African Journal of Inter/Multidisciplinary Studies (AJIMS)
Volume 8, Issue 1, pp. 1-19
e-ISSN: 2663-4589

Challenges in the Use of E-Learning Technologies for Teaching and Learning at Universities of Technology

Navitha Ramroop[1] and Karunanidhi Reddy[2]

[1]Department of Public Management and Economics, Durban University of Technology, Durban, South Africa
[2]Department of Applied Law, Durban University of Technology, Durban, South Africa

Abstract: Emerging technologies have reshaped education through e-learning, prompting academics to reconsider teaching methods. While technology enhances empowerment and creativity, challenges remain, including lecturer resistance and difficulty adapting to new approaches. Constructivist Theory highlights students' active learning role, yet e-learning demands both subject mastery and technical skills. Students lacking digital proficiency may not benefit fully. This article examines challenges faced in using e-learning technologies for teaching and learning in higher education, particularly in Universities of Technology. An empirical research approach was adopted, with surveys being conducted with both teaching staff and students at the Durban University of Technology (DUT), the selected UOT. Apart from determining the challenges and best-practices experienced by lecturers and students at DUT, the study has produced recommendations and intervention strategies to address the challenges of teaching and learning with e-learning, outlining the development of a phased implementation plan for e-learning at DUT. The survey, in the form of structured questionnaires, comprised open- and closed-ended questions based on the aim and objectives of the study. The data collected relating to the various themes set out in the objectives was tabulated in Microsoft Excel. The subsequent analysis was then conducted using the Statistical Package for the Social Sciences (SPSS) Version 26 for Windows. The findings reveal that limited access to devices, data, infrastructure, and technological resources restricts effective e-pedagogy. The study recommends implementing targeted interventions to address these barriers and enhance technology-supported teaching and learning.

Keywords: digital devices; e-learning; higher education; teaching and learning; use of technology

CORRESPONDENCE
Email: ramroopn@dut.ac.za

EDITORIAL DATES
Received: 31 March 2025
Revised: 17 November 2025
Accepted: 18 November 2025
Published: 09 February 2026

DOI: https://doi.org/10.51415/ajims.v8i1.2656

Introduction

The development of information technology (IT) and its array of tools has enhanced and led to improvements in people's daily lives, with influences in various fields such as finance, business, health and education (Al-Fraihat et al., 2020, p. 67). In recent years, digital technologies have strengthened the involvement of individuals in social, political and economic dimensions, with IT being seen as a

significant transformational tool, especially for developing countries (Soomro et al., 2020). Moreover, these emerging technologies and recent innovations have created a change in how individuals acquire knowledge on a daily basis. Prior to 2020, using technological tools to deliver curricula was not a forced endeavour by HEIs. However, the global impact of the Covid-19 pandemic accelerated the need for HEIs to rethink the delivery of their curricula to students. Although the #RhodesMustFall and #FeesMustFall student-led protests forced universities to shut down and decisions were made at higher education institutions (HEIs) for "blended learning" to be a strategy for students to complete their courses (Czerniewicz, 2020), the consequences and tragedies inflicted by the Covid-19 pandemic left HEIs worldwide with no option but to pursue online and web-based teaching and learning on an unprecedented scale, never seen before.

According to Al-Hunaiyyan et al. (2016), the transformation of traditional classroom activities into online or virtual sessions has led to most HEIs becoming "electronic" or "virtual" universities. The digital revolution serves as a driving force for transformation and technological progress in education by facilitating collaborations with various stakeholders, thereby encouraging creativity and fostering innovation in higher education (Mashiyi & Baleni, 2023). Educational transformation is further advocated by the Fourth Industrial Revolution (4IR), which dictates that the traditional information transfer as a way of teaching is no longer viable for HEIs (Gleason, 2018). Mashiyi and Baleni (2023) iterate further that traditional methods of teaching, focusing on information transfer, are considered inadequate to meet the dynamic demands of a digitally-driven society. Instead, 4IR encourages integrating digital technologies into curricula, thus promoting collaborative and interactive learning approaches. According to Ramraj and Marimuthu (2019, p. 36), the mammoth obligation of "delivering relevant content that adequately prepares students with vital and necessary skills as technologies continue to transform" has lecturers at HEIs scurrying to marry transformed methods of teaching with traditional approaches.

The integration of information technology into education has been widely studied, with scholars emphasizing its transformative role across multiple sectors. Al-Fraihat et al. (2020) assert that technological advancements have significantly enhanced daily life, influencing domains such as finance, health and education. Similarly, Soomro et al. (2020) highlight digital technologies as pivotal tools for socio-economic transformation, particularly in developing countries. These innovations have fundamentally altered how individuals acquire knowledge, shifting from passive consumption to active engagement (Mashiyi & Baleni, 2023). Prior to 2020, the adoption of technological tools for curriculum delivery in higher education institutions (HEIs) was largely optional. Czerniewicz (2020) notes that whilst student-led movements such as #RhodesMustFall and #FeesMustFall prompted temporary shifts toward blended learning, these changes were not systemic. However, the global outbreak of COVID-19 accelerated the transition to online learning on an unprecedented scale, compelling HEIs to reconfigure traditional teaching models (Al-Hunaiyyan et al., 2016). This transformation aligns with the imperatives of the Fourth Industrial Revolution (4IR), which challenges the viability of traditional information-transfer pedagogies and advocates for interactive, technology-driven learning approaches (Gleason, 2018; Mashiyi & Baleni, 2023). Despite these developments, existing literature reveals gaps in understanding the contextual challenges faced by Universities of Technology (UOTs), which emphasize vocational and applied learning. While prior studies have explored e-learning broadly, few have examined its implementation within UOTs in South Africa. The present study addresses this gap by investigating trends, practices and challenges in the use of e-learning technologies at a selected UOT. Unlike descriptive analyses, this research aimed to develop a strategic framework for sustainable e-learning integration, informed by both lecturer and student perspectives.

The aim of the study was to investigate the trends, practices and challenges in the use of e-learning technologies for teaching and learning at UOTs. The research focussed on determining the challenges that lecturers and students at a selected South African UOT experience with e-learning. The results derived from an analysis of the data obtained from lecturers and the students will inform the development of possible strategies to overcome these challenges and produce a framework for the successful implementation of e-learning in higher education. In order to achieve the aim, the following objectives had to be addressed: to explore the practices and trends in the use of e-learning technologies for teaching and learning in higher education, particularly at UOTs; to investigate the effectiveness of using e-learning technologies in teaching and learning in higher education; and to determine the challenges encountered in the use of e-learning technologies for teaching and learning at the UOT.

As expounded by the Constructivist Theory, the findings revealed that learning and teaching processes do not only involve the transmission of information, nor is it deemed only as the acquisition of knowledge. The student is an active participant and the lecturer ensures the facilitation of the learning process (Fernando & Marikar, 2017). Technology adds a further dimension to teaching and learning practices, justifying e-learning in

pedagogies. Furthermore, by situating its findings within the post-COVID landscape and aligning them with 4IR competencies, the study offers a novel contribution to the discourse on digital transformation in higher education.

Theoretical framework

The integration of technology into education is pivotal for enhancing the quality of learning and equipping students with competencies relevant to a digital society. For example, the integration of artificial intelligence (AI) and Learning Management Systems (LMS) has been shown to personalize learning experiences, improve educational quality, and foster better student engagement and outcomes. These systems offer tools like adaptive assessments and learning analytics, which help tailor educational experiences to individual needs and support institutional effectiveness (Alotaibi, 2024). The integration of technology in education is increasingly recognized as essential for improving the quality of learning and enhancing students' competence in environments rich in technological resources (Zou et al., 2025). Ramraj and Marimuthu (2019) posit that as educators adapt to rapidly evolving technological landscapes, their ability to remain current with advancements significantly impacts the accessibility and effectiveness of instruction, leading to better educational outcomes. The transformation of educational methods has been especially pronounced during the Covid-19 pandemic, which accelerated the adoption of e-learning and made it a fundamental aspect of education (Radha et al., 2020).

Generations Y (millennials) and Z (centennials) have been immersed in technology from an early age, which shapes their learning preferences and engagement levels. These students are more inclined toward e-learning platforms, thus increasing their interest in higher education institutions (HEIs) that leverage these technologies (Kuleto et al., 2021). Studies show that technology not only enriches learning by providing diverse and informative resources but also encourages collaboration amongst students, ultimately raising academic standards (Priya, 2016). These systems offer tools like adaptive assessments and learning analytics, which help tailor educational experiences to individual needs, as well as supporting institutional effectiveness (Alotaibi, 2024).

