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About the Journal

The *Teacher Education through Flexible Learning in Africa* (TETFLE) and other developing contexts online journal is a refereed, open-access e-journal that publishes original research on distance teacher education in Africa. TETFLE aims to create a platform for researchers and practitioners on glocal matters that relate to distance teacher education on the continent. Publications cover issues of content, pedagogical consideration, technology and management in distance education. Exemplar papers with rigour showing research evidence are most appreciated.

TETFLE also publishes review articles and book reviews. The journal currently appears once in a year, with an additional special edition from accepted biennial conference papers, as applicable. The journal is the official journal of the Distance Education and Teachers' Training in Africa (DETA) biennial conference, hosted by the Faculty of Education, University of Pretoria, South Africa.

Focus and scope

The *Teacher Education Through Flexible Learning in Africa* journal is an independent, open-access publication, and serves as a medium for articles of interest to researchers and practitioners in distance teacher education. The journal provides a unique platform

for researchers from faculties of education to share knowledge on educational issues that especially affect Africa. It gives particular issue preference to research presented at the DETA Conference, which takes place biennially.

The views expressed in the journal are those of the respective authors.

Teacher Education Through Flexible Learning in Africa invites submissions sent electronically to: https://upjournals.up.ac.za/index.php/tetfle/about/submissions conforming to the author guidelines.

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Editorial

A paradigm shift towards innovative, resilient and transformative teacher education

Dr Tony Lelliott, South African Institute for Distance Education, Saide
Ms Mohini Baijnath, Neil Butcher and Associates.

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In the *Teacher Education through Flexible Learning in Africa* Volume 5, teacher-educator researchers tried to imagine teacher education through distance education for a post-pandemic future. The key concepts in the theme for the current issue of the journal are innovation, resilience, and transformation. Over the past decade, much has been written about innovation in teacher education. Evgeny Morozov (2014) regarded innovation as a "buzzword" embraced by all political persuasions. Within the context of teacher education, Ellis and colleagues (Ellis et al., 2019) attempted to move the concept of innovation away from the new technologies and marketisation, and make a place for it within social justice and equity. Within the African context, the latter have not yet been fully adopted, at least within the articles for this issue of *Teacher Education through Flexible Learning in Africa* and Other Developing Contexts (TETFLE). Nevertheless, teacher education must embrace innovation for the transformation of practices, promotion of lifelong learning, and achievement of education for sustainable development.

Resilience in teacher education would seem to be a vital concept to promote, given the last five years of turbulence in the sector. In addition to the pandemic, African countries undergo various events that disrupt schooling, such as significant weather events, Internet shutdowns, insecurity, distribution, and transport of resources. Some countries have also introduced changes in school curricula that demand new teacher competencies. Teacher education therefore needs to provide solutions to enable teachers to surmount these obstacles and cope with the changes, amidst the normal day-to-day stresses of teaching. Elena Agular (2021) suggests that three actions distinguish thriving teachers from those who merely survive, namely, reflection, boundary-setting, and clear decision-making.

The third aspect of this issue's theme is transformation. For UNESCO World

Teachers' Day in 2022, the theme was "The transformation of education begins with teachers", and included the need for 15 million properly qualified teachers to achieve SDG 4 by 2030; the improvement of teachers' working conditions and opportunities, including sufficient funding; and the need for teachers to actively participate in social dialogue, and decision-making processes and policies. Therefore, a question is what countries and teacher education institutions in Africa are doing to ensure that transformation in this sector is achieved.

Within the last 18 months, a new opportunity and threat has begun to emerge for teacher education, which future researchers will likely see as a true paradigm shift: artificial intelligence (AI). There were several discussions at DETA 2023 (Kampala, Uganda) mainly on the threats posed by AI, principally concerning the fact that students can use tools such as Chat-GPT to answer their assignments. However, we should note that the same concerns were voiced when the Internet itself was developed, and the most far-sighted educationists realised that it was more of an opportunity than a threat (Education Week, 1998). As long as teacher educators view AI as a tool for them to use, it can undoubtedly be used innovatively and transformatively.

The first article in this issue, contributed by Orucho Michael Ngala (2024), examines strategies used by OdeL centres to enhance the acceptance of new technologies by online learners. Using the Technology Acceptance Model to analyse the findings, Ngala found that the strategy most commonly used by users in the centres was to continuously evaluate to identify gaps for improvement, followed by developing a comprehensive plan for integrating new technologies into the teaching and learning processes. The study identifies ten strategies for enhancing the ODeL mode of Learning in Kenya, the most important being policy and institutional support, infrastructure development, the promotion of awareness and communication, and training and capacity building. In summary, the study recommends that OdeL centres select user-friendly platforms and tools, and conduct regular evaluations of the usability and effectiveness of these tools to identify areas for improvement.

Pambas Tandika Basil, Placidius Ndibalema, Godlove Lawrent, Joyce Mbepera and Prosper Gabrieli (2024) researched how an in-service training programme on phonics-based literacy impacted teachers in Tanzanian Public Schools. They found that teachers received better support for their teaching practices than for materials development or for improving their content knowledge. Overall, teachers were relatively unsatisfied with the training they received, as it was conducted over a short

period, and the study concluded that the training should have been continued over a more extended time period.

Waaiza Udhin and Vicky Avinash Oojorah (2024) conducted an in-depth study on how innovation is conceptualised in education in Mauritius, using online questionnaires and focus group discussions. The article reveals diverse and often conflicting views influenced by sectoral experiences. For example, while primary educators focus on technological tools like tablets and projectors, secondary educators express disillusionment due to limited visible innovation. Higher education respondents are split, with some emphasising digital tools and others cautioning against equating innovation solely with technology. Systemic barriers such as rigid curricula, lack of funding, minimal industry involvement, and conservative mindsets hinder meaningful change. The study stresses the need for a shared understanding of innovation, more decisive leadership, and policies promoting tangible and intangible innovations. The paper highlights the absence of African-centric models, warning that reliance on Global North benchmarks may obscure local innovations.

Joyce West (2024) used a mixed-method design to examine South African lecturers' and students' experiences in interactive video assessment. The article reveals that both students and lecturers found the videos engaging and beneficial for promoting cognitive and teacher presence in online and hybrid learning environments. The study, guided by the Community of Inquiry and Technology Acceptance Model frameworks, highlights that interactive videos support active, inquiry-based learning; continuous assessment; and self-reflection. While lecturers appreciated their pedagogical flexibility and ease of use, successful adoption was contingent on comprehensive training and thoughtful instructional planning. Despite their many benefits, the study notes that interactive videos do not effectively foster social presence (CoI framework) and must be complemented by other strategies.

Eric Addae-Kyeremeh, Jane Cullen, Might Kojo Abreh, Margaret Ebubedike, and Joyceline Alla-Mensah (2024) explores how course tutors in a Ghanaian distance learning institution enact pedagogical practices, particularly focusing on learner-centred approaches rooted in transformative pedagogy. Drawing on Freirean concepts of dialogue and facilitation, the study finds that most tutors favour interactive, discussion-based teaching; which is sometimes challenged by course content (e.g., Mathematics); student unpreparedness; and logistical constraints. Tutors must often adapt their methods to accommodate mature learners with varied backgrounds

and limited study time. The study recommends ongoing professional development, improved monitoring, and investment in technology to support inclusive, flexible, and engaging distance education.

