settings with limited resources.

In addition to highlighting important research needs, Sanders and Mukhari (2024) assert that the rapid adoption of blended learning in South African higher education has also revealed new best practices. Therefore, understanding the long-term effects of blended learning on student performance across various socioeconomic groups is an important knowledge gap. Although early research shows that some students have more freedom and access, less is known about the effects of long-term hybrid learning on graduation rates, employability, and cognitive development,

especially for students from underprivileged backgrounds (Janse van Rensburg and Oguttu, 2022). Furthermore, as present blended models frequently duplicate western frameworks without sufficient adaptation to South Africa's multilingual and multicultural context, additional study is required on culturally responsive teaching approaches in digital spaces. Therefore, the psychological impacts of less in-person participation are also poorly understood, particularly for first-year students who may experience feelings of loneliness and a lack of campus integration (Jowsey et al., 2020).

However, institutions that have made the move effectively are beginning to share their best practices. According to Smith and Hill (2019), the benefits of centralized digital support centers have been proven by institutions like Rhodes University and the University of Witwatersrand, which offer students on-demand technical support and staff training in instructional design. Bridging network gaps have been successfully accomplished through the use of offline-capable learning management systems (LMS) and low-bandwidth learning platforms such as Moya Messenger. Thus, STEM subjects have shown great promise for flipped classroom formats, in which students participate in online lectures and employ in-person sessions to solve problems together. Furthermore, schools that place high priority on conducting frequent feedback loops, such as focus groups or surveys, have found it easier to modify their blended learning approaches to accommodate changing student demands (Sanders and Mukhari, 2024).

3.1 Methods

This study used a literature review process, consulting a wide variety of academic publications from Sabinet, Springer, Emerald, ScienceDirect and Google Scholar. These databases, which include new preprints and research perspectives, peer reviewed high-impact publications, and regionally relevant studies, were chosen to guarantee thorough study. With an emphasis on South African higher education, the study examines post-pandemic trends in student performance and engagement within blended learning models by combining this diverse body of work.

This study has noted that, even though the shift to blended learning, a combination of online and in-person instruction, has changed higher education around the world, its efficacy in South Africa is still a crucial topic for research. Variations in student participation, academic performance trends, and institutional adaptability following the epidemic are highlighted in the research studied. Special attention is paid to the distinctive educational environment of South Africa, where socioeconomic constraints, pedagogical preparedness, and differences in digital access affect learning outcomes. This review evaluates the current state of blended learning by combining the results of several studies and offers practical suggestions for future research, educators, and policy makers.

3.2 PRISMA flow diagram

Literature search of Sabinet, Springer, Emerald, ScienceDirect databases, and Google Scholar.

In this study, the PRISMA flow diagram was utilized to methodically record the literature selection procedure to examine the effects of blended learning on South African higher education following the pandemic.

This study presents Table 1 to address the examination of several articles that have been downloaded and reviewed. The

TABLE 1 Review methodology, findings, key contributions, and research limitations.

Authors	Methodology	Findings	Key contributions	Limitations
Ngwenya et al. (2023)	Mixed methods (surveys + interviews)	Digital access gaps significantly impact engagement	Highlighted socioeconomic barriers in the SA context	Too urban-focused
Janse van Rensburg and Oguttu (2022)	Longitudinal study (2020–2022)	Gradual improvement in performance as institutions adapted	Tracked institutional adaptation over time	Only historically advantaged universities were included.
Dube (2021)	Critical Discourse Analysis	Policy rhetoric does not match implementation challenges	Exposed policy-practice disconnect	Empirical data not available
Dwivedi et al. (2019)	Policy analysis + institutional case studies	Wide variability in institutional readiness for blended learning	Proposed national blended learning framework	Lacks student performance data
Luvalo (2024)	Systematic Review (SA-focused)	Cultural relevance crucial for engagement	Linked pedagogy to local context	Relied on self-reported data
Mali and Lim (2021)	Comparative Historical Analysis	Post-pandemic changes mirror past educational crisis	Longitudinal Perspective	Limited contemporary data
Sanders and Mukhari (2024)	Institutional ethnography	Administrative systems struggled with blended assessment	Identified bureaucratic barriers	Narrow institutional focus
Karassellos (2024)	Comparative Study	Blended learning reduced post-pandemic dropout rates	Cross-country Resilience Insights	Limited generalisability
Mphuthi and Tshelane (2023)	Phenomenology (student experiences)	Students value flexibility but struggle with isolation.	Deep qualitative insights into student perspectives	Limited to a specific institution
Maphalala and Adigun (2021)	Mixed-method interviews/surveys with students/educators	Students struggled with self-directed learning in blended environments.	Highlighted the need for institutional support	Over-representation of urban/resourced institutions

results of the reviewed articles are further displayed in the sample that follows.