In South Africa, the historical context continues to present significant challenges to the education system, largely due to the apartheid regime, which entrenched racial and socio-economic fragmentation. This fragmentation has perpetuated disparities in educational quality and negatively influenced both teaching standards and student morale (Ngobeni et al., 2023; Soudien, 2023). The enduring effects of apartheid have left many Black students underprepared for higher education, thus complicating their academic trajectories (Mabulana, 2025). Recent scholarship highlights ongoing debates about whether these challenges stem primarily from students' preparedness or from the capacity of higher education institutions to provide adequate academic development and support (Dube, 2024; Gruijters et al., 2024). Historically Disadvantaged Institutions (HDIs) in South Africa face systemic challenges that contribute to poor educational outcomes. These institutions often struggle with limited resources and inadequate support systems, which further hinder their ability to deliver effective education to marginalized populations. Originally established during apartheid to serve marginalized communities, HDIs continue to grapple with systemic barriers, insufficient resources, and outdated infrastructure that impede their ability to provide quality education (Mateko et al. 2025). Students frequently face additional hurdles such as poverty, inadequate foundational education, and restricted access to digital resources (Maluka et al., 2024). Lembani et al. (2019) assert that the impact of South Africa's lower Gross National Income (GNI) compared to developed countries exacerbates these challenges, leading to technological disparities that limit access to digital resources necessary for effective learning.

The inability to effectively integrate technology in education can be attributed to both economic constraints and a lack of foundational skills amongst students to utilize digital technologies meaningfully. The digital divide not only reflects inequalities in access but also a disparity in the quality of educational experiences offered to students from different backgrounds. The UOT in this study, as a developing university, confronts the dual challenge of addressing these historical inequalities whilst striving to integrate technology into its curriculum. Efforts to improve student preparedness and academic development are critical, yet the university must navigate the complexities of digital equity to create an inclusive learning environment (Leibowitz et al. 2015). To address these pressing issues, there is a growing need for a comprehensive understanding of digital equity in education, particularly in developing countries like South Africa. This understanding should focus on ensuring that all students have equal opportunities to engage with technology, thus enhancing their educational experiences and outcomes. Moreover, fostering a culture of technological proficiency amongst educators and students alike will be essential for navigating the future landscape of education.

In summary, while the integration of technology into education holds significant promise for enhancing learning and engagement, historical inequalities and systemic challenges must be addressed to ensure that all students benefit from these advancements. The interplay between technology, education and socioeconomic factors in contexts like South Africa calls for ongoing attention and innovative solutions to create a more equitable educational landscape.

Teaching and learning challenges in the use of e-learning technologies at higher education institutions

The integration of technology into teaching practices at HEIs presents numerous challenges for lecturers and students alike. This section outlines the key difficulties faced in adapting to and implementing technology in educational settings, focusing on both teaching and learning challenges.

Teaching challenges in the use of e-learning technologies

Resistance to change remains a significant challenge as many lecturers exhibit a reluctance to adopt e-learning tools due to difficulties in adapting to new technologies. They often question the effectiveness of e-learning compared to traditional teaching methods, which can hinder their willingness to invest time and resources into these innovations (Olawale et al., 2025). Recent studies highlight the reluctance of many lecturers in South Africa to adopt e-learning tools due to challenges in adapting to new teaching paradigms and scepticism about the efficacy of digital learning compared to traditional methods (Mbanga & Mtembu, 2020).

A further challenge relates to rigid teaching practices. Lecturers' pedagogical beliefs profoundly influence their teaching methods. Many educators prefer tried-and-tested delivery methods and view new approaches as risky, leading to hesitance in employing e-learning techniques effectively (Buchanan et al. 2013). Recent studies by Sato et al. (2024) emphasize the challenges and hesitance that many educators face when adopting e-learning techniques, which are often attributed to rigid teaching practices. The authors add that lecturers' pedagogical beliefs strongly shape their teaching methods, with a preference for familiar, traditional approaches. This reluctance to adopt newer methods is sometimes linked to concerns about the effectiveness of online tools and the potential for lower teaching quality.

Effective teaching with technology goes beyond basic computer skills. Therefore, the lack of technological proficiency remains a significant challenge. Many lecturers struggle with usability and technical issues when integrating educational technology, leading to frustration and inefficiencies (Kaqinari, 2023; Mardiana, 2024; Uzorka et al., 2023). Moreover, limited engagement with technology may be an added problem as some lecturers do not resist technology outright but are unsure of how to effectively implement it in their teaching. This uncertainty often prevents them from integrating digital tools into their pedagogical practices (Kaqinari, 2023; Mardiana, 2024; Uzorka et al., 2023). Recent studies suggest that while some lecturers are not opposed to integrating technology into their teaching, they often face challenges due to limited knowledge of effective implementation methods. This uncertainty can prevent them from leveraging digital tools fully in their pedagogy. For instance, research has shown that many educators struggle with aligning digital tools to effectively enhance learning outcomes (Azanza et al., 2024). Inadequate infrastructure is another facet contributing to teaching challenges. The lack of access to proper devices and sufficient infrastructure, including reliable Wi-Fi and bandwidth, poses significant barriers for lecturers trying to engage with e-learning initiatives (Maphalala & Adigun, 2021b). Furthermore, comfort in using technology is crucial for successful integration into teaching. Lecturers may question the value of online courses compared to traditional ones, thus impacting their enthusiasm for teaching with technology (Alphalearn, 2024). Regarding integration challenges, the technical demands of delivering learning materials through compatible software and hardware can be overwhelming, especially when faced with erratic internet connectivity (Grajek, 2015). This complexity can deter lecturers from fully engaging with new technologies.

Perceptions of workload are also a challenge as lecturers often feel that incorporating technology into their teaching requires more effort and time, which is not always recognized by institutional management (Lea et al., 2025). This perception can further disincentivize the adoption of innovative teaching practices. Johnson et al. (2022) note that educators often perceive the integration of digital technologies into their teaching practices as an additional workload. The authors add that faculty members report that preparing and adapting materials for digital delivery, learning new technologies and managing online platforms require significant time and effort, which they feel is not adequately recognized or compensated by their institutions. This perception can lead

to reluctance in adopting such tools, especially when paired with insufficient institutional support. Misunderstanding student learning styles also contributes to teaching challenges. The online environment complicates interactions between lecturers and students, making it challenging for educators to understand and accommodate diverse learning styles, which can lead to sub-optimal educational outcomes (Alphalearn, 2024).

Learning challenges in the use of e-learning technologies

The learning challenges in the use of e-learning technologies include barriers to technology acceptance. Various factors inhibit the acceptance of technology in education, including technological, educational, human, administrative and economic challenges. The appropriateness of technology can also depend on a country's geographical conditions and the financial standing of its education sector (Gkrimpizi et al., 2023). For some students, especially those who struggle academically, the internet can become a source of distraction. Overuse and digital addiction can detract from their focus on learning, sometimes leading to disengagement and reduced participation in online environments. Additionally, the lack of face-to-face interaction in e-learning settings can hinder essential social and collaborative learning, limiting opportunities for communication and skill-sharing amongst students (Martin et al., 2025). Furthermore, many learners primarily use digital technology for basic tasks such as accessing content and submitting assignments, rather than engaging in interactive and collaborative learning experiences, which can result in a sterile learning environment devoid of creativity and participation (Pavin Ivanec, 2022).

Online learning often requires more time and effort compared to traditional learning methods, particularly in relation to tasks such as taking notes on digital devices or accessing materials from learning management systems (Sarmiento Acosta & Wang, 2025). Additionally, assessing students' work in an online environment presents unique challenges, especially for learners who may feel less comfortable with digital testing platforms (Khan et al., 2021). Whilst e-learning provides flexibility and convenience, it can also lead to feelings of isolation and disconnection amongst students (Alphalearn, 2024). Recent research highlights the importance of cultivating a strong sense of community and belonging in virtual learning spaces to mitigate these challenges and enhance learner engagement. The emphasis is on the importance of fostering a sense of belonging in online learning environments to reduce isolation and enhance student engagement (Dulfer et al. 2024; Franklin & Patterson, 2025).

Further learning challenges relate to underdeveloped problem-solving skills and gaps in technological literacy. The limited human interaction in online learning environments can hinder the development of critical problem-solving abilities as feelings of isolation often reduce opportunities for collaboration and peer learning (Mtebe & Raphael, 2021). Moreover, disparities in digital literacy remain a significant barrier, with many students lacking the technological competencies required to effectively engage with online platforms and tools (Tang et al., 2025). The authors emphasise that addressing these challenges requires targeted support strategies to enhance both collaborative learning and digital skills development. For effective learning, Mtebe and Raphael (2021) state that students must be competent in using technological devices. In addition, many students lack confidence in using technology for learning. This can stem from fears related to electronic communication and self-efficacy with computers. Constant technological advancements can also contribute to a lack of motivation (Choudhury & Pattnaik, 2020; Mahmodi, 2017). Students may also face challenges because of access limitations or inadequate technological infrastructure. Limited access to technology can significantly hinder the effectiveness of e-learning initiatives. Whether through economic constraints or inadequate resources, the availability of computers directly impacts students' learning experiences (Lembani et al. 2020). Furthermore, institutions often face challenges in adapting to technological changes, resulting in insufficient infrastructure, such as outdated laboratories and online facilities, which negatively affect the learning environment (Alphalearn, 2024).