Natasha Madhav (2024) discusses the importance of optimising Open Educational Resources (OER) and practices to enable inclusive education, particularly in African universities. Madhav highlights the challenges faced by Higher Education Institutions in developing countries, such as the digital divide, budget constraints, and power cuts, and emphasises the potential of OER and Information and Communication Technology to provide effective and inclusive access to educational resources. The study explores an open pedagogical approach that promotes inclusivity, access, and collaboration between students and educators, aiming to enhance teaching and learning activities and support curriculum transformation

The editors hope that this set of articles will inspire researchers and practitioners in distance learning for teacher education across Africa to adopt innovative and transformative approaches to their work. In conclusion, the editors of this special issue of *Teacher Education through Flexible Learning in Africa* (TETFLE) would like to thank the following colleagues who assisted with the review process and contributed to the community of practice in this way:

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The Teacher Education through Flexible Learning in Africa (TETFLE)

Strategies for Enhancing Acceptance of New Technologies by Open, Distance, and eLearning Centers in Kenya

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Strategies for Enhancing Acceptance of New Technologies by Open, Distance, and eLearning Centers in Kenya

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Abstract

Introducing a new technology can be very exciting especially to the technology creators. However, as espoused by the Technology Acceptance Model (TAM), while the creator of a given technology may believe that the new technology is very user-friendly, it may only be accepted by its potential users if they share the same beliefs. The study sought to establish strategies that Open, Distance, and eLearning Centers pursue to enhance acceptance of new technologies by online learners. This study is mainly anchored on the Technology Acceptance Model (TAM) which is widely used to explain the factors related to users' acceptance of new technologies. A cross-sectional survey of seventy-three (73) universities in Kenya was undertaken with the in-charge Open, Distance, and electronic Learning (ODel) Centers as the respondents. Fifty-nine (59) respondents completed a survey tool, which was shared as a Google form. Data were analysed quantitatively and qualitatively. Continuous evaluation and improvement of ODeL technologies was the most common strategy perceived to enhance new technology acceptance at 85%. The study recommends a need to develop and operationalise a new technology acceptance and adoption policy as a key strategy to enhance the acceptance of new ODeL technologies.

Keywords: New technologies, Strategies, ODeL, Enhancement, Adoption, Acceptance

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Introduction

The Kenyan educational landscape has witnessed an increasing demand for flexible learning options, driven by factors such as limited physical infrastructure, geographical constraints, pandemics such as COVID-19 and the need for lifelong learning. Open, distance, and electronic Learning (ODeL) has emerged as a powerful educational approach, leveraging technology to provide flexible and accessible learning opportunities. The university centres play a crucial role in meeting this demand by providing accessible education through the integration of digital technologies. In Kenya, ODeL has gained significant attention and investment in recent years, with universities establishing dedicated ODeL centres to facilitate remote learning. However, challenges related to technology acceptance, adoption, and effective implementation persist, hindering the full potential of ODeL. Consequently, successful implementation and utilisation of new ODeL technologies require effective strategies for acceptance and adoption. This study examined the strategies employed by ODeL centres in Kenya to enhance the acceptance and adoption of new technologies, based on a comprehensive census survey of all 73 ODeL centres in Universities across Kenya.

Despite the potential benefits of ODeL technologies such as increased accessibility, flexibility, and the ability to reach learners in remote areas, there is a persistent challenge in Kenya regarding the acceptance and adoption of new ODeL technologies by ODeL centres. Although various initiatives have been undertaken to integrate technology into education, such as setting up ODeL centres and introducing digital platforms, there remains a lack of effective strategies to foster the acceptance and adoption of these technologies within the ODeL centres. The problem stems from several factors including inadequate awareness and understanding among ODeL centres regarding the benefits and potential of new ODeL technologies, which lead to scepticism and resistance towards incorporating these technologies into their educational practices. Additionally, there may be inadequate technical expertise and infrastructure within the centres, making it difficult for them to implement and effectively utilise these technologies. Furthermore, there may be cultural and institutional barriers that impede the acceptance and adoption of new ODeL technologies (Davis et al., 1992). Traditional teaching and learning methods may be deeply entrenched within the ODeL centres, making it challenging to introduce and integrate new technological tools and platforms. According to Barasa et al. (2019), resistance to change, limited training

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opportunities, and a lack of incentives for educators to embrace these technologies may also contribute to the problem. Consequently, the low acceptance and adoption of new ODeL technologies hinder the potential growth and improvement of ODeL centres in Kenya. These technologies have the potential to enhance the quality of education, expand access to learning opportunities, and provide a more flexible and personalised learning experience for students. In order to maximise the benefits of OdeL mode, there is a need to identify and develop effective strategies that can lead to the full adoption of new ODeL technologies within ODeL centres in Kenya.

The main objective of the study was to examine the Strategies put in place by ODeL centers in Kenya to enhance the acceptance and adoption of new ODeL technologies. This objective was synthesised from the literature review to address the research problem.

Literature Review and Theoretical Frameworks

In recent years, ODeL has gained significant attention and popularity in the field of education worldwide, including Kenyan universities (Kyalo et al., 2017). ODeL refers to a mode of learning that employs digital technologies and online platforms to deliver education to learners who are geographically separated from the institution or unable to attend traditional face-to-face classes (Manyasi et al., 2018). The ODeL mode of learning has the potential to overcome barriers of time, space, and accessibility, making quality education more accessible to a larger population (Manyasi & DeLange, 2018). Kenya, a country known for its enthusiasm towards technological advancements, has embraced ODeL as a means to address the challenges of increasing demand for higher education and limited physical infrastructure. According to Ouma et al. (2017), Kenyan universities have recognised the potential of ODeL in expanding educational opportunities, improving student outcomes, and enhancing institutional competitiveness. By leveraging technology, these Universities aim to provide flexible learning options that cater for the diverse needs of students, including professionals who are working and are located in remote areas or have other commitments that prevent them from attending traditional face-to-face classes. According to Venkatesh et al. (2008), ODeL technologies encompass a range of digital tools and platforms designed to facilitate learning and instructional delivery beyond traditional classroom settings. These technologies include learning management systems, video conferencing

tools, mobile applications, virtual reality, and other interactive online resources (Abuya et al., 2018; Kamau & Mbarika, 2014). They enable learners and instructors to engage in flexible, self-paced, and location-independent education (Ouma & Shih, 2017). Furthermore, the technologies offer numerous benefits, including increased access to education, improved flexibility for learners, cost-effectiveness, and the ability to accommodate diverse learning styles (Barasa et al., 2019). In the Kenyan context, ODeL technologies have the potential to address challenges such as limited physical infrastructure, teacher shortages, and geographical barriers, thereby expanding educational opportunities for a larger population (Musyoka & Mwirichia, 2018). Despite these benefits, there are several challenges in the acceptance and adoption of ODeL technologies by users and stakeholders, including infrastructure limitations, inadequate technical support, lack of digital literacy among learners and instructors, resistance to change, and cultural barriers (Venkatesh et al., 2003). Addressing these challenges requires the implementation of effective strategies tailored to the Kenyan educational context (Venkatesh & Bala, 2008).

This study is mainly anchored on the technology acceptance model (TAM) model by Davis (1986) and the unified theory of acceptance and use of technology (UTAUT) by Venkatesh et al. (2003). The TAM is a widely used theoretical framework that explains users' acceptance and adoption of new technologies. According to Davis (1986), perceived usefulness and ease of use are key determinants of an individual's intention to use technology. In the context of ODeL technologies, understanding the factors influencing their acceptance and adoption can help institutions design strategies to overcome resistance and promote their usage. The UTAUT extends the TAM by considering additional factors that influence technology adoption, including social influence, facilitating conditions, and user experience. According to Venkatesh et al. (2003), UTAUT provides a comprehensive framework for understanding the complexities of technology acceptance and adoption, and it can guide the development of strategies to enhance the adoption of ODeL technologies in open, distance, and e-learning centres. Developing a policy on the acceptance and adoption of new ODeL technology in ODeL centres is crucial for ensuring effective implementation and integration of technology-driven learning methods. Such a policy can provide guidelines, standards, and procedures for ODeL centres to follow and promote consistency and quality in ODeL practices. This would, in turn, enhance the level of acceptance and adoption of new technologies by the intended users.

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According to Kamau et al. (2014), policy on acceptance and adoption of new (ODeL) technology ought to address accessibility and inclusivity and promote adherence to relevant accessibility standards and guidelines. Ouma et al. (2017) emphasised the need for such a policy to address the plight of learners with disabilities and connectivity challenges in remote areas and promote digital equity. For users to easily accept new technology, there should be a clear policy addressing data privacy and security concerns by outlining measures to protect learners' personal information and sensitive data and document protocols for data collection, storage, and usage in compliance to relevant data protection regulations (Venkatesh et al., 2012).