3.3 Research settings

Five scholarly databases, Sabinet, Springer, Emerald, ScienceDirect and Google Scholar, were used in this study to examine post-pandemic student performance and participation with blended learning methods. Following the COVID-19 pandemic, the study examined blended learning trends, difficulties, and outcomes through a systematic review of 198 published research articles. In addition to the present year, relevant publications from 2017 to 2025 were sourced using the following configuration. One specific question is: (Title-key) blended learning and student performance and engagement; (Title-key) post-pandemic education; and (Title-key) COVID-19 impact.

To improve the effectiveness of the research cycle, other characteristics were also used, such as the year of publication (2017–2024), the type of document (articles 113), conference papers (53) and journals with series of books (32). This study focused on 52 documents that were used for analysis once the parameters were established. These databases were chosen because they provide a thorough analysis of both regional and international viewpoints due to their broad coverage of peer-reviewed journals and conference proceedings. PRISMA Framework inclusion and exclusion criteria covered purely qualitative outcomes, online or traditional courses, and peer-reviewed, empirical studies conducted within the last ten years that compare the academic performance of higher education students exposed to a defined blended learning model combining online and in-person instruction (Figure 2). By highlighting changes in pedagogical approaches, technology use, and student outcomes, the findings compiled from this corpus provide information on how post-pandemic education is developing.

3.4 Documents analysis

198 relevant research publications published between 2017 and 2024 were systematically found and analyzed for this study using the Sabinet, Springer, Emerald, ScienceDirect and Google Scholar databases. Peer-reviewed articles with important terms like blended learning, post-pandemic education, student performance, student engagement, South African higher education and the impact of COVID-19 were the main emphasis of the search approach. These databases were chosen to ensure that both global and regional viewpoints were fairly represented with Sabinet offering important insights into the context of higher education in South Africa.

The original pool of 198 papers was reduced to 52 documents based on a stringent selection criterion; each document had to clearly contribute to understanding the impact of blended learning on student performance and engagement in post-pandemic South African higher education. This was done to increase the study's realism and practical applicability. By focusing on studies that offered practical insights, empirical support, or theoretical breakthroughs in the field, this criterion ensured that only the most significant and pertinent research was included. The 52 documents chosen were carefully examined to find important trends, obstacles, and best practices in the use of blended learning paradigms after the pandemic in higher learning.

4 Results

The literature presents a conflicting picture of student achievement. According to several studies, students who took courses that successfully blended synchronous and asynchronous learning modalities performed better academically. They also benefited from having the freedom to review lectures that were recorded and to access online materials whenever they wanted. However, other research found that students who had trouble with self-directed learning or who did not have enough access to technology performed worse. According to the findings, effective adoption of blended learning requires both a strong technology foundation and extensive student support programmes, such as academic counseling and training in digital literacy.

While some research evaluates competency-based or project-driven results, where blended models flourish owing to flexibility and iterative feedback, other studies depend on standardized exam scores, which may benefit the rote-learning emphasis of traditional training. Furthermore, the findings of short-term vs. long-term performance evaluations are contradictory: traditional techniques may give faster gains, while blended learning frequently exhibits delayed benefits as students adjust to self-regulated learning.

Variations in student demographics and participation levels also lead to contradictory findings. While at-risk students, especially those with poor time-management or digital literacy skills, may find it difficult to succeed without formal supervision, high-achieving, self-motivated learners usually perform better in blended environments because they have more autonomy. While some research shows greater dropout rates in blended courses, others emphasize enhanced engagement through interactive digital technologies, suggesting that learner readiness, not the model itself, mediates performance diffusion.