Learning challenges in higher education may also stem from an insufficient pedagogical integration of e-learning. Beyond possessing technical skills, lecturers require a comprehensive understanding of content development, effective teaching strategies, and appropriate assessment methods to successfully embed online learning into their curricula (Maphalala and Adigun 2021a). The quality and effectiveness of e-learning systems are also highly dependent on their usability and accessibility. Hence, poorly designed platforms can hinder the learning process by forcing students to spend unnecessary time navigating the system rather than engaging with course content (Henderson et al., 2020). Furthermore, variations in end-user competency persist, as not all students entering higher education institutions possess the necessary digital literacy or computing skills for effective participation in online environments (Mtebe & Raphael, 2021). The authors posit that students with limited or

intermediate digital proficiency often require targeted training and support to adapt successfully to e-learning contexts. Consequently, the challenges of integrating technology into teaching and learning are multifaceted and interrelated. Both lecturers and students face barriers that can obstruct the effective adoption of technology-enhanced education. Omodan (2023) states that addressing these challenges requires a holistic approach that includes strengthening digital infrastructure; enhancing training for educators and learners; and cultivating an institutional culture that supports technological innovation and pedagogical transformation.

Methodology

This study adopted an empirical research approach utilizing a quantitative research design. The quantitative design was chosen to enable the collection and analysis of numerical data that would reveal trends, practices and challenges associated with the use of e-learning technologies at a South African UOT. This approach allowed for the objective measurement and statistical analysis of the variables under investigation. The target population included 516 full-time lecturers and 16,914 full-time students across six faculties. Using Sekaran and Bougie's (2013) sampling table the sample size was determined to be 220 full-time lecturers and 375 full-time students, specifically from Levels 1 to 3. Lecturers were selected through systematic sampling, where every third staff member from the sampling frame within each faculty was chosen as a participant. The student sample was selected using a non-probability method, namely convenience sampling. The survey instruments comprised mainly closed-ended Likert scale questions, designed to address the study's objectives regarding the challenges of teaching and learning with technology. Both online and hardcopies of the instruments were used. A small group of respondents from both the lecturer and student populations participated in a pre-test to ensure clarity and effectiveness. Of the 220 lecturer survey questionnaires that were sent out, 161 were returned (a 73% response rate) and 256 student questionnaires were returned (a 68% response rate). The data from both the staff and student surveys was analysed with the Statistical Package for the Social Sciences (SPSS) Version 26.

To ensure the accuracy and credibility of the data collection instruments, multiple validation techniques were employed, as illustrated in Table 1 below:

Table 1. Validation techniques used

Validity type	Technique used	Purpose
Reliability	Cronbach's alpha	Tested internal consistency of Likert scale items
Construct validity	Factor Analysis (KMO & Bartlett)	Confirmed that items measured intended constructs
Criterion validity	Pearson Correlation	Examined relationship between variables
Content validity	Pre-test	Ensured clarity and relevance of questions

Data were analysed using SPSS Version 26 while employing techniques such as Descriptive Statistics, Reliability Analysis, Factor Analysis, Pearson Correlation, Cross Tabulations and Chi-Square Tests and Triangulation. Cronbach's alpha (α) coefficient technique and a pre-test tested the reliability of the survey instruments in this study. Bryman (2016, p. 158) states that Cronbach's alpha is a commonly used test of internal reliability. Factor analysis ensured that the survey instrument measured the constructs that it was designed to measure. The Kaiser-Meyer-Olkin (KMO) and Bartlett's test ensured that the conditions necessary for the factor analysis procedure were fulfilled. Factor analysis was conducted only for the Likert scale items. A rotated component matrix illustrated the components, with certain components being divided into finer components. Bryman (2016, p. 168) states that the main goal of factor analysis is to "reduce the number of variables with which the researcher needs to deal" in relation to multiple-item measures, such as Likert scales.

Furthermore, the validity of the survey instrument is indicated by the Pearson coefficient results that were obtained. This technique examined the direction of the relationship between the coefficients, which resulted in either a negative or positive relationship (Bryman, 2016, p. 341). Cross-tabulations consisted of chi-square tests to determine statistically significant relationships between the variables (Bryman, 2016). To increase the credibility and validity of the results, the study also adopted triangulation as a technique to draw up valid conclusions. Bryman (2016, p. 386) states that "triangulation entails using more than one method or source of data in the study of social phenomena". The author adds that triangulation allows for confidence in the findings of a study as the technique uses more than one way of measuring a concept (Bryman, 2016). Ethical clearance was obtained for the study and ethical principles and processes were followed. All respondents provided written consent after they were fully informed about the study. The collection of data was in accordance with research

policies and guidelines concerning human subjects; written consent and voluntary participation and AI tools were not used in the preparation of the manuscript.

Findings and discussion

Table 2 reflects the Cronbach's alpha score for the items that constituted the staff questionnaire.

Table 2. Cronbach's alpha coefficient

	Section	Number of Items	Cronbach's Alpha
Q2	Methods Relating to Teaching Practices	5	0.659
Q3	Importance for Teaching and Learning	2	0.657
Q4	Teaching Challenges in Higher Education Institutions (HEIS)	4	0.601
Q11	Rigid Teaching Practices	5	0.770
Q13	Lack of Skills/Knowledge/Engagement in The Use of Technology	6	0.670
Q14	Lack of Access to Technology	4	0.781
Q15	Challenges Relating to Poor Infrastructure	2	0.712
Q16	Challenges in Integrating Technology into Teaching Practices	2	0.720
Q17	Use of Technology Entails More Work	2	0.632

The reliability scores for all sections exceeded the recommended Cronbach's alpha value. All scores are higher than 0.60, which indicates a degree of acceptable, consistent scoring for these sections of the study. The results of the KMO and Bartlett's Test for the student instrument are reflected in Table 3 below. The requirement is that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be greater than 0.50 and Bartlett's Test of Sphericity less than 0.05. In all instances, the conditions were satisfied, which allows for the factor analysis procedure. The staff instrument also meets all conditions for factor analysis.

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,849
Bartlett's Test of Sphericity	Approx. Chi-Square	5246,419
	df	1035
	Sig.	0,000

The focus of the study was to determine the challenges that lecturers and students encountered in using technology for teaching and learning, not only logistical challenges, but also the underlying inhibitions of skills, attitude and acceptance of a technologically driven curriculum. The findings were analysed and interpreted in accordance with the specific objectives outlined in the study. A selected number of challenges were highlighted in this article due to their pertinence to UOTs.

Challenges relating to teaching with technology

Specific challenges were evident from the lecturer survey. Regarding rigid teaching practices, the findings indicate that adopting technology-enhanced teaching challenges basic Constructivist assumptions about lecturer facilitation and the promotion of student agency in digital learning environments. Constructivism views the lecturer as a facilitator who designs interactive student-centred experiences that encourage exploration, collaboration and knowledge construction. However, the findings as reflected in Figure 1 indicated that, collectively, the majority of respondents (58.4%) agreed or strongly agreed that academics are less eager to adopt e-learning to support their teaching as they find it difficult to adapt to change, while 65.2% agreed that academics need to be convinced that the technology enhanced method benefits students before adopting it. While these attitudes reveal that some lecturers still view teaching through a traditional, transmission-based lens rather than as a process of shared knowledge construction, the reasons for "lecturer reluctance" to adopt technology-enhanced teaching could relate to institutional and pedagogical constraints that may be evident from the findings that follow. The attitudes implied in these findings may reflect anxiety about losing interpersonal connection with students, as 70.2% expressed concern about losing face-to-face interaction with students. Lautenbach (2010) similarly suggests that lecturers with preferred traditional teaching methods are often not comfortable with embracing

technology for teaching. Britto et al. (2016) note that face-to-face instruction is important for communicating with students and fostering a sense of community belonging.