A comprehensive assessment of the current technology landscape is the first critical step in identifying the technological gaps that the intended new technology needs to address. According to Davis (1989), introducing a new technology should begin by assessing the existing technology infrastructure and resources available. This will help identify gaps, challenges, and areas where improvements are needed. Venkatesh et al. (2003) assert that a mechanism for evaluating and assessing new educational technologies before their adoption must involve considering factors such as compatibility, scalability, reliability, ease of use, cost-effectiveness, and alignment with educational objectives. Such factors are the most pivotal in accelerating user acceptability. Wanyama et al. (2020) postulate that ODeL centres need to develop a comprehensive plan for integrating new technologies into the teaching and learning processes. This plan should outline goals, timelines, and strategies for implementing and evaluating emerging technology initiatives. Davis et al. (1992) emphasised the need to conduct pilot programmes and demonstrations to showcase the benefits and effectiveness of the new ODeL technologies and that this would enable users to have firsthand experience on how the new technology is expected to enhance their learning process, increase access to education, and enhance engagement. This hands-on experience can generate interest that may then enhance speedy acceptance of the new technology. According to Abuya et al. (2018), the adoption of new ODeL technology requires appropriate infrastructure development and technical support in order to improve technological infrastructure and provide adequate technical support as essential factors to enhance acceptability by users. This includes ensuring reliable internet connectivity, access to devices, and ongoing technical assistance to address issues and challenges that may arise during implementation. ODeL centres must endeavour to assist with the setup, troubleshooting, and maintenance of the systems

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(Kamau & Mbarika, 2014). Professional development and training to enhance the acceptance and adoption of ODeL technologies is another central factor. According to Anderson et al. (2011), it is crucial to invest in comprehensive professional development and training programmes by offering workshops, webinars, and tutorials to both instructors and learners. These familiarise them with the new technologies and their effective use. It is important to address any fears or reservations the users and instructors may have by building their confidence and competence.

Garrison and Kanuka (2004) emphasised that blended learning, a combination of traditional face-to-face and online experiences, supports deeper learning by fostering collaboration between instructors and students. This aligns with the notion that ODeL programs must focus on not only training instructors in technology but also fostering a collaborative learning environment that allows students and instructors to engage meaningfully with the content and each other. The integration of both in-person and online elements provides flexibility and can improve learner engagement and outcomes, making the technology adoption process smoother. Dziuban et al. (2018) suggest that for ODeL technologies to be successfully integrated, both the technology itself and the pedagogical practices must evolve. This means that professional development should not only focus on technological skills but also on reshaping teaching strategies to accommodate flexible learning environments. They argue that a systemic approach is essential for ensuring that ODeL technologies are effective, which includes aligning technological tools with pedagogical goals.

Additionally, continuous evaluation and improvement are crucial for sustaining ODeL adoption. Musyoka et al. (2018) stress that iterative feedback from users helps in refining technology, making it more user-friendly and effective. Such an approach encourages sustained engagement with the platform by addressing emerging challenges and user concerns.

In conclusion, fostering a culture of innovation and collaboration is vital. As Ngaruiya et al. (2018) noted, establishing peer-to-peer support systems and networks within ODeL centres can significantly enhance the adoption process. These platforms allow users to share best practices and success stories, fostering a sense of community and reducing resistance to change. Similarly, Kiboss et al. (2019) advocated for recognising and rewarding innovative practices in using ODeL technologies, which can further incentivise instructors to adopt new tools and methodologies.

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Methods

Ethical considerations are paramount in research involving human participants, particularly when studying ODeL directors. As Creswell and Poth (2017) emphasise, adhering to ethical principles ensures the integrity of the research and protects the participants. In this study, informed consent was obtained from all participants, ensuring they were fully aware of the study's objectives, the voluntary nature of their participation, and their right to withdraw at any time without consequence (Babbie, 2016). Participants' confidentiality was strictly upheld, with their identities and responses anonymised to protect their privacy following the Declaration of Helsinki (World Medical Association, 2013). Data was securely stored and accessible only to the research team. Additionally, the principle of non-maleficence was followed, ensuring no harm—whether physical, psychological, or social—came to the participants as a result of their involvement (Robinson, 2020).

The data collection process was structured to ensure both thoroughness and reliability. An online survey questionnaire was created, combining both closed-ended and open-ended questions to capture comprehensive data. The closed-ended questions were designed to gather quantitative data, while the open-ended questions allowed for qualitative insights, enabling a more nuanced understanding (Creswell & Plano Clark, 2018). The survey was distributed to all seventy-three ODeL directors across the universities in Kenya. To improve the response rate, reminder emails were sent to participants, with a final reminder issued before the survey closed (Dillman et al., 2014). The data collection lasted for four weeks to ensure sufficient time for responses. Throughout, ethical guidelines were followed to guarantee participants were informed about the study's purpose and their right to confidentiality.

Upon collection, the quantitative data from the closed-ended questions were analysed using descriptive statistics such as frequencies and percentages to summarise the directors' perceptions (Field, 2013). The qualitative data from the open-ended responses were analysed using thematic analysis to identify key themes and patterns, enriching the quantitative findings (Braun & Clarke, 2006). The findings were triangulated to offer a comprehensive understanding of the strategies required to enhance the adoption and acceptance of ODeL technologies.

To ensure the validity of the research instruments, a pretest was conducted with a similar group of ODeL directors. Feedback from the pretest informed modifications

and refinements to the instruments (Neuman, 2006). Reliability was assessed using Cronbach's alpha, with a threshold of 0.7 indicating acceptable reliability (Tavakol & Dennick, 2011). This rigorous process ensured that the instruments were both valid and reliable in measuring the constructs they aimed to assess.

This study employed a cross-sectional survey design, targeting all seventy-three ODeL directors from Kenyan universities. The survey was designed to gather information on the directors' perspectives, experiences, and perceptions regarding strategies to enhance the acceptance and adoption of new technologies by ODeL Centers. The questionnaire, containing both quantitative and qualitative questions, also explored contextual factors influencing technology adoption. Data was analysed using a mixed-methods approach, integrating quantitative descriptive statistics with qualitative thematic analysis to provide comprehensive insights into the study objectives. Validity was ensured through careful instrument design, pretesting, and triangulation, while reliability was confirmed using Cronbach's alpha, ensuring the research tools were robust and trustworthy in capturing the intended data.

Results

Both qualitative and quantitative results were consolidated and presented in tables 2 and 3.

Response Rate

Table 1 summarises the responses per university category.

Table 1: Response Rate

S/No.	Status	Total Number	No. Responded
1	Chartered Public Universities in	31	27
2	Public University Constituent Colleges	5	2
3	Chartered private universities in Kenya	21	19
4	Private University Constituent Colleges	3	2
5	Universities with Letters of Interim University	12	9
6	specialised universities	1	0
	Total	**73**	**59**
	Response Rate		**80%**

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From Table 1, fifty-nine (59) out of the seventy-three From Table 1, fifty-nine (59) out of the seventy-three (73) respondents completed and returned the questionnaires. This amounted to an eighty per cent (80%) response rate.

Qualitative Results

Qualitative data from open-ended questions were analysed using thematic analysis to identify key themes and patterns within the data. The following key responses from the fifty-nine (59) respondents were summarised in Table 2

Table 2: Key Thematic Analysis Findings

S/No	Thematic Area (Strategies)	No. of Respondents	Proportion
1	Availability of Policy on Acceptance and Adoption of New (ODeL) Technology	44	75%
2	Comprehensive assessment of the current technology	36	66%
3	Availability of a comprehensive plan for integrating new technologies into the teaching and learning processes	48	83%
5	Execution of pilot programs which demonstrate and showcase the benefits and effectiveness of new ODL technologies	29	51%
6	Appropriate infrastructure and technical support	33	58%
7	Comprehensive professional development and training programs	20	32%
8	Continuous engagement of key stakeholders	22	36%
9	Intuitive and user-friendly interfaces of ODeL Technology	17	29%
10	Continuous evaluation and improvement of ODeL technologies	50	85%
11	Fostering a culture of innovation	15	25%

Table 2 shows that the majority of respondents (85%) emphasised the need for continuous evaluation and improvement of ODeL technologies. Although it did not come out from the findings that ODeL centres continually undertake evaluation and improvement of new ODeL technologies, the majority of the respondents felt that it is indeed a good idea to continuously evaluate for gap identification and eventual

improvement of existing technology.

The second most popular thematic area mentioned by 83% of the respondents was the aspect of a comprehensive plan for integrating new technologies into the teaching and learning processes. They indicated that there is a need for such a plan to assist in systematic and seamless transitioning from an existing technology to a new one.

The third thematic aspect was on the availability of policy on the acceptance and adoption of new (ODeL) technology. From Table 2, about 75% of the respondents highlighted that such a policy would address the plight of learners with disabilities and connectivity challenges in remote areas and promote digital equity.