Future studies should take a contingency-based approach to address these discrepancies, acknowledging that blended learning is a range of tactics whose efficacy depends on alignment between learner profiles, course design, and institutional support rather than a single intervention.

5 Findings

Various student performance outcomes in blended learning contexts were found to be influenced by digital literacy, self-regulation, and resource accessibility, according to the investigation. Since they could autonomously traverse online components and fully engage with asynchronous content, high-achieving students flourished. On the other hand, time

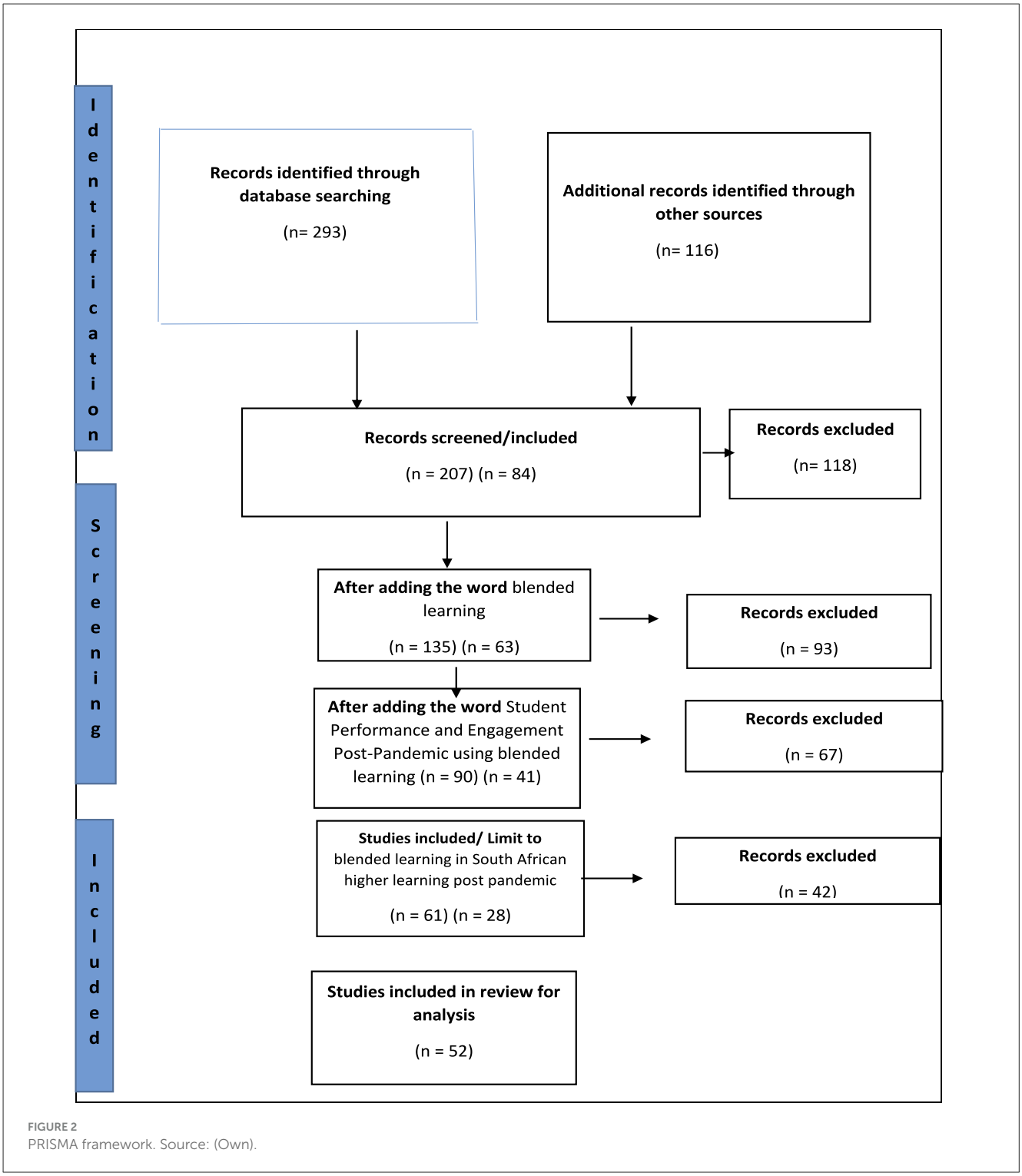

FIGURE 2
PRISMA framework. Source: (Own).

management issues, technological limitations, or a lack of connection in virtual environments were problems for struggling students. Notably, by encouraging peer support, collaborative blended designs such as discussion boards combined with in-person lessons assist in reducing inequities. These findings imply that although blended learning provides flexibility, institutional support and pedagogical design that meets the requirements of diverse learners are necessary for its efficacy.