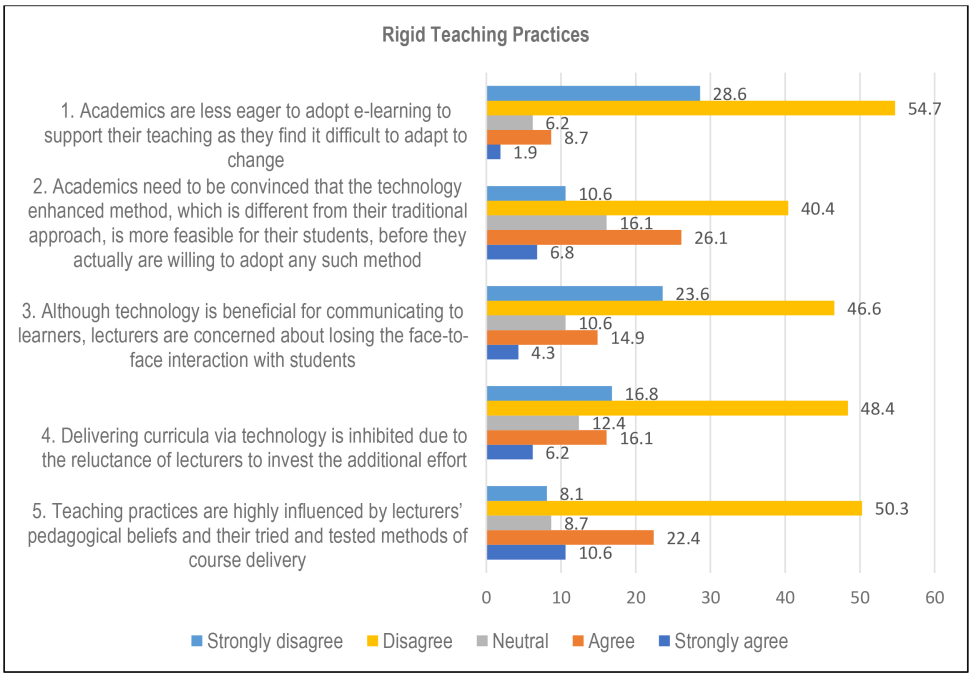

Figure 1. Rigid teaching practices

The majority (60%) also agreed that delivering curricula via technology is inhibited due to the reluctance of lecturers to invest the additional effort. Allen and Seaman (2015) and Chimbo and Tekere (2014) confirm that lecturers need to be flexible and adapt to emerging pedagogical technologies for the successful implementation of academic innovations. Furthermore, the finding that 83.3% agreed that teaching practices are highly influenced by lecturers' pedagogical beliefs and their tried and tested methods of course delivery emphasizes how deeply-rooted teaching habits can limit innovation and hamper the facilitative role envisioned by constructivism. A study by Buchanan et al. (2013) notes that lecturers believed that new methods of teaching are risky, and they doubt whether technology would enhance their subjects. While technology proffers benefits in terms for interactive student-driven learning, its effectiveness depends on the willingness of lecturers to embrace new pedagogical roles.

The reasons advanced by respondents as to why lecturers are not willing to modify their teaching practices included a lack of skills, technical support, and infrastructure, training and resources; reluctance of lecturers to change; fear of the unknown; and time constraints.

The findings also reveal that although lecturers generally recognise the importance of technological competence, the gaps in infrastructure and confidence further challenge Constructivist assumptions about lecturer facilitation and student agency in online learning environments. Although the majority believed that improving technological skills and knowledge (95.3%), as well as having the appropriate facilitation skills (90.7%), are crucial priorities to ensure success in teaching with technology, many still struggle to implement technology effectively. Over half (54.6%) believed that lecturers who lacked technological skills cannot provide appropriate feedback to students and 57.7% indicated that they grapple with the preparation of course content. These findings resonate with Mouyabi's (2010) view that improving technological skills and alleviating confusion on how to infuse teaching with technology is a crucial priority to ensure success in teaching with technology. Although 61% believed that the lack of skills necessary to integrate technology into curricula and provide appropriate feedback to students was not a challenge to teaching with technology, more than half (54.6%) believed that lecturers may not be resistant to technological application but are simply confused as to how to implement technology into their formal teaching methods. The findings further reveal that poor infrastructure, as depicted in Figure 2, was highlighted as a major challenge in the institution as a large portion of respondents (72,1%) agreed that insufficient access to Wi-Fi and bandwidth undermines lecturers' ability to create responsive, interactive

learning environments, while 74.5% agreed that technical errors, system slowness and bugs significantly disrupt the e-learning process. Maphalala and Adigun (2021b) have identified that inadequate technological resources—including limited access to appropriate devices, unreliable internet connectivity, and insufficient bandwidth—create substantial obstacles for lecturers attempting to implement e-learning programs.

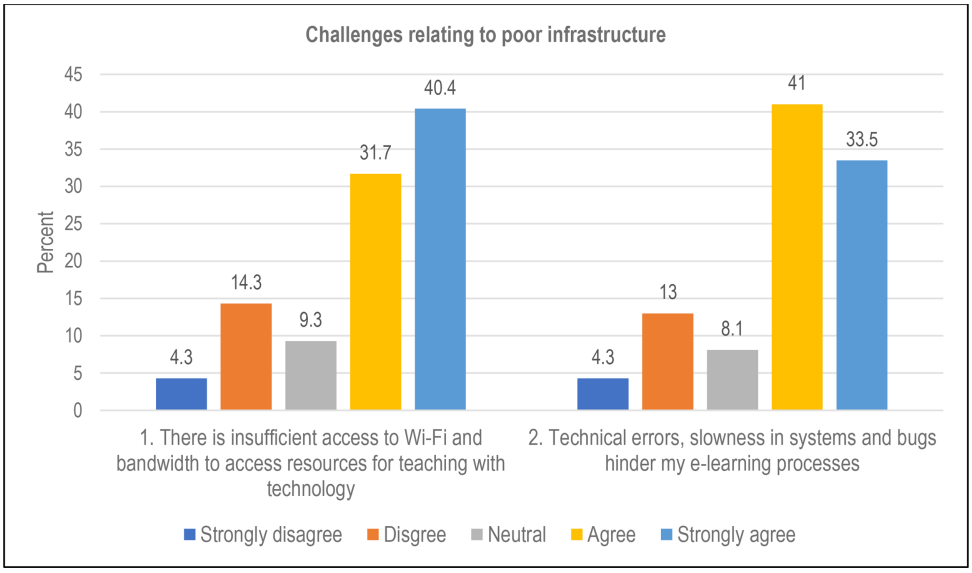

Figure 2. Challenges relating to poor infrastructure

The findings also revealed that limited access to technology, inadequate institutional support and low lecturer confidence challenge core Constructivist assumptions about the facilitation of student agency in technology-enhanced learning environments. Constructivist pedagogy assumes that lecturers are facilitators who integrate technology to create student-centred learning experiences. However, more than half the respondents (57.7%) agreed that there is inadequate technical support in HEIs, and 48.1% noted this specifically within this institution. Over half (65.9%) agreed that lecturers face challenges using innovative teaching methods due to outdated desktop computers and laptops. With respect to integrating technology into teaching practices, almost half the respondents believed that upgrades or various new technologies (47.2%) and the inability to combine "content knowledge, pedagogical knowledge and technological knowledge" (49.7%) are challenges in integrating technology into their teaching practices. This confirms Grajek's (2015) and Mouyabi's (2010) assertions that various new technologies and upgrades to existing technologies for integration into existing teaching practises, can overwhelm lecturers.

As revealed in Figure 3, on the theme "use of technology entails more work, 59.7% viewed evolving e-learning technologies create challenges and tension, leading to reluctance in adopting e-pedagogy, while 77% indicated that a lack of understanding and confidence in new technologies makes lecturers more resistant to using technology in their teaching methods. Such constraints limit a lecturer's ability to facilitate interactive learning and support students' knowledge construction – a central principle of constructivism. Similarly, when technology is seen as burdensome (Johnson et al., 2022), it undermines both the lecturer's role as facilitator and the student's opportunity for active engagement. Furthermore, lecturers' hesitation in adopting technologically-enhanced teaching may be a protective response signalling systemic shortcomings (such as inadequate technical support and outdated devices) rather than an unwillingness to innovate. Understanding such underlying challenges reframes "resistance to change" as a contextual issue, emphasizing the need for organizational support and professional development that enables lecturers to integrate technology.

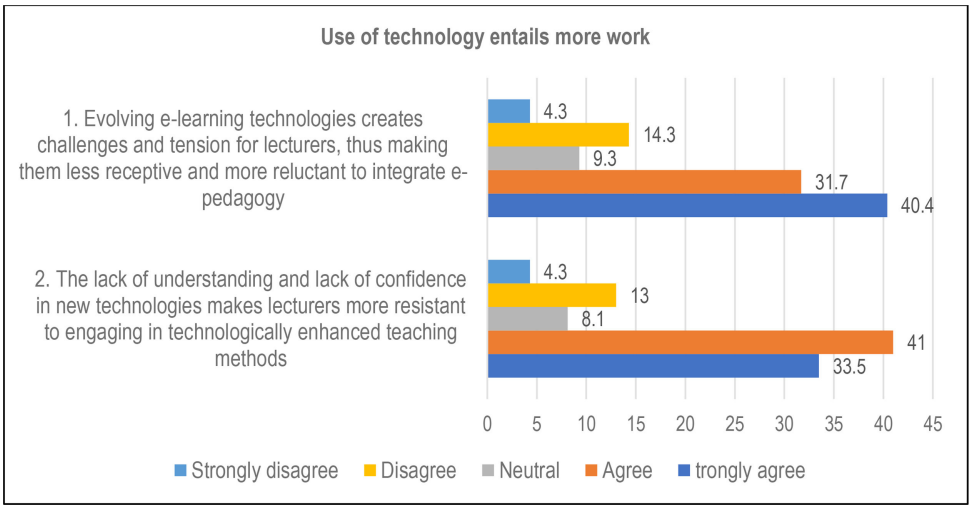

Figure 3. Use of technology entails more work

Challenges relating to learning with technology

The student survey focussed on challenges with respect to "learning with technology". Regarding technology in learning being a distraction to weaker students, some of the respondents (36.7%) agreed that they are distracted by social media and other online content while using technology for learning. This suggests that not all students possess the self-regulation or digital literacy that constructivism assumes. The Constructivist Theory relies on interactive, innovative teaching, yet almost a third (30.5%) felt that students are distracted by technology during lessons that lack innovation, implying that lecturers may not be effectively engaging in the use of technology to promote engagement and enquiry by students. This may point to a breakdown in the facilitator role. Overall, only a portion of respondents believed that social media and non-innovative technology-based lessons distract weaker students from their work. Furthermore, a deeper reading of these findings becomes more meaningful when situated within the context of South Africa's historical inequalities, which continue to impact students' capacity to engage with e-learning.