The fourth thematic aspect was on comprehensive assessment of the current technology. This was mentioned by 66% of the respondents.

Appropriate infrastructure and technical support followed as the fifth area of convergence by 58% of the respondents, pointing out that effective ODeL technology requires the development of sustainable technological infrastructure, leading to the adoption of energy-efficient practices and renewable energy sources in Universities.

Fifty-one (51%) of the respondents indicated that the execution of pilot programmes is necessary and critical to demonstrate and showcase the benefits and effectiveness of new ODL technologies. The pilot would also enable the institute to ascertain the credibility of a proposed new ODEL technology.

Stakeholder engagement is another critical activity that is paramount to ensure the acceptability and adoption of new ODeL technology. Although 36% of the respondents converged on this point, the aspect of stakeholder engagement is a key anchor.

The other strategies include comprehensive professional development and training programmes, intuitive and user-friendly interfaces of ODeL technology, and fostering a culture of innovation at 32%, 29%, and 25%, respectively.

Quantitative Results

Quantitative data collected from closed-ended questions which were framed using a five-point Lickert type scale (5= Strongly Agree, 4= Agree, 3= Not sure, 2= Disagree, 1= Strongly Disagree) were analysed descriptively, and the results summarised in Table 3.

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Table 3: Descriptive Results

Employee Motivation	N	Mean	Std. Deviation
The institute has in place, a Policy on Acceptance and Adoption of new (ODeL) Technology that addresses accessibility and inclusivity.	59	1.28	0.22
The institute comprehensively assesses the current technology in terms of infrastructure and resources before introducing a new one.	59	1.98	0.71
The institute conducts an assessment of a new ODeL technology for compatibility, scalability, reliability, ease of use, cost-effectiveness, and alignment with educational objectives.	59	3.68	0.93
The institute develops a comprehensive plan for integrating new technologies into the teaching and learning processes, outlining goals, timelines, and strategies for implementing and evaluating emerging technology initiatives.	59	3.62	0.85
The institute executes pilot programs which demonstrate and showcase the benefits and effectiveness of new ODL technologies and that enable users to have firsthand experience on how the new technology is expected to enhance their learning process, increase access to education, and enhance engagement.	59	2.02	0.71
The institute has put in place appropriate infrastructure and technical support for the enhancement of user experience, such as internet connectivity, access to devices, and ongoing technical assistance.	59	3.12	0.91
The institute conducts comprehensive professional development and training programs, including workshops, webinars, tutorials on digital literacy skills, pedagogical approaches for online instruction, and interactive learning experiences for learners.	59	3.01	0.59
The institute continuously engages key stakeholders, such as students, faculty, administrators, and support staff, in the decision-making process from the beginning	59	1.02	0.85
The institute ensures intuitive and user-friendly interfaces of ODeL Technology that are easy to navigate and understand, consequently reducing barriers and encouraging users to engage with it more readily.	59	2.0	0.61
The institute conducts continuous evaluation of ODeL technologies to identify gaps for improvement	59	3.92	0.85

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The institute fosters a culture of innovation, encouraging experimentation, recognition and reward for individuals or teams that showcase innovative practices that positively impact teaching, learning, and student engagement.	59	1.92	0.15
Average		**2.5**	

The descriptive results presented in Table 3 demonstrate that the ODeL centres and, by extension, the universities in Kenya are not doing much to enhance the acceptability and adoption of new ODeL technologies. The average mean score is 2.5, which implies disagreement by the respondents for the majority of the statements. The only aspects which approximated to agreement score from the respondents were continuous evaluation of ODeL technologies to identify gaps for improvement at 3.92; development of a comprehensive plan for integrating new technologies into the teaching and learning processes outlining goals, timelines, and strategies for implementing and evaluating emerging technology initiatives at 3.62; and finally, the assessment of a new ODeL technology for compatibility, scalability, reliability, ease of use, cost-effectiveness, and alignment with educational objectives at 3.68. Although the aspect of the policy on acceptance and adoption of new (ODeL) technology that addresses accessibility and inclusivity is at the centre of defining the actual procedure of adopting a new ODeL technology, the results show that it is the second least consideration by ODeL centres on Kenyan universities. In fact, only two (2) universities out of the 59 had such a policy in place. It is also worth noting that despite the significance of stakeholder engagement, the results show that it was the least (mean of 1.02) executed aspect in all the universities studied. All respondents indicated that continuous stakeholder engagement during the introduction of a new ODeL technology never takes place.

Discussion

The main focus of this study was to identify the strategies employed by Kenyan universities to enhance the acceptance and adoption of new technologies. Overall, the research findings emphasise the importance of a holistic and systematic approach to enhance the acceptance and adoption of new technologies in ODEL centres. By focusing on infrastructure development, training, and collaboration, Kenyan universities

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can effectively leverage technology to improve the quality and accessibility of distance education. This study established that the most commonly suggested strategies include:

a. Continuous Evaluation and Improvement of ODeL Technologies

The majority of the responses (85%) converged on the need for continuous evaluation and improvement of ODL technologies as a critical strategy to ensure their effectiveness, relevance, and alignment with the needs of learners and ODeL centres. This observation is consistent with the findings of Musyoka et al. (2018), who emphasised that conducting research and evaluation to assess the impact and effectiveness of new technologies in ODeL settings is pivotal to providing evidence for decision-making and further improvements.

b. Comprehensive Plan for Integrating New ODeL Technologies

The availability of a comprehensive plan for integrating new technologies into the teaching and learning processes was supported by 82% of the respondents. This finding is consistent with that of Wanyama et al. (2020), who stressed that in order to enhance the acceptability and adoption of new ODeL technologies, there is a crucial need for a comprehensive plan that focuses on their integration. ODeL technologies, such as online platforms, virtual classrooms, and interactive learning tools, have the potential to revolutionise ODeL centres by providing flexible and accessible learning opportunities. However, without a well-thought-out plan, their implementation may face resistance and challenges. A comprehensive plan for integrating new ODeL technologies is an essential strategy to ensure that the adoption of ODeL technologies is seamless and effective, ultimately leading to increased acceptability and widespread utilisation. Davis et al. (1992) indicated that such a plan would not only enable institutions to keep up with the evolving educational landscape but also empower learners by providing them with enhanced opportunities for personalised, self-paced, and lifelong learning.

c. Comprehensive Assessment of the Current Technology

Sixty-six per cent (66%) of the respondents indicated that there is a need for a comprehensive assessment of the current ODeL technologies to enhance their acceptability and adoption. As technology continues to advance at a rapid pace, it is crucial to evaluate the effectiveness, accessibility, and user-friendliness of these technologies in order to ensure their successful integration into the educational

landscape. This view is in line with that of Venkatesh et al. (2003), who indicated that comprehensive assessments can help identify strengths and weaknesses of ODeL technologies, enabling educators and institutions to make informed decisions about their implementation. By understanding the needs and preferences of learners, as well as addressing potential barriers and challenges, such assessments can facilitate the development of user-centric ODeL platforms that foster engagement, interactivity, and effective learning outcomes. Moreover, an in-depth evaluation of these technologies can also contribute to their wider acceptance and adoption by providing evidence-based insights and recommendations for improvement. Ultimately, a comprehensive assessment of current ODeL technologies is essential to promote their widespread usage and unlock their full potential in revolutionising education and expanding access to quality learning opportunities.

d. Professional Development and Training

Thirty-two per cent (32%) of the respondents agreed that training and capacity-building programmes are highly effective in promoting the acceptance and adoption of new technologies. The findings are consistent with the assertion of Anderson et al. (2011), who indicated that providing adequate training and professional development opportunities for ODeL staff and faculty members enhances their technological skills and familiarity with new technologies. This indicates that universities recognise the importance of equipping their staff with the necessary skills and knowledge to effectively use new technologies in teaching and learning and to integrate technology into their teaching practices.

e. Appropriate Infrastructure and Technical Support

Regarding infrastructure development, 58% of the respondents considered it to be critical in enhancing the acceptance and adoption of new technologies. This observation is in line with the findings of Ouma et al. (2017), who emphasised that the necessary technological infrastructure, such as reliable internet connectivity, hardware, and software, is needed to support the adoption of new technologies. This suggests that universities need to invest in robust technological infrastructure to provide reliable access to new technologies for both staff and students. The respondents stressed the need to improve the technological infrastructure in Kenyan Universities, including robust internet connectivity, well-equipped computer labs, and adequate software and hardware resources. This goes