6 Conclusion

In higher education, blended learning approaches offer a dynamic interaction between digital learning resources and traditional in-person instruction that alters student performance in a variety of ways. Three fundamental dimensions, pedagogical adaptation, technological integration, and student engagement can be used to analytically identify diffusion trends in academic

outcomes. By encouraging active learning techniques that accommodate different cognitive styles, like flipped classrooms and hybrid debates, blended learning pedagogically undermines the passive transmission of knowledge. However, institutional preparation, where faculty readiness and curriculum alignment impact the effectiveness of blended approaches, is frequently the cause of performance heterogeneity. In terms of structure, the synthesis shows that unequal access to digital infrastructure makes inequality worse by favoring pupils who are more tech-savvy and excluding those who are less-resourced.

To improve student performance, blended learning models that combine traditional in-person instruction with online learning components have become popular in higher education. By providing flexibility, individualized learning experiences, and enhanced engagement, blended learning has been shown to enhance academic results. Since the hybrid approach permits self-paced learning while retaining instructor supervision, studies show that students in blended learning contexts frequently outperform those in strictly online or traditional classroom settings. In a meta-analysis, Means et al. (2013) found that blended learning produced considerably higher accomplishment scores than either wholly online or fully face-to-face training. They attributed this success to adaptive learning technology and improved instructional time.

However, several variables, such as student preparedness, instructor facilitation, and course design, affect how effective blended learning is. According to research, students perform better in well-structured blended courses with distinct goals, engaging online resources, and frequent feedback systems (Sanders and Mukhari, 2024). Thus, poorly executed blended models that fail to mix online, and in-person components might result in worse results and disengaged students. Success in mixed learning environments is also greatly influenced by student attributes like digital literacy and self-regulation abilities. Therefore, to optimize the advantages of blended learning, educational institutions must ensure that both teachers and students receive sufficient training.

The success of blended learning depends on transactional interaction, as demonstrated by a critical synthesis of engagement dynamics. In blended learning settings, students frequently show two distinct performance patterns: self-regulated learners benefit from asynchronous subject mastering, while those who require organized guidance find it difficult to meet demands for autonomy. This polarity emphasizes how metacognitive support systems counteract performance diffusion. Thematically, institutional strategies that homogenize learning experiences without contextual flexibility run the danger of exacerbating performance discrepancies.

In conclusion, structural conflicts between innovation and equity are reflected in the spread of student achievement in blended learning. The focus of analysis must move from simple comparisons of results to detailed diagnostics of how institutional scaffolding, socio-technical impediments, and pedagogical design interact. To identify causal levers like the proportion of synchronous to asynchronous components that maximize fair outcomes in hybridized higher education environments, future research should give priority to longitudinal maps of performance diffusion.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by College of Science, Engineering and Technology Ethics Committee. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

AM: Writing – original draft, Conceptualization, Writing – review & editing. MP: Supervision, Writing – review & editing. LM: Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Al-Maroof, R., Al-Qaysi, N., Salloum, S. A., and Al-Emran, M. (2022). Blended learning acceptance: a systematic review of information systems models. *Technol. Knowl. Learn.* 27, 1–36. doi: 10.1007/s10758-021-09519-0

Anthony, B., Kamaludin, A., Romli, A., Raffei, A.F.M., Phon, D. N. A. E., Abdullah, A., and Ming, G. L., (2022). Blended learning adoption and implementation in higher education: a theoretical and systematic review. *Technol. Knowl. Learn.* 27, 1–48. doi: 10.1007/s10758-020-09477-z

Ashipala, D. O., Sapalo, E. M., and Shikulo, P. I. (2024). Blended learning: exploring nurse educators' perspectives. *Health* 29:2659. doi: 10.4102/hsag.v29i0.2659