As indicated in Figure 4, the findings show that nearly half of the respondents (47.2%) agreed that they lacked concentration because they cannot afford the necessary technology, which reflects the enduring socio-economic disparities produced by the apartheid era of educational and economic exclusion. These inequalities influence not only access to devices and data but also influenced the "digital confidence" of students as 51.9% reported difficulty in concentrating due to being inexperienced with technology. Such patterns are consistent with the reality that faces many first-generation and low-income students that enter higher education from under-resourced schools where exposure to digital tools remains limited. Consequently, what appears as a distraction – such as social media use amongst 36.7% of respondents or disengagement in non-innovative lessons – may reflect broader struggles to cope with unfamiliar digital environments rather than a mere lack of discipline. Another 36.7% cited insufficient time to study as the reason for their lack of focus. This points to competing academic, financial and family responsibilities that are common amongst students from a disadvantaged background. Understanding the findings relating to the challenges with learning with technology in the context of South Africa's post-apartheid inequalities highlights that technology integration in higher education cannot be separated from questions of access, historical justice and structural disadvantage. With respect to the challenge of devices not being affordable, Britto and Rush (n.d.) believe that affordability is one of the factors impacting the poor retention of students in online courses, which highlights that the agency of the student as an active participant in learning is not an individual one, but is impacted by context and socio-economic factors. Constructivism assumes that all students have an equitable learning environment, yet these findings show that notable inequities can constrain them from being effective participants in their learning.

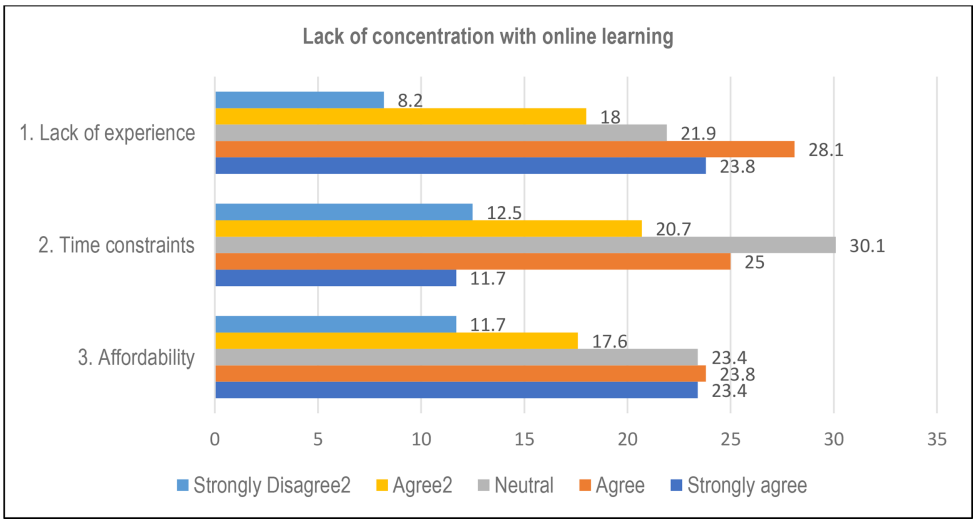

Figure 4. Lack of concentration with online learning

Ali et al. (2017) highlight how internet usage can undermine academic performance, particularly among struggling students, as excessive online engagement and dependency can diminish learning focus, potentially resulting in social loafing. Constructivism assumes that students can manage their learning process. However, the evidence of distraction, dependence on the internet and difficulty in concentrating shows reduced learner autonomy. This challenges the notion that students are in fact capable of directing their own learning in digital spaces, especially the less technologically skilled ones. Some of the respondents believed that engaging in online sessions takes up time due to retrieving information from the LMS, rather than engaging with online activities. Selwyn 2016 affirms that retrieving information from the LMS is time consuming compared to traditional teaching methods. The perception that retrieving information from the LMS consumes study time challenges the Constructivist notion that digital tools support efficient and active learning. Instead, it suggests an overload on the student.

Figure 5 reveals that the lack of human contact was viewed as a challenge as majority of respondents (54.3%) agreed that e-learning limits their interaction with fellow students and lecturers, while 55.8% noted the lack of immediate feedback from lecturers. Interaction is central to the Constructivist Theory, hence limited interaction meant that there were limited opportunities for students to learn together and engage in the co-construction of knowledge. The delay in or absence of lecturer feedback implies that the lecturer's facilitative role is weakened. Additionally, 36.3% felt that e-learning restricts the expression of thoughts and ideas. Overall, most respondents believe that e-learning hinders interaction and timely feedback. Constructivism values self-expression by the student and when this is restricted, it reduces the student's capacity to be an agent for learning. Regarding the impact of e-learning on interactions between peers, lecturers and learning material, the findings indicate that a significant number of respondents feel isolated in e-learning environments. Specifically, 54.7% reported a lack of personal interaction with peers, while 49.6% felt similarly regarding lecturers. Additionally, 41.4% agreed that e-learning focuses solely on digital materials without offering interactive activities. The emphasis on digital materials is related more to a behaviourist than a Constructivist concept. Being able to collaborate with peers in solving problems is a vital notion in terms of the Constructivist Theory, hence its absence undermines student-centred learning. Furthermore, 55.8% stated that e-learning does not facilitate problem-solving opportunities with peers. Overall, the findings highlight a perception of limited interaction and engagement in e-learning settings. According to Alphalearn (2024), e-learning platforms do provide adaptable learning opportunities, but they simultaneously risk fostering a sense of disconnection and solitude amongst learners. These results highlight that technology alone does not ensure Constructivist learning. It must be pedagogically designed to promote dialogue, reflection and collaboration

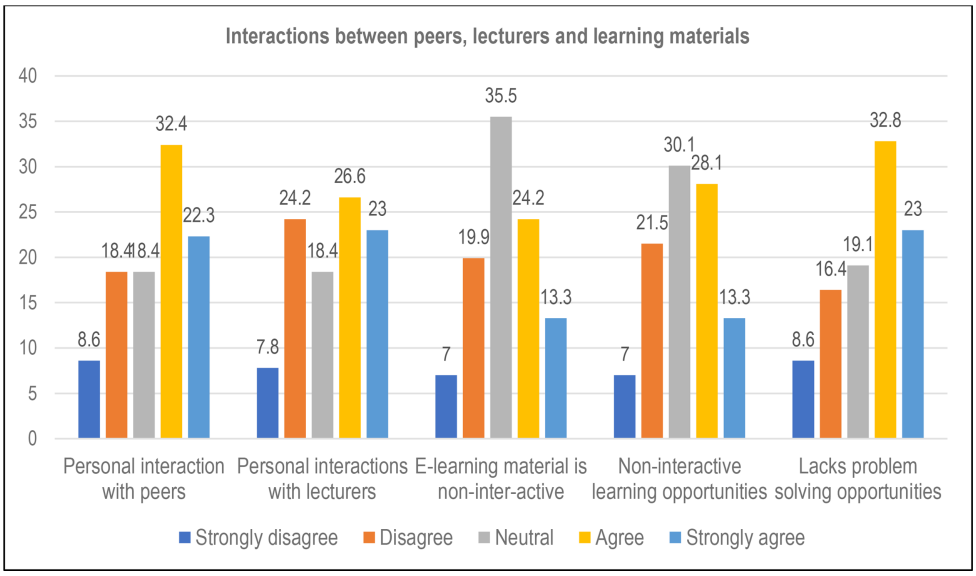

Figure 5. Interactions between peers, lecturers and learning materials

On the theme "impact of e-learning on interactions between peers, lecturers and learning material", the findings highlight that limited access to technology, poor connectivity and inadequate digital skills challenge Constructivist assumptions about student agency for learning and lecturer facilitation in technology-enhanced learning environments. Constructivism emphasizes that learners actively construct knowledge through engagement and collaboration. However, a significant proportion (42.2%) reported an inability to afford the necessary devices, while 41.8% noted poor network connectivity at their institution. Additionally, 37.9% indicated inadequate Wi-Fi access for e-learning purposes. While some respondents felt that computing facilities were sufficient, the majority disagreed, emphasizing concerns about the lack of necessary technology and infrastructure for effective e-learning. Such conditions restrict participation and collaborative interaction, which is central to Constructivist learning. On technological skills challenges, the findings revealed that almost a third of the respondents (30.8%) agreed that they found e-learning difficult because they do not have appropriate technological skills. Olutola and Olatoye (2015) observe that students who are not trained in using technological devices for learning will not experience the full benefits offered by the e-learning environment. Some of the respondents indicated that they are afraid to use technology because they find it difficult to access course material or prepare for online assessments, while half the respondents disagreed. These limitations suggest technological inequality and digital inexperience, which limits the student's capacity for self-directed interactive learning.