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hand in hand with the support and technical assistance necessary for faculty and staff in utilising new technologies, addressing any challenges that may arise during the adoption process, and ensuring a smooth transition.

f. Policy on Acceptance and Adoption of New (ODeL) Technology:

Availability of a policy on acceptance and adoption of new (ODeL) technology was perceived as highly effective by 75% of the respondents. In their study, Kamau et al. (2014) highlighted the importance of establishing clear policies and providing institutional support for the adoption of new technologies. Such support can create an enabling environment for the integration of new technologies in teaching and learning. The respondents stressed the importance of supportive policies and institutional frameworks that encourage and incentivise technology adoption. They called for the development of clear guidelines, standards, and evaluation mechanisms to ensure effective technology integration.

g. Pilot Testing and Gradual Implementation:

Execution of pilot programmes which demonstrate and showcase the benefits and effectiveness of new ODeL technologies had a convergence of 51% of respondence and was emphasised as a critical strategy in building confidence in users by testing the effectiveness of the proposed ODeL technology. Davis et al. (1992) posited conducting pilot tests to evaluate the effectiveness and feasibility of new technologies before scaling them up across the ODeL centres. Gradual implementation allows for learning from initial experiences and making necessary adjustments.

h. User-Centered Design and Stakeholder Engagement

Continuous engagement of key stakeholders is another strategy that attracted 36% of the respondents. This finding is in line with that of Barasa et al. (2019) who asserted that involving ODeL stakeholders, including directors, faculty, and students in the design and development of new technologies to ensure that they meet their specific needs and preferences, is key in winning users' acceptance and adoption of a new ODeL technology.

Intuitive and user-friendly interfaces of ODeL technology were also pointed out as an essential strategy in 20% of the responses. This position is supported by Gakindi et al. (2017) who emphasised that if the technology is easy to navigate and understand, it reduces barriers and encourages users to engage with it more readily.

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Conclusion

In conclusion, this research study sheds light on the strategies that can effectively enhance the acceptance and adoption of new technologies by ODEL centres in the 73 universities in Kenya. The findings underscore the importance of aligning technological advancements with the specific needs and goals of ODEL centres, as well as the significance of providing comprehensive training and support to faculty members and administrators. Additionally, fostering a culture of innovation, collaboration, and continuous improvement within these centres emerges as a crucial factor in facilitating the successful integration of new technologies. By implementing the identified strategies, ODeL centres in Kenyan universities can overcome barriers, embrace technological advancements, and ultimately provide enhanced educational experiences to their diverse student populations. This research study contributes valuable insights to the field of educational technology and serves as a foundation for future initiatives aimed at improving the utilisation of new technologies in ODEL settings.

Study Implications and Recommendations

This study aimed to examine the strategies put in place by ODeL Centers in Kenya in order to enhance the acceptance and adoption of new ODeL technologies. By examining the survey responses from fifty-nine (59) ODeL directors, this research provides valuable insights on priorities that need to be addressed in order for the institutions to enhance acceptance and adoption of new ODeL technologies. The study, therefore, recommends the following strategies for enhancing ODeL mode of Learning in Kenya:

Policy and Institutional Support

Universities and ODEL centres should establish supportive policies and frameworks that encourage the adoption of new technologies. This includes allocating financial resources for technology investments, revising curriculum and assessment practices to align with technology-enhanced learning, and recognising and rewarding faculty who demonstrate excellence in integrating technology into their teaching practices.

Infrastructure Development

One of the key factors influencing the acceptance and adoption of new technologies

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is the availability of adequate infrastructure. Open, distance, and eLearning centres in Kenya should prioritise the development of robust internet connectivity, reliable power supply, and appropriate hardware and software resources. This will create an enabling environment for the effective use of new technologies in education.

Promote Awareness and Communication

Conduct awareness campaigns and communication initiatives to disseminate information about the benefits and success stories of new technologies in ODEL. This can include creating newsletters, online platforms, and social media channels to share experiences, best practices, and practical tips for effective technology integration.

Training and Capacity Building

It is crucial to provide training and undertake capacity building for instructors, administrators, and support staff to enhance their digital literacy and technological skills. This can be achieved through workshops, seminars, online courses, and partnerships with technology providers. By equipping the personnel with the necessary skills, they will be more confident and competent in integrating new technologies into their teaching and learning practices.

Stakeholder engagement and collaboration

Open, distance, and eLearning centres should actively engage stakeholders, including policymakers, educators, learners, and the local community in the decision-making and implementation processes. Collaborative partnerships can foster a sense of ownership and collective responsibility, leading to increased acceptance and adoption of new technologies. Stakeholders can provide valuable insights, contribute resources, and support the sustainability of technology initiatives.

Customisation and Localisation

The successful adoption of new technologies requires customisation and localisation to meet the specific needs and contexts of the learners and educators in Kenya. This involves adapting technological tools and content to align with local languages, cultural norms, and educational frameworks. By incorporating indigenous knowledge and cultural references, new technologies can become more relevant and engaging for the target audience.

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Continuous Evaluation and Feedback

Open, distance, and e-Learning centres should establish mechanisms for continuous evaluation and feedback on the use of new technologies. This can involve monitoring learner outcomes, conducting surveys, and collecting qualitative feedback from instructors and learners. The insights gained from these evaluations can inform improvements and refinements in the technology implementation, leading to better acceptance and adoption rates.

Addressing accessibility and inclusivity

To ensure equitable access and adoption of new technologies, it is essential to address barriers related to affordability, digital literacy, and disability. Open, distance, and e-Learning centres should explore strategies such as providing affordable devices, offering digital literacy programmes, and incorporating accessibility features in technological tools. By addressing these barriers, more learners can benefit from the opportunities offered by new technologies.

Collaboration and Partnerships

Collaboration and partnerships with technology vendors, educational institutions, and industry players can facilitate the adoption of new technologies. Engaging in joint research projects, sharing best practices, and participating in technology-driven initiatives can provide valuable insights and resources for ODEL centres. Additionally, establishing partnerships with technology companies can lead to favourable pricing and access to cutting-edge solutions. Participants suggested promoting collaboration and knowledge sharing among universities to share best practices, experiences, and lessons learned. They recommended establishing networks and forums where ODL directors could exchange ideas and resources.

Change Management and Support Systems

The implementation of new technologies requires a comprehensive change management approach. ODeL centres should provide adequate support systems, such as help desks, online tutorials, and communities of practice to assist faculty and students in effectively navigating and utilising new technologies. Change management strategies should also address concerns and resistance to change through clear communication, addressing misconceptions, and highlighting the benefits of technology integration.

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User-Friendly Platforms and Tools

The usability and accessibility of technology platforms and tools greatly influence their adoption. ODeL centres should select user-friendly platforms and tools that are intuitive and accommodate diverse learning needs. Regular evaluations of the usability and effectiveness of these tools should be conducted to identify areas for improvement.

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Early Grade Teachers' Implementation of Phonics-based Literacy Instruction for Reading Skills Development: Do Teachers' Professional Experiences Make a difference?

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Early Grade Teachers' Implementation of Phonics-based Literacy Instruction for Reading Skills Development: Do Teachers' Professional Experiences Make a difference?

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Abstract

In-service training in phonics-based literacy instruction comparing the USAID and non-USAID Jifunze Uelewe schools has not been focused on by the research team in Tanzania. Thus, there has been limited evidence to inform planning and implementing lessons improving reading skills among early grades pupils using phonics-based literacy instruction. Three data collection methods were used: in-depth interviews, classroom observation and a questionnaire reaching 305 participants (208 early-grade teachers, and 97 Ward Education Officers) in 50 public schools (40 in the Tanzania mainland and 10 from Zanzibar). Content analysis was used to analyse responses given by teachers' and education quality assurance officers on the focused research questions. The results indicate that teachers reported receiving better support for teaching practices than for the preparation of materials or for growing their content knowledge. Also, the programmes rarely help teachers gain skills for teaching children with special needs. Overcrowded classrooms and lack of technological materials were reported to compromise teachers' ability to promote responsive classrooms in their teaching. A good number of teachers (78%) in the USAID Jifunze Uelewe regions and 48% from non-USAID regions had an opportunity to attend in-service professional development on working with special needs children. Some teachers felt less satisfied with the in-service training they received as it was conducted over a short period, thereby not impacting their teaching skills. The study concludes that in-service training, especially mentoring and coaching, should be sustained to improve teachers' knowledge and skills to prepare and deliver phonics-based lessons appropriately.