Bada, S. O., and Olusegun, S. (2015). Constructivism learning theory: a paradigm for teaching and learning. *J. Res. Method Educ.* 5, 66–70. doi: 10.9790/7388-05616670

Bervell, B., and Arkorful, V. (2020). LMS-enabled blended learning utilization in distance tertiary education: establishing the relationships among facilitating conditions, voluntariness of use and use behaviour. *Int. J. Educ. Technol. High. Educ.* 17:6. doi: 10.1186/s41239-020-0183-9

Bozalek, V., and Ng'ambi, D. (2015). *The Context of Learning With Technology. Moving Beyond the Hype: A Contextualised View of Learning With Technology in Higher Education*. Pretoria: Universities South Africa. 3–6.

Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., Lambert, S., Al-Freih, M., Pete, J., Olcott Jr, D., and Rodes, V. (2020). A global outlook to the interruption of education due to COVID-19 pandemic: navigating in a time of uncertainty and crisis. *Asian J. Distance Educ.* 15, 1–126. doi: 10.5281/zenodo.3778083

Czerniewicz, L., Agherdien, N., Badenhorst, J., Belluigi, D., Chambers, T., Chili, M., De Villiers, M., Felix, A., Gachago, D., Gokhale, C., and Ivala, E. (2020). A wake-up call: equity, inequality and Covid-19 emergency remote teaching and learning. *Postdigital Sci. Educ.* 2, 946–967. doi: 10.1007/s42438-020-00187-4

Department of Basic Education (2020). *National Development Plan 2030*. Pretoria: Department of Basic Education.

Department of Higher Education and Training (2021). *Policy framework for internalisation of higher education in South Africa*. Available online at: https://www.dhet.gov.za/Policy%20and%20Development%20Support/Policy%20Framework%20for%20Internationalisation%20of%20Higher%20Education%20in%20South%20Africa.pdf (Accessed May 22, 2025).

Department of Statistics South Africa (2021). *Annual Report*. Available online at: https://static.pmg.org.za/Minister_in_the_Presidency_Stats_SA_Annual_Report_Book_1_202021_Final_Email.pdf (Accessed May 22, 2025).

Dube, S. (2021). *A paradox of the second order digital divide in higher education institutions of developing countries: a case of Zimbabwe (thesis)*. University of Cape Town, Cape Town, South Africa.

Dwivedi, A., Dwivedi, P., Bobek, S., and Sternad Zabukovšek, S. (2019). Factors affecting students' engagement with online content in blended learning. *Kybernetes* 48, 1500–1515. doi: 10.1108/K-10-2018-0559

Gachago, D., Huang, C. W., Immenga, C., Cox, G., Mosienyane, T., and Govender, S. (2024). Designing in the times of AI: co-creation as a strategy towards emergent learning design. *Afr. J. Inter/Multidiscip. Stud.* 6, 1–13. doi: 10.51415/ajims.v6i1.1536

Halverson, L. R., Spring, K. J., Huyett, S., Henrie, C. R., and Graham, C. R. (2023). "Blended learning research in higher education and K-12 settings," in *Learning, Design, and Technology: An International Compendium of Theory, Research, Practice, and Policy* (Cham: Springer International Publishing), 3107–3135. doi: 10.1007/978-3-319-17461-7_31

Hongxu, C., and Isa, Z. B. M. (2024). Navigating new normal: evaluating the effects of blended learning models on college student outcomes in southwest China post-epidemic. *(DREAM)*, 3, 26–37. doi: 10.56982/dream.v3i05.236

Hua, M., and Wang, L. (2023). The relationship between Chinese university students' learning preparation and learning achievement within the EFL blended teaching context in COVID-19 post-epidemic era: the mediating effect of learning methods. *PLoS One* 18:e0280919. doi: 10.1371/journal.pone.0280919

Isaacs, S. (2020). "South Africa's (unequal) digital learning journey: a critical review," in *ICT in Education and Implications for the Belt and Road Initiative* (Singapore: Springer), 187–211. doi: 10.1007/978-981-15-6157-3_11

Jahoor, F., Botha, A., and Herselman, M. (2020). "Conceptualizing mobile digital literacy skills for educators," in *Proceedings of the 6th International Conference on Mobile Learning* (Pretoria: International Association for Development of the Information Society). doi: 10.33965/ml2020_202004L007