The findings challenge Constructivist assumptions in several ways. Firstly, diminished self-regulation by the student challenges the constructive notions of student agency and autonomous learning in online settings. Secondly, Constructivist learning cannot take place in isolation from material conditions, including technological and socio-economic conditions such as connectivity and affordability. Thirdly, technological inexperience amongst learners undermines the Constructivist assumption that learners have the digital competence for self-directed learning. Fourthly, with technology enhanced environments, a sense of isolation and limited opportunities for expression may result in the student feeling disempowered rather than self-directed. The Constructivist theory assumers that the student operates within a supportive environment. Moreover, Constructivism assumes that lecturers can guide and support students, yet the lack of immediacy and personal contact with online settings can challenge lecturers with respect to responding and facilitating learning in real time. Furthermore, the emphasis on digital materials over interaction shows a shift towards content-based learning, which is in contradiction to the Constructivist "shared meaning-making" approach.

A comparison of the findings from the lecturer and student surveys revealed a common trend on many of the sub-themes on the challenges experienced. Most lecturers surveyed disagreed that they do not have the skills to engage with technology for teaching. They lack access to technology for e-learning as they have outdated computers and laptops, while the student survey revealed that just under half of them do not have the skills to engage with technology and they lacked access to technology for e-learning as they cannot afford technological

devices. Insufficient access to Wi-Fi and bandwidth to access resources for teaching with technology was a challenge for most lecturers and about half of the students believed that there is poor network connectivity and a lack of Wi-Fi access at the institution. Just under half of the lecturers believed that there is a lack of technical support at the HEI, which differed from the student survey, where the majority disagreed that there is a lack of technical support. Most lecturers are concerned about losing face-to-face interaction with students, which agrees with the findings from the student survey. Furthermore, the majority of lecturers are reluctant to invest additional effort into delivering curricula via technology, while the student survey revealed that just under half disagreed that lecturers do not integrate technology into the curriculum adequately. Almost half the lecturers agreed that the rapid evolution of technology creates overwhelming stress in their teaching practices, which differed from the findings of the student survey, where the majority do not believe that advancements in technology are a challenge. Many lecturers believed that the lack of technological skills hinders them from providing appropriate feedback to students. This agreed with the findings from the student survey.

The study provides empirical evidence that validates global trends in technology adoption challenges, reinforcing the need for targeted interventions in South African UOTs. It highlights specific institutional barriers (e.g., infrastructure and technical support), enabling HEIs to prioritize resource allocation. Regarding the implications of the study, it highlights the need for professional development programs focusing on technological skills and pedagogical flexibility and institutional investment in reliable infrastructure and technical support systems, which will directly impact the success of e-learning initiatives (Ahmad et al., 2023). Moreover, the study relied on self-reported data, which may introduce bias. The use of convenience sampling for students also limits generalizability. Although the research focused on a single UOT, reducing the scope for broader application across diverse HEIs, conducting comparative studies across multiple UOTs can help to identify common and unique challenges. The long-term impact of professional development programs on technology adoption and teaching effectiveness can be further investigated.

Further thoughts

Traditional learning theories encourage lecturers to reflect on their own practices, while the Constructivist Theory encourages self-guided exploration and application by students. Hence, both students and lecturers play a role in enhancing e-learning pedagogies. The study has highlighted specific challenges, such as rigid teaching practices, the reluctance to invest additional effort and the loss of face-to-face interaction with students, as factors that prove challenging to teaching with technology. Outdated desktop computers and laptops are a major challenge for teaching staff when engaging in innovative teaching methods. There is a lack of technical support in HEIs and insufficient investments in equipment, infrastructure and resources. Moreover, there is insufficient access to Wi-Fi and bandwidth, coupled with technical impediments. The lack of understanding and confidence in new technologies is a challenge that makes lecturers more resistant to engage in e-learning. The dynamic nature of evolving e-learning technologies is a challenge for lecturers, creating a reluctance to integrate e-pedagogy. The integration of technology into curricula entails more work in designing a curriculum, thus making lecturers less receptive to e-pedagogy. Regarding challenges in relation to learning with e-learning, the inability to afford technological devices for e-learning hinders e-learning. A lack of data, the lack of network coverage and unconducive learning environments prove challenging to students who engage in e-learning. E-learning further impedes interactions with lecturers, interactions with peers and interactions with the learning material. In addition, e-learning does not provide students with the opportunity to get immediate feedback from their lecturers, nor does it provide students with the opportunity to problem solve with their peers. Furthermore, e-learning does not allow students to engage in interactive learning activities as e-learning material is not interactive. System downtimes on Moodle or the maintenance of the LMS spread over a long period creates further difficulties when students need to upload work or submit assessments.

The study recommends a phased-implementation framework for interventions to address challenges in the use of e-learning technologies at UOTs, as depicted in Table 4 below. Immediate interventions include adequate equipment and Wi-Fi access; sufficient bandwidth; the provision of data; and technical support (ongoing and just-in-time) to alleviate the lack of adequate resources in teaching. Networking with colleagues, informal interactions/exchanges of knowledge and lecturer chat groups can ease the uncertainty created by the technological transformation of teaching. Other immediate interventions include the use of social media and online group forums to provide feedback to students; fostering meaningful discussions in online learning environments; and addressing challenges such as non-interactive e-learning materials and limited peer interaction. Educational guidance in the use of technological devices in students' own language is also advocated. Additionally, lessons

and assessments should include open book/open web assessments; online databases and free internet resources and videos; games and quizzes; social media platforms for interactive discussions; websites and blogs for practical skills; podcasts; and computer simulations to alleviate the lack of problem-solving activities, e-learning material that is not interactive and impeded interaction with peers. Medium-term interventions that can be implemented include staff development strategies such as workshops and training; customized seminars; webinars; department- level training; teamwork and collaboration; and an introduction to computers as orientation in the first level of study to ensure that students are familiar with basic computer skills. In addition, the provision of exclusive Wi-Fi classrooms, (e.g., student halls and laboratories, to alleviate challenges with unconducive learning environments can also be useful. Furthermore, the teaching content should be applied in accordance with the academic and online readiness of students to alleviate challenges with language and comprehension; and there should be an adequate availability of resources such as laptops and tablets on loan, as well as complimentary network packs to ensure digital equity. Given the infrastructure challenges of UOTs, interventions that can be implemented in the long-term include the establishment of "connected zones", i.e. designated proper learning spaces within student residences for students in underdeveloped townships and squatter settlements to ensure equal access; and Smart City initiatives to ensure free and high-quality network access to students, whether located in the city, townships or rural areas around UOTs.

Table 4. Phased-implementation framework for interventions to address challenges in the use of e-learning technologies at UOTs

Implementation phase	Interventions to address challenges in the use of e-learning technologies
Immediate interventions	• Adequate equipment and Wi-Fi access; sufficient bandwidth; provision of data; and technical support to alleviate the lack of adequate resources in teaching. • Networking with colleagues; informal interactions; and lecturer chat groups can ease the uncertainty created by the technological transformation of teaching. Using social media and online group forums to provide feedback to students, fostering meaningful discussions in online learning environments. • Guidance in the use of technological devices in student's own language. • To alleviate lack of problem-solving and materials that are not interactive, lessons and assessments should include open book/open web assessments; online databases and free internet resources and videos; games and quizzes; social media platforms for interactive discussions; websites and blogs for practical skills; Podcasts; and Computer simulations.
Medium-term interventions	• Staff development strategies such as workshops and training; customized seminars; webinars; department level training; and teamwork and collaboration. • Introduction to computers as orientation in 1st level of study to ensure basic computer skills, as well as the provision of exclusive Wi-Fi classrooms, e.g. student halls, laboratories to alleviate challenges with unconducive learning environments. • Teaching content to be applied in accordance with academic and online readiness of students to alleviate challenges with language and comprehension. • Ensuring adequate resources such as laptops; tablets on loan; and complimentary network packs to ensure digital equity.
Long-term interventions	• "Connected zones" i.e. designate proper learning spaces within student residences and for students in underdeveloped townships and squatter settlements to ensure equal access • Smart City initiatives to ensure free and high-quality network access to students, whether located in the city, townships or rural areas around UOTs.