Keywords: In-service teacher education, phonics approach, literacy, special needs, early grade

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Introduction

Enabling early-grade children to read at a young age is the cornerstone of improving educational outcomes (Hanemann, 2022). Central to the success of the teaching and learning process is the level of progress children attain in reading. Without developing reading ability, a child would inadequately participate and attain learning goals successfully (Sullivan & Brown, 2015). Gedik and Akyol (2022) point out that children below the expected reading levels struggle to develop more advanced skills because they are likely to disengage from different learning instructions. Gove and Wetterberg (2011) differentiate effective readers from ineffective readers, arguing that the former develops vocabularies through absorbing increasing amounts of written information and improving comprehension. However, the ineffective readers lose motivation and remain unable to comprehend information.

Different international and national reports show that most children complete their primary level of education without sufficient knowledge of reading (UNESCO, 2017; UWEZO, 2019; World Bank, 2019). UNESCO (2017) reveals that globally, more than 617 million children and adolescents are not achieving minimum proficiency levels in reading. The available statistics show that the challenge exists more in Sub-Saharan Africa (138 million primary school children) and in Central and Southern Asia (152 million primary school children). The World Bank (2019) highlighted that 53% of children in low and middle-income families could not read an age-appropriate text with comprehension by age 10. The challenges children face in reading at various levels threaten the progress towards the achievement of the Sustainable Development Goals, particularly goal number 4, which focuses on all children completing primary and secondary education with relevant and effective learning outcomes in reading and mathematics (UNESCO, 2017).

In Tanzania, poor reading skills among primary school pupils has been documented for many years (Uwezo, 2013; Brombacher et al., 2014). Uwezo (2019) indicates that 24% of grade seven pupils could not read grade two Kiswahili texts. Brombacher et al. (2014) state that most grade two pupils could not read with comprehension. There is a close and direct relationship between a teacher's literacy knowledge and skills and a pupil's reading outcomes with teachers' professional experiences [pre- and in-service training] they are exposed to (Piasta et al., 2009).

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The teaching and learning of reading skills

Though the development of reading skills is attained through the involvement of the pupil in multiple tasks (Fielding-Barnsley & Purdie, 2005), there are debates on the approaches resulting in the so-called "reading wars" (Torgerson et al., 2019; Solity, 2020). The main variants of the debate focus on phonics-based literacy instruction, whole-language instruction, and the use of the balanced literacy approach (BLA). While the phonics-based literacy approach stresses teaching pupils to read sequentially and explicitly by forming the relationship of letter-sound correspondence in words, the whole language approach uses the entire word to engage pupils in developing reading skills without breaking it down into letters or combinations of letters (Maddox & Feng, 2013).

Grabe and Stoller (2002) challenge the use of the whole language arguing that it encourages guessing in reading among pupils, thus limiting the basic ability to decode text. Several authors recommend phonics-based literacy instruction as it enables children to become skilled readers by developing phonemic awareness and alphabet knowledge among pupils (Grabe & Stoller, 2002). The BLA on the other hand, is underpinned by the use of explicit instruction in which learners are engaged in authentic learning experiences while incorporating both reading and writing activities (Acosta, 2012). The author adds that the approach is characterized by read-aloud, shared reading, independent reading, modelled writing, shared writing, and independent writing. Therefore, the BLA (integrated phonics and whole language), in teaching reading skills is gaining more attention in increasing learners' engagement in knowledge construction though some countries still favour phonics-based literacy instruction, including the United States of America (US), England, Australia, and Tanzania (URT, 2016).

Flynn et al. (2021) argue that effective teachers' implementation of phonics-based literacy instruction needs special training. Designing this research was triggered by limited studies that have explored the effectiveness of professional development for phonics instruction, especially in Tanzania. Available evidence shows that teachers are unaware of their limited subject knowledge and skills or overestimate the level of knowledge and ability to teach early literacy skills (Stark et al., 2016). Oliveira et al. (2019) argue that any effective programme must be able to provide content and pedagogical knowledge and provide teachers with the tools to connect that

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knowledge to classroom practices.

Further, Lenski et al. (2013) inform that most programmes prioritize and equip teachers with knowledge related to literacy theory, instructional practices, and assessment procedures. The International Reading Association (2010) depict that teacher professional development has several impacts on teachers' teaching of reading skills ranging from foundational knowledge on curriculum and instruction, assessment and evaluation, to diversity in teaching reading. To make teacher professional development bring positive changes, Sailors and Price (2010) suggest classroom-based coaching as it gives teachers and experts to collaborate and enables practitioners (teachers) to put new knowledge into practice. On the other hand, Prince et al. (2010) purport that peer coaching at school contributes more to success than training via standalone events for large groups of teachers.

In Tanzania, teacher professional development requires refocusing as the available training and programmes are concentrated mainly on the general learning of pupils, with little attention given to specific skills such as foundational learning skills (Swai et al., 2022) as it inadequately helps to improve pupils' learning (UNICEF Innocenti-Global Office of Research and Foresight et al., 2024). The limited focus of the teacher professional programmes illustrates the importance of quality assurance in the design for supporting the achievement of quality learning outcomes. Teachers' professional development and quality assurance are inextricably linked and crucial interventions in a teacher's career and professional practices. When teachers' professional development and quality assurance are inadequately conducted, they compromise quality in teaching and learning outcomes (Day, 1991). To make a positive difference, professional development should equip teachers with a solid knowledge base, effective instructional tools that are aligned with the knowledge base, and school systems should support and nurture implementation. Kennedy (2016) and Taylor et al. (2019) add that for in-service training to be effective, they should be developed and conducted through ongoing practice. Taylor et al. (2019) expound further that a bundled intervention, the one that provides teachers with lesson plans and learning materials, combined with training and reading coaches who visit teachers regularly to observe teaching and provide feedback, is more likely to lead to significant improvements in early-grade reading.

Understanding the effectiveness of the professional development practices in Tanzania requires the voices of those who frequently interact at the institutional

level—the teachers, headteachers, and ward education officers. Available studies are general and do not compare the experience of teacher education programmes between regions under USAID Jifunze Uelewe and non-USAID Jifunze Uelewe; thus this study was conducted.

Phonics-based literacy instruction in Tanzania

Many programmes are initiated to address the challenge of phonics-based literacy instruction (URT, 2017, 2019). USAID, through the Tusome Pamoja Programme, worked to improve reading (with comprehension), writing, and mathematics for pupils in grades two and four in the target regions (Mtwara, Ruvuma, Iringa, Morogoro, and Zanzibar). Other initiatives included reducing the number of subjects among grade two pupils to the 3Rs to make sure that pupils and teachers concentrate on developing reading, writing, and arithmetic skills (Rodriguez-Segura et al., 2022). All these initiatives aim at achieving the 2025 Development Vision, which requires that children aged four to six develop reading skills (URT, 2014).

Phonics-based literacy instruction for basic education and teacher education in teaching reading for grades one and two and a whole-language approach for grades three and four (URT, 2016) was adopted. The phonics approach was proposed for lower grades as it is a tool for learning that words are composed of different sounds which is important for reading whole words or connected texts promoted through the whole language approach (Double et al., 2019). For its implementation, in-service training for teachers teaching in early grade classes was conducted by different agencies, including the USAID Tusome Pamoja programme, EQUIP-Tanzania in collaboration with the Ministry of Education Science and Technology (Rodriguez-Segura at al., 2022). The provision of training to teachers gives them the knowledge needed to implement a range of successful classroom strategies, such as pacing instruction based on pupils' needs (Leinhardt et al., 1981) and creating the right instructional groups (Johnson & Larsen, 2012). Training enables teachers to plan instruction (Elleman & Oslund, 2019), measure children's comprehension and misunderstanding (Ball et al., 2008), and create projects that deepen children's reading skills (An et al., 2004).

However, the learning attainment of early-grade learners is poor, as those performing at national benchmark levels for reading decreased from eleven per cent in 2019 to nine per cent in 2021 (National Examination Council of Tanzania-NECTA,

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2022). Results raise concern over the effectiveness of teacher education, especially the quality of in-service training in equipping teachers with sufficient knowledge and skills for implementing inclusive phonics lessons. The current study planned to answer two questions:

i. How does in-service training equip teachers with robust knowledge and skills to implement phonics lessons?

ii. How well does the in-service training enable teachers to effectively facilitate learning for all pupils?