Janse van Rensburg, E. D., and Oguttu, J. W. (2022). Blended teaching and learning: exploring the concept, barriers to implementation and designing of learning resources. *South Afr. J. Higher Educ.* 36, 285–296. doi: 10.20853/36-6-4595

Jansen, J. D. (2019). "Inequality in education: what is to be done?," in *South African Schooling: The Enigma of Inequality: A Study of the Present Situation and Future Possibilities* (Cham: Springer International Publishing), 355–371. doi: 10.1007/978-3-030-18811-5_19

Jowsey, T., Foster, G., Cooper-Ioelu, P., and Jacobs, S. (2020). Blended learning via distance in pre-registration nursing education: a scoping review. *Nurse Educ. Pract.* 44:102775. doi: 10.1016/j.nepr.2020.102775

Jung, J., Horta, H., and Postiglione, G. A. (2021). Living in uncertainty: the COVID-19 pandemic and higher education in Hong Kong. *Stud. Higher Educ.* 46, 107–120. doi: 10.1080/03075079.2020.1859685

Karassellos, L. (2024). *Pedagogic practices in online and blended learning environments in South African higher education: implications for students' epistemological access (dissertation)*. United Kingdom: University of Oxford.

Kong, S. C., Huang, R., and Kwok, W. Y. (2021). "e-Learning in teacher education in Hong Kong and Beijing in the digital era," in *Quality in Teacher Education and Professional Development* (Abingdon, VA: Routledge), 94–106. doi: 10.4324/9781003197973-7

Lam, B. H., and Yang, L. (2025). "Prospective teachers' innovative lesson design based on a design thinking intervention in Hong Kong," in *Innovative Teaching and Classroom Processes* (London: Routledge), 23–40. doi: 10.4324/9781003436065-4

Lazar, I. M., Panisoara, G., and Panisoara, I. O. (2020). Digital technology adoption scale in the blended learning context in higher education: development, validation and testing of a specific tool. *PLoS ONE* 15:e0235957. doi: 10.1371/journal.pone.0235957

Letseka, M., Akintolu, M., and El-bahay, M. A. (2023). Reflections on recent development in inclusive open and distance learning. *West Afr. J. Open Flexible Learn.* 12, 179–186.

Lim, C. P., and Graham, C. R. (2021). *Blended Learning for Inclusive and Quality Higher Education in Asia*. Singapore: Springer. doi: 10.1007/978-981-33-4106-7

Lo, N. P. K., and Chan, S. (2022). "Teaching in the time of Corona (Virus): a cross-institutional study of online English language teaching in Hong Kong higher education," in *Digital Communication and Learning: Changes and Challenges* (Singapore: Springer Singapore), 125–142. doi: 10.1007/978-981-16-8329-9_8

Lu, Y., and Wang, H. (2022). "A study of students' emotional engagement in blended learning in the post-epidemic era-a case study of college English course," in *International Conference on Computer Science and Education* (Singapore: Springer Nature Singapore), 336–348. doi: 10.1007/978-981-99-2449-3_30

Luvalo, L. M. (2024). Post-pandemic higher education: systematic review of implications and approaches on teaching and learning. *Soc. Sci. Educ. Res. Rev.* 11, 249–254. doi: 10.5281/zenodo.15258199

Mahaye, N. E. (2020). The impact of COVID-19 pandemic on education: navigating forward the pedagogy of blended learning. *Res. Online*, 5, 4–9.

Mali, D., and Lim, H. (2021). How do students perceive face-to-face/blended learning as a result of the Covid-19 pandemic?. *Int. J. Manage. Educ.* 19:100552. doi: 10.1016/j.ijme.2021.100552

Maphalala, M. C., and Adigun, O. T. (2021). Academics' experience of implementing e-learning in a South African higher education institution. *Int. J. Higher Educ.* 10, 1–13. doi: 10.5430/ijhe.v10n1p1

Martin, F., and Bolliger, D. U. (2018). Engagement matters: student perceptions on the importance of engagement strategies in the online learning environment. *Online Learn.* 22, 205–222. doi: 10.24059/olj.v22i1.1092

Means, B., Toyama, Y., Murphy, R., and Baki, M. (2013). The effectiveness of online and blended learning: a meta-analysis of the empirical literature. *Teachers Coll. Rec.* 115, 1–47. doi: 10.1177/016146811311500307