Each HEI differs in their historical background, their engagement in practices for teaching and learning, as well as their approach to how they envisage technology for teaching and learning. The use of platforms such as Moodle, customized to meet the needs of both lecturers and students, may provide some solutions. Given the diversity of students and lecturers and the various programmes offered at this UOT, perhaps it is imperative to understand the needs of the university community and build tools that best address them (Aguilar, 2020). A needs analysis should thus be conducted to recognize diversities within teaching and learning and to find technologies, integrate software applications, building "your own" media platforms which speak to the current requirements. This UoT can exploit the expertise of the skillsets in ICTS, teaching and learning centres and IT departments for a strong coherent e-learning system. Further investigations into how lecturers can learn and develop their capacity while designing online teaching and learning programmes needs to commence to ensure continuous staff development. The implementation of compulsory online learning for virtual simulations and other technological

innovations can also be productive. It is therefore important to gain the perspective of students regarding their online experiences to improve the quality of teaching and learning.

The study underscores critical implications for HEIs, particularly UOTs, in integrating e-learning technologies. It highlights the need for pedagogical transformation through professional development that fosters both technical competence and flexibility, alongside addressing resistance to change. Infrastructure upgrades, including modern equipment, reliable Wi-Fi, and connected zones, are essential to overcome resource limitations. Continuous technical support and capacity-building initiatives such as workshops and peer-learning networks are vital to boost confidence in technology use. Institutions must also provide instructional design support to manage increased workload and promote collaborative curriculum development. For students, equitable access through device loan schemes, data provision, and interactive learning resources is crucial to enhance engagement. Finally, HEIs should conduct needs analyses to customize platforms like Moodle, leverage ICT expertise, and adopt strategic initiatives to ensure sustainable and inclusive e-learning integration.

Declarations

Interdisciplinary Scope: This study integrates educational theory, technology, and organizational change to examine how e-learning reshapes pedagogy through Constructivist principles while addressing challenges of digital literacy, infrastructure limitations, and lecturer resistance. It integrates ICT design, instructional strategies, equity considerations, and policy development to propose evidence-based interventions and a phased implementation plan that enhances inclusive, technology-supported teaching and learning in Universities of Technology.

Author Contributions: Conceptualisation (Ramroop and Reddy), literature review (Ramroop), methodology (Ramroop and Reddy), analysis (Ramroop), review and editing (Ramroop and Reddy). The final version of the article has been approved by both authors.

Conflict of Interest: The authors have no conflict of interest to declare.

Funding: There was no funding for the publication of this article.

Availability of Data: The paper includes all relevant data. Additional information can, however, be obtained from the corresponding author upon reasonable request.

References

Aguilar, S. J. (2020). A research-based approach for evaluating resources for transitioning to teaching online. *Information and Learning Sciences*, *121*(5/6), 301–310. https://doi.org/10.1108/ILS-04-2020-0072

Ahmad, S., Mohd Noor, A. S., Alwan, A. A., Gulzar, Y., Khan, W. Z., & Reegu, F. A. (2023). eLearning acceptance and adoption challenges in higher education. *Sustainability*, *15*(7), 6190. https://doi.org/10.3390/su15076190

Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating E-learning systems success: An empirical study. *Computers in Human Behavior*, *102*(2020), 67–86. https://doi.org/10.1016/j.chb.2019.08.004

Al-Hunaiyyan, A., Al-Hajri, R., Alzayed, A., & Alraqqas, B. (2016). Towards an effective distance learning model: Implementation framework for Arab universities. *International Journal of Computer Application*, *6*(5), 87–102. https://d1wqtxts1xzle7.cloudfront.net/53722035/Distant_learning.pdf

Ali, S., Uppal, M. A., & Gulliver, S. R. (2018). A conceptual framework highlighting e-learning implementation barriers. *Information Technology & People*, *31*(1), 156–180. https://doi.org/10.1108/ITP-10-2016-0246

Allen, I. E., & Seaman, J. (2015). *Grade level: Tracking online education in the United States*. Babson Survey Research Group. http://www.onlinelearningsurvey.com/reports/gradelevel.pdf

Alotaibi, N. S. (2024). The impact of AI and LMS integration on the future of higher education: Opportunities, challenges, and strategies for transformation. *Sustainability*, *16*(23), 10357. https://doi.org/10.3390/su162310357

Alphalearn. (2024). *Challenges of online learning for students and L&D professionals*. https://www.alphalearn.com/challenges-of-online-learning-for-students-and-ld-professionals/

Azanza, G., Korres, O., Paños-Castro, J., & Petchamé, J. (2024). Empowering university lecturers in the digital age: Exploring the factors influencing the use of digital technologies in higher education. *Education Sciences*, *14*(7), 728. https://doi.org/10.3390/educsci14070728

Britto, A., Murugeson, R., & Subramanian, A. (2016). E-learning and hybrid teaching. S. Subramanian & J. V. Babu (Eds.), *Proceedings of NAAC Sponsored National Conference. (2016, September–October*). The Madurai Diraviyam Thayumanavar Hindu College, Tamil Nadu. (pp. 91–95). HINDCO Publications.

Britto, M., & Rush, S. (n.d.). Developing and implementing comprehensive student support services for online students. *Online Learning*, *17*(1), 29–42. https://doi.org/10.24059/olj.v17i1.313

Bryman, A. (2016). *Social research methods*. (5th ed.). Oxford University Press. https://ebookcentral.proquest.com/lib/durbanut-ebooks/reader.action?docID=4776951

Buchanan, T., Sainter, P., & Saunders, G. (2013). Factors affecting faculty use of learning technologies: Implications for models of technology adoption. *Journal of Computing in Higher Education*, *25*(1), 1–11. https://doi.org/10.1007/s12528-013-9066-6

Chimbo, B., & Tekere, M. (2014). A survey of the knowledge, use, and adoption of emerging technologies by academics in an Open Distance Learning environment. *The Journal for Transdisciplinary Research in Southern Africa*, *10*(1), 67–86. https://doi.org/10.4102/td.v10i1.26

Choudhury, S., & Pattnaik, S. (2020). Emerging themes in e-learning: A review from the stakeholders' perspective. *Computers & Education*, *144*, 103657. https://doi.org/10.1016/j.compedu.2019.103657

Czerniewicz, L. (2020). *What we learnt from "going online" during university shutdowns in South Africa*. https://philonedtech.com/what-we-learnt-from-going-online-during-university-shutdowns-in-south-africa/

Dube, K. (2024). Challenges and opportunities facing higher education in South Africa. In *Redefining Education and Development* (pp. 11–27). Springer. https://doi.org/10.1007/978-3-031-69954-2_2

Dulfer, N., Gowing, A., & Mitchell, J. (2024). Building belonging in online classrooms: Relationships at the core. *Teaching in Higher Education*, *30*(4), 1024–1040. https://doi.org/10.1080/13562517.2024.2349993

Fernando, S. Y., & Marikar, F. M. (2017). Constructivist teaching/learning theory and participatory teaching methods. *Journal of Curriculum and Teaching*, *6*(1), 110. https://doi.org/10.5430/jct.v6n1p110

Franklin, T., & Patterson, T. (2025). Fostering inclusion and belonging in virtual learning environments: Strategies from faculty members for enhancing online student engagement. *Tapestry: Journal of Research in Education*, *Retrieved from*(1). https://digitalcommons.acu.edu/deie/vol3/iss1/3

Gkrimpizi, T., Peristeras, V., & Magnisalis, I. (2023). Classification of barriers to digital transformation in higher education institutions: Systematic literature review. *Education Sciences*, *13*(7), 746. https://doi.org/10.3390/educsci13070746

Gleason, N. W. (2018). Singapore's higher education systems in the era of the Fourth Industrial Revolution: Preparing lifelong learners. In N. W. Gleason(Ed.), *Higher Education in the Era of the Fourth Industrial Revolution*. Singapore: Yale NUS College. https://doi.org/10.1007/978-981-13-0194-0_1

Grajek, S. (2015). Research report: Digital capabilities in higher education, 2015: E-learning Educause Center for Analysis and Research. Louisville: CO: ECAR.

Gruijters, R. J., Elbers, B., & Reddy, V. (2024). Opportunity hoarding and elite reproduction: School segregation in post-apartheid South Africa. *Social Forces*, *103*(1), 173–201. https://doi.org/10.1093/sf/soae070

Henderson, M., Selwyn, N., & Aston, R. (2020). What works and why? Student perceptions of 'useful' digital technology in university teaching and learning. *Studies in Higher Education*, *45*(4), 686–700. https://doi.org/10.1080/03075079.2015.1007946

Johnson, N., Veletsianos, G., Reitzik, O., & VanLeeuwen, C. (2022). Faculty perceptions of online education and technology use over time: A secondary analysis of the annual survey of faculty attitudes on technology from 2013 to 2019. *Online Learning*, *26*(3), 293–310. https://doi.org/10.24059/olj.v26i3.2824

Kaqinari, T. (2023). Facilitators and barriers to online teaching and educational technology use by university lecturers during COVID-19: A systematic review of qualitative evidence. *Trends in Higher Education*, *2*(4), 636–666. https://doi.org/10.3390/higheredu2040038

Khan, A., Rehman, M., & Iqbal, S. (2021). Challenges of online assessment in higher education: A student perspective. *Education and Information Technologies*, *26*(5), 6205–6222.