Methods and Procedures

The study deployed a qualitative descriptive research design to collect and analyze data on teachers' views on the extent to which teacher preparation and professional experiences help them implement phonics-based literacy instruction. The qualitative descriptive study was selected to guide data collection and analysis as it allows the research team to obtain factual responses from respondents about how teacher preparation and professional experiences help them implement phonics-based literacy instruction (Sandelowski, 2000).

Sampling and Participants

The study was conducted in 50 primary schools in thirteen regions across Tanzania's mainland (eight) and Zanzibar (five). A total of 305 participants (208 early-grade teachers, and 97 quality assurers) with varied educational backgrounds, ages, and genders participated in the study. The study was conducted in two categories of regions: those with educational programmes implemented under the USAID funding we refer to as USAID Jifunze Uelewe regions, and those without specific funding from USAID. Regions which had no specific funding from USAID we refer to in this study as non-USAID Jifunze Uelewe. The USAID Jifunze Uelewe regions earlier implemented the Tusome Pamoja Programme, which was phased out in 2021. The USAID Jifunze Uelewe programme started its implementation as an extension project to the TUSOME PAMOJA project in the same regions to advance the benefits gained. Sampling of schools considered high- and low-performing in the randomly sampled districts. The sampling considered the rural-urban divide factor in the inclusion of a

location would have impacted the resource availability and engagement of teachers in professional development.

Most of the teachers had completed the minimum required formal training (i.e., certificate in teacher education referred to in Tanzania as Grade three); 144 teachers (69% of the total) had a certificate in teacher education, Grade three A, 53 teachers had a college diploma (associates' degree) in education (26% of the total), nine had a bachelor's degree (4.3%), and two (1.0%) held a postgraduate diploma in education. On the other hand, all quality assurers had either the minimum required qualification or above, that is, a diploma in education.

Early grade teachers and the quality assurers (constituted of Head teachers-HTs and Ward Education Officers-WEOs) were purposely selected as they are at the implementation level of phonics-based literacy and are the ones involved in the in-service programmes aimed at enhancing reading skills through improved use of the phonics-based literacy approach. Therefore, their experiences were an important factor in their involvement in this study. Further, the quality assurers were involved because they are the immediate supervisors and are responsible for monitoring early-grade teachers in implementing the curriculum at the school level.

Data collection methods

Semi-structured interviews and classroom observations were used to gather data responding to the research questions. Classroom observations were conducted first for teachers to reveal their practices in using the phonic approach to develop reading skills among targeted pupils in early grades. A classroom observation guide consisting of the closed-ended scale observation rubric was used to observe how teachers implemented phonics-based literacy instruction during the reading lessons in the early-grade classroom. Classroom observation was employed as it enabled the research team to enter and understand the situation as it happened in a natural context (Cohen et al., 2007). Classroom observation took 40 minutes for the observers (research team) for the grade three lessons, 30 minutes were used to collect data in grades one and two, and 20 minutes were used for pre-primary.

Individual in-depth interviews were held with teachers and quality assurers following the classroom observation. A semi-structured interview guide was developed and used to lead the conversation between the research team and early-grade

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teachers, HTs, and WEOs. Data collection through the semi-structured interviews involved systematic recording and documenting of responses using tape recorders and notebooks. Each interview took about 40 to 60 minutes per informant. The use of the two methods aimed at triangulation of the findings (Creswell, 2009; Tzagkarakis & Kritas, 2022) to enable the research team to validate the results from different data sources (Clark et al., 2008; Drolet et al., 2022; Flick, 2009).

Ethical issues

This research observed all ethical matters regarding fieldwork. Research permits and ethical clearances were obtained from the respective authorities—the University of Dodoma, on behalf of the Tanzania Commission for Science and Technology (COSTECH); and the President's Office of Regional Administration and Local Government (PoRALG) respectively. The two allowed the research team access to the participants. During the data collection, the research team and the research assistants observed respect for human and moral values and sought informed consent from the HTs and participants. Research participants were informed about the purpose of the research and assured of how their responses would be treated and managed to ensure anonymity and confidentiality (Drolet et al., 2022).

Data analysis

Content analysis was used to develop an understanding of the teachers' and quality assurers' responses using open coding (Bengtsson, 2016). Information was transcribed from Kiswahili, the language used in conversing between research team and study respondents, which was conducted immediately after data collection. The transcription of information was done by the research team and trained enumerators by listening and re-listening to audio recordings for the development of texts that were processed. Translating the information collected in Kiswahili into English. Coding was done by reading and re-reading transcripts for initial code development as per the research and interview responses (Chandra & Shang, 2017). Similar codes were grouped to form categories related to research questions. Since the primary purpose of the study was to identify the extent to which professional training enabled teachers' instruction of phonics-based literacy, the frequencies of responses related to emergent codes were recorded to determine the extent

of the frequencies (Baker-Henningham & Walker, 2009). Furthermore, tables and charts were used to present data, which later facilitated report writing.

Findings

Results are presented in line with the research questions. Furthermore, the themes identified within each research question are discussed, and their content is explained with participant quotes. To amplify the importance of each theme in the data, response frequencies are also presented.

The extent to which in-service training equips teachers with sufficient knowledge and skills to implement phonics lessons

The study began by exploring whether teachers had attended any training regarding the teaching of phonics lessons. The analysis of the data shows that professional experiences engaged teachers differently in that those in USAID Jifunze Uelewe also participated in the Tusome Pamoja regions and appeared to have been better prepared than their counterparts, the non-USAID Jifunze Uelewe regions. Figure 1 illustrates percentages of teachers reported to have participated in professional development programmes focusing the phonics instruction.

Figure 1: Teachers Participated in Professional Development Programmes

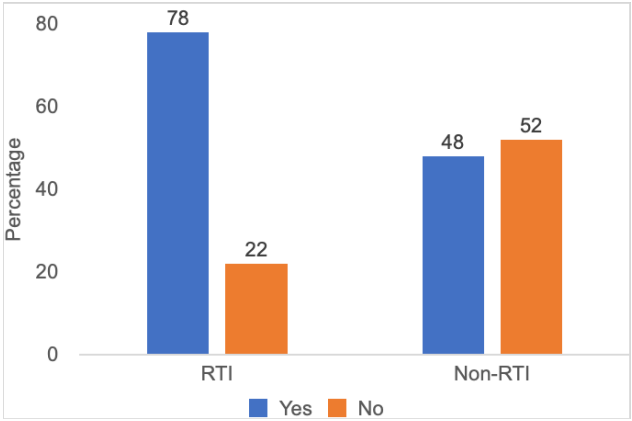

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Figure 1 shows a difference in teachers receiving professional development between USAID and the non-RTI regions regarding equipping them with adequate knowledge and skills to implement phonics-based instruction. In the USAID Jifunze Uelewe regions, 78% of the teachers reported receiving training, compared to only 48% in the non-RTI regions. Such a difference implies that teachers in the USAID Jifunze Uelewe regions are more likely to be able to implement a phonic approach in promoting reading skills compared to the non-USAID Jifunze Uelewe regions.

The participants demonstrated a sense of dissatisfaction with in-service teacher education programmes prepared for teachers regarding their ability to use phonics-based literacy instruction. Some teachers were of the view that such in-service training opportunities were conducted rarely and therefore inadequately enhanced their knowledge and skills on the phonics-based approach and application to teaching and learning reading. One of the teachers said:

Teacher 1:

> *I have attended one training that was conducted over two days. The training had many things that were planned to be covered. As such, deep learning was limited in a way that many of the attendees claimed to not have been satisfied with what they had learned, particularly how to promote children's literacy* (Teacher, Morogoro).

Teacher 2:

> *I happened to attend training that focused on how to manage the class. However, the conducted training hardly exposed us to the actual challenges as we handle a larger number of children in a single classroom, which impacts efforts to use the phonics-based approach to enhance reading skills* (Teacher, Songwe).

This implies that teacher education programming and implementation need to focus on problems teachers' face that are classroom-based so they can help solve problems for better teacher-pupil interaction. Positive teacher-pupil interaction is crucial in implementing phonics-based reading lessons.