Mhlanga, D. (2021). The fourth industrial revolution and COVID-19 pandemic in South Africa: the opportunities and challenges of introducing blended learning in education. *J. Afr. Educ.* 2:15. doi: 10.31920/2633-2930/2021/v2n2a1

Mhlanga, D., Denhere, V., and Moloi, T. (2022). COVID-19 and the key digital transformation lessons for higher education institutions in South Africa. *Educ. Sci.* 12:464. doi: 10.3390/educsci12070464

Mphuthi, M., and Tshelane, M. (2023). "Online educational technologies as a curriculum approach in teaching and learning for first year pre-service teachers," in *Edulearn 23 Proceedings* (Free State: IATED), 8582–8589. doi: 10.21125/edulearn.2023.0655

Mthethwa, S., Nthatheni, R. G., Maremi, K. J., and Thulare, T. (2023). *Recommendations for sustainable post COVID-19 eLearning development in rural schools in South Africa (thesis)* (Pretoria).

Muhuro, P., and Kangethe, S. M. (2021). Prospects and pitfalls associated with implementing blended learning in rural-based higher education institutions in Southern Africa. *Perspect. Educ.* 39, 427–441. doi: 10.18820/2519593X/pie.v39.i1.26

Mzimela, J. H., and Moyo, I. (2024). On the efficacy of Indigenous knowledge systems in responding to the COVID-19 pandemic: unsettling coloniality. *Int. J. Environ. Res. Public Health* 21: 731. doi: 10.3390/ijerph21060731

Namyssova, G., Tussupbekova, G., Helmer, J., Malone, K., Afzal, M., and Jonbekova, D. (2019). Challenges and benefits of blended learning in higher education. *Int. J. Technol. Educ.* 2, 22–231.

Ngwenya, S. O., Heymann, R., Swart, T. G., and Lysko, A. (2023). *A comparative analysis of urban and rural broadband penetration and access trends in South Africa (thesis)* (Johannesburg).

Paschal, M. J., Mawela, R., Gougou, S. A. M., and Oyore, M. (2024). Investigating internationalization of higher education in the post-pandemic era. *Int. J. Res.* 13, 73–88. doi: 10.5861/ijrse.2024.24080

Sanders, D. A., and Mukhari, S. S. (2024). Lecturers' perceptions of the influence of AI on a blended learning approach in a South African higher education institution. *Discover Educ.* 3:135. doi: 10.1007/s44217-024-00235-2

Shadiev, R., and Yang, M. (2020). Review of studies on technology-enhanced language learning and teaching. *Sustainability* 12:524.

Singh, V., and Thurman, A. (2019). How many ways can we define online learning? A systematic literature review of definitions of online learning (1988–2018). *Am. J. Distance Educ.* 33, 289–306. doi: 10.1080/08923647.2019.1663082

Smith, K., and Hill, J. (2019). Defining the nature of blended learning through its depiction in current research. *High. Educ. Res. Dev.* 38, 383–397. doi: 10.1080/07294360.2018.1517732

Veletsianos, G., Irvine, V., and Johnson, N. (2023). *Online Delivery Trends: Online, Hybrid, and Multi-Access Learning and Teaching in British Columbia–Post-Pandemic Trends and Intentions*. British Columbia Council on Admissions and Transfer.

Vidergor, H. E., Sela, O., Vidergor, H. E., and Sela, O. (2017). "Blended learning environments higher education," in *Innovative Teaching Strategies and Methods Promoting Lifelong Learning in Higher Education* (Israel: Nova Science Publishers), 85.

Winberg, C., Finn, F., Sheridan, I., and Engel-Hills, P. (2022). Enhancing work-integrated learning through South-North collaboration: a comparative contextual analysis. *Int. J. Work Integr. Learn.* 23, 463–479. doi: 10.1080/02702711.2022.2118914

Zaugg, H., Graham, C. R., Lim, C. P., and Wang, T. (2021). "Current and future directions of blended learning and teaching in Asia," in *Blended Learning for Inclusive and Quality Higher Education in Asia* (Singapore: Springer), 301–327. doi: 10.1007/978-981-33-4106-7_16