Kuleto, V., P., M. I., Stanescu, M., Ranković, M., Šević, N. P., Păun, D., & Teodorescu, S. (2021). Extended reality in higher education, a responsible innovation approach for generation Y and generation Z. *Sustainability*, *13*(21), 11814. https://doi.org/10.3390/su132111814

Lautenbach, G. (2010). Expansive learning cycles: Lecturers using educational technologies for teaching and learning. *South African Journal of Higher Education*, *24*(5), 699–715. https://journals.co.za/content/high/24/5/EJC37647

Lea, H. T., Viet, H. P., Thanh, N. N., Thanh, N. B. H., Huy, H. T., Van, H. T., & Hoang, L. P. (2025). The perceptions of lecturers about the application of e-learning in the process of organizing teaching activities at universities. *Multidisciplinary Science Journal*, *7*(10), 2025585. https://doi.org/10.31893/multiscience.2025585

Leibowitz, B., Bozalek, V., van Schalkwyk, S., & Winberg, C. (2015). Institutional context matters: The professional development of academics as teachers in South African higher education. *Higher Education*, *Available*(2), 315–330. http://dx.doi.org/10.1007/s10734-014-9777-2

Lembani, R., Gunter, A., Breines, M., & Dalu, M. T. B. (2019). The same course, different access: The digital divide between urban and rural distance education students in South Africa. *Journal of Geography in Higher Education*, *44*(1), 70–84. https://doi.org/10.1080/03098265.2019.1694876)

Lembani, R., Gunter, A., Breines, M., & Dalu, M. T. B. (2020). The same course, different access: the digital divide between urban and rural distance education students in South Africa. *Journal of Geography in Higher Education*, *Available*(1), 70–84. https://doi.org/10.1080/03098265.2019.1694876

Mabulana, K. (2025). Learners' preparedness for higher education in South Africa: Developing a sense of academic belonging through the selective learning approach. *Frontiers in Education*, *10*. https://doi.org/10.3389/feduc.2025.1465786

Mahmodi, M. (2017). The analysis of the factors affecting the acceptance of e-learning in higher education. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, *8*(1), 1–9. https://doi.org/10.5812/ijvlms.11158

Maluka, H. R., Mowela, S., & Mabasa, F. D. (2024). Green HRM practices at a historically disadvantaged higher education institution in South Africa: Implementation and challenges. *International Journal of Applied Research in Business and Management*, *5*(2). https://doi.org/10.51137/ijarbm.2024.5.2.2

Maphalala, M. C., & Adigun, O. T. (2021a). Academics' experience of integrating technology in teaching and learning at South African universities. *South African Journal of Education*, *41*(2), 1–9.

Maphalala, M. C., & Adigun, O. T. (2021b). Academics' experience of implementing e-learning in a South African higher education institution. *International Journal of Higher Education*, *10*(1), 1–13. https://doi.org/10.5430/ijhe.v10n1p1

Mardiana, H. (2024). Perceived impact of lecturers' digital literacy skills in higher education institutions. *Sage Open*, *14*(3). https://doi.org/10.1177/21582440241256937

Martin, F., Long, S., Haywood, K., & Xie, K. (2025). Digital distractions in education: A systematic review of research on causes, consequences and prevention strategies. *Educational Technology Research and Development*. https://doi.org/10.1007/s11423-025-10550-6

Mashiyi, N., & Baleni, L. (2023). The implementation of 4IR technologies in higher education teaching and learning: A qualitative systematic review. *Proceedings of the 10th Focus Conference*. https://doi.org/10.2991/978-2-38476-134-0_27

Mateko, F. M., Dowelani, M., & Sinamano, R. (2025). Digital inequality and transformation in South African higher education during COVID-19: A comparative analysis of historically disadvantaged and historically advantaged universities. *Higher Education Policy*, 1–19.

Mbanga, N., & Mtembu, V. N. (2020). Digital learning: Perceptions of lecturers at a Technical Vocational Educational and Training college. *South African Journal of Higher Education*, *34*(4), 155–173. https://doi.org/10.20853/34-4-3656

Mouyabi, J. S. M. (2010). Higher education in the wake of new ICT: Reaping benefits or creating more problems through e-learning. *South African Journal of Higher Education*, *24*(5), 1178–1090.

Mtebe, J. S., & Raphael, C. (2021). Key factors influencing collaborative learning in online environments in higher education. *International Journal of Education and Development Using ICT*, *17*(2), 58–74.

Ngobeni, N. R., Chibambo, M. I., & Divala, J. J. (2023). Curriculum transformations in South Africa: some discomforting truths on interminable poverty and inequalities in schools and society. *Frontiers in Education*, *8*. https://doi.org/10.3389/feduc.2023.1132167

Olawale, B. E., Omodan, B. I., & Saddiq, K. (2025). X-raying the enablers and barriers of e-learning in higher education institutions: A systematic review. *Frontiers in Education*, *10*. https://doi.org/10.3389/feduc.2025.1526076

Olutola, A. T., & Olatoye, O. O. (2015). Challenges of e-learning technologies in Nigerian university education. *Journal of Educational and Social Research*, *5*(1), 301–306. https://doi.org/10.5901/jesr.2015.v5n1p301

Omodan, B. I. (2023). Towards effective digital transformation in higher education: A framework for technology integration and pedagogical change. *Journal of Educational Technology and Online Learning*, *6*(1), 15–28.

Pavin Ivanec, T. (2022). The lack of academic social interactions and students' learning difficulties during COVID-19 faculty lockdowns in Croatia: The mediating role of life disruption and adjustment to online studying. *Social Sciences*, *11*(2), 42. https://doi.org/10.3390/socsci11020042

Priya, M. B. (2016). A study on e-learning in India. In S. Subramanian & J. V. Babu (Eds.), *Proceedings of the NAAC Sponsored National Conference, The Madurai Diraviyam Thayumanavar Hindu College, Tamilnadu, September–October 2016* (pp. 169–173). HINDCO Publications.

Radha, R., Mahalakshmi, K., Kumar, V. S., & Saravanakumar, A. R. (2020). E-learning during lockdown of Covid-19 Pandemic: A global perspective. *International Journal of Control and Automation*, *13*(4), 1088–1099. https://www.academia.edu/download/64029090/covid-pandemic-scopus.pdf

Ramraj, U., & Marimuthu, F. (2019). The impact of technology in expediting learning: A South African experience. In *EBEE'19: Proceedings of the 2019 International Conference on E-Business and E-commerce Engineering* (pp. 35–40). Association for Computing Machinery. https://doi.org/10.1145/3385061.3385065

Sarmiento Acosta, C. R., & Wang, Z. (2025). Comparative analysis of online and traditional classroom learning. *North American Academic Research*, *8*(3), 164–176. https://doi.org/10.5281/zenodo.15168657

Sato, S. N., Condes Moreno, E., Rubio-Zarapuz, A., Dalamitros, A. A., Yañez-Sepulveda, R., Tornero-Aguilera, J. F., & Clemente-Suárez, V. J. (2024). Navigating the new normal: Adapting online and distance learning in the post-pandemic era. *Education Sciences*, *14*(1), 19. https://doi.org/10.3390/educsci14010019

Sekaran, U., & Bougie, R. (2013). *Research methods for business: A skill building approach*. (6th ed.). John Wiley and Sons.

Selwyn, N. (2016). Digital downsides: exploring university students' negative engagements with digital technology. *Teaching in Higher Education*, *Available*(8), 1006–1021. https://doi.org/10.1080/13562517.2016.1213229

Soomro, K. A., Kale, U., Curtis, R., Akcaoglu, M., & Bernstein, M. (2020). Digital divide among higher education faculty. *International Journal of Educational Technology in Higher Education*, *17*(1), 1–16. https://doi.org/10.1186/s41239-020-00191-5

Soudien, C. (2023). Race, class, and the democratic project in contemporary South African education: Working and reworking the law. *Education Policy Analysis Archives*, *31*, 105. https://doi.org/10.14507/epaa.31.8017

Tang, Q., Kamarudin, S., Rahman, S. N. A., & Zhang, X. (2025). Bridging gaps in online learning: A systematic literature review on the digital divide. *Journal of Education and Learning*, *14*(1), 161. https://doi.org/10.5539/jel.v14n1p161

Uzorka, A., Namara, S., & Olaniyan, A. O. (2023). Modern technology adoption and professional development of lecturers. *Education and Information Technologies*, *28*, 1–27. https://doi.org/10.1007/s10639-023-11790-w

Zou, Y., Kuek, F., Feng, W., & Cheng, X. (2025). Digital learning in the 21st century: Trends, challenges, and innovations in technology integration. *Frontiers in Education*, *10*. https://doi.org/10.3389/feduc.2025.1562391