Further, the study explored the extent to which the training equipped them with robust knowledge for implementing phonics literacy instructions. The research team asked teachers to weigh the benefits of professional experiences in improving their knowledge of phonics-based literacy instruction. The analysis shows that teachers acknowledged that in-service training mainly equips teachers in two aspects: content and pedagogical knowledge (see Table 1). It indicates that in-service training inadequately developed teachers with pedagogical knowledge to support pupils in

becoming proficient readers because they focused on alphabetical knowledge.

Table 1: Teaching Skills Developed by Teachers Through Professional Experience

Responses	Extent	Status			Grand Total, N (% of responses)
		HTs, N (% of responses)	Teachers, N (% of responses)	WEOs, N (% of responses)	
Classroom management	Large extent		2 (<1)		2 (<1)
	Small extent		7 (2)		7 (1)
Coaching and mentoring skills	Large extent	9 (10)	4 (1)	4 (4)	17 (3)
	Small extent	15 (17)	6 (2)		21 (4)
	Some extent	13 (14)	2 (<1)	1 (1)	16 (3)
Instructional knowledge	Large extent	8 (9)	6 (2)	2 (2)	16 (3)
	Small extent	10 (11)	5 (2)		15 (3)
	Some extent	11 (12)	3(<1)	1 (1)	15 (3)
Pedagogical knowledge	Large extent		51 (16)		51 (10)
	Small extent		26 (8)		26 (5)
	Some extent		27 (8)		27 (5)
Subject matter knowledge	Large extent	5 (6)	63 (19)	30 (33)	98 (19)
	Small extent	9 (10)	72 (22)	19 (21)	100 (20)
	Some extent	11 (12)	49 (15)	35 (38)	95 (19)
Life skills	Small extent		1 (<1)		1 (<1)
Grand Total*		**91 (100)**	**324 (100)**	**92 (100)**	**507 (100)**

* (Participants could give more than one response)

Note. This table presents perceived benefits of teacher education program in developing teachers with required skills in the teaching of phonics-based lessons in early-grades in Tanzania.

Subject matter knowledge

A great number of teachers (121 of 208 teachers equivalent to 37 per cent of responses) indicate that, to a lesser extent, professional learning experiences developed teachers with subject matter knowledge more than their pedagogical knowledge. On the other hand, WEOs indicated that professional experiences had little to contribute

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to teachers' subject matter knowledge. HTs held a different perspective from that of teachers and WEOs.

The knowledge was explained as being important in implementing phonics lessons through the phonic approach. Sounding letters and preparing and using phonics-based learning materials were mostly promoted. Teachers reported that before attending the training (USAID-Tusome Pamoja and the famous in-service programme called Kusoma, Kuandika, na Kuhesabu, that is, reading, writing, and arithmetic (3Rs) organized by MoEST under Global Partnership for Education-GPE), their knowledge on the reading components was poor. As such, the teacher reported:

> *The training I received was helpful. I did not know some of the letter sounds, such as glottal sounds involving /g/ and /k/, but now I can sound them appropriately* (Teacher, Unguja).

In addition, teachers also reported that some knowledge and skills related to preparing and using phonics instructional materials were enhanced. Instructional materials development was their challenge, but in-service training supported them with the ability to use locally made and purchased materials for teaching the initial and final sounds. In their preparation of materials, they could prepare reading cards facilitating the way of teaching syllables such as /ba/ + /ba/ = /baba/ meaning that the word "baba" (meaning father in English) has two syllables.

On the other hand, classroom observation revealed that teachers still exhibit inadequate knowledge to implement phonic lessons. For instance, most of the teachers were observed concentrating on teaching pupils to read a connected text accurately and fluently, attending to punctuation, expression, and intonation as well as word-recognition errors. On the other hand, teachers revealed limited knowledge of phoneme teaching and comprehension teaching (see Table 2).

Pedagogical knowledge

Though HTs and WEOs did not see the contribution of professional experience to improve teachers' pedagogical knowledge, classroom teachers indicated the opposite. Table 2 depicts that teachers' professional experience was somewhat enhanced with multiple skills, especially preparation of teaching aids, lesson preparation, strategies to engage children in learning, and classroom management. One teacher exemplified:

> *The in-service training helped me, especially in the learning involving the use of story-reading books that have levels and not using them without adhering to specified guidelines.*

Previously, I used to read the whole storybook to the children without being focused. I came to learn it was beyond their learning capacity (Teacher, Iringa).

Teachers' growth in pedagogical knowledge was also boosted by the school-based peer coaching done to sustain within and outside school experience sharing. One of the teachers explained:

I consult my fellow teachers in our community of practice to assist me in preparing teaching and learning aids and share experiences on methods used to teach phonics-based learning. For example, they help me with appropriate methods to teach the sounds, letter names, vocabulary, and blending (Teacher, Ruvuma).

Analysis of the data obtained through classroom observation showed that teachers had limited knowledge of the use of effective strategies. For instance, teachers were observed modelling appropriate reading (94%), sharing reading activities with all pupils (98%) and providing pupils with reading practices (78%). However, other strategies, such as partner reading (44%) and small group reading (31%) were inadequately used. In general, the analysis shows that the methods focusing on teaching reading comprehension, such as discussing with pupils, making predictions about a text or story they read, and answering questions about the text or story they read were not observed. This implies that the teaching of reading comprehension is likely to be compromised as teachers focus more on strategies that improve phonological awareness and fluency.

Table 2: Practices Commonly Used to Ensure Inclusion in Reading Instruction

		USAID		Non-USAID		Total	
Aspect observed	**Response**	**N**	**%**	**N**	**%**	**N**	**%**
Reading connected text accurately and fluently	Not Observed	14	18	8	16	22	17
	Observed	62	82	43	84	105	83
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Purposefully focusing on increasing fluency toward the grade-level goal	Not Observed	13	17	12	24	25	20
	Observed	63	83	39	77	102	80
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Reading attending to punctuation, expression, intonation	Not Observed	26	34	18	35	44	35
	Observed	50	66	33	65	83	66
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Self-correcting word-recognition errors	Not Observed	19	25	15	29	34	27
	Observed	57	75	36	71	93	73
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**

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Identifying and sorting pictures of words into categories, sets, or groups	Not Observed	56	74	45	88	101	80
	Observed	20	26	6	12	26	21
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Using word structure and use in a sentence to infer word meaning	Not Observed	42	55	29	57	71	56
	Observed	34	45	22	43	56	44
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Use correct procedures for handling books (opening, closing books, turning the page).	Not Observed	49	65	42	82	91	72
	Observed	27	36	9	18	36	28
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Categorizing words hierarchically	Not Observed	38	50	29	57	67	53
	Observed	38	50	22	43	60	47
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Use finger-pointing to indicate text direction	Not Observed	36	47	32	63	68	54
	Observed	40	53	19	37	59	47
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Develop knowledge of print and printed material (e.g. identify book cover; title of the book, author; and contents)	Not Observed	57	75	49	96	106	84
	Observed	19	25	2	4	21	17
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Match picture or action to vocabulary word in print to clarify the meaning	Not Observed	46	61	44	86	90	71
	Observed	30	40	7	14	37	29
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Discuss the meaning of vocabulary words with peers	Not Observed	38	50	32	63	70	55
	Observed	38	50	19	37	57	45
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Discuss in small or large groups what they see in a picture in a story or on the cover of a book	Not Observed	51	67	44	86	95	75
	Observed	25	32	7	14	32	25
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Predict what will happen based on a story or from a picture they are reading in a story or the title of a story	Not Observed	52	68	40	78	92	72
	Observed	24	32	11	22	35	28
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**
Retell, act out or summarize a story they have read or has been read to them (covering the story or plot)	Not Observed	46	61	42	82	88	69
	Observed	30	40	9	18	39	31
	Subtotal	**76**	**100**	**51**	**100**	**127**	**100**

Note: This table presents instructional strategies used by teachers in implementing phonics-related lessons for promoting reading skills among early-grade pupils in the sampled schools in Tanzania mainland and Zanzibar. Analysis revealed that there were no significant differences between the two categories of the regions, USAID and non-USAID, in the classroom practices. However, some teachers in the USAID regions have shown better phonics-related instruction practices, for example, purposefully focusing

on increasing fluency toward the grade-level goal; paying attention to punctuation, expression, and intonation; and using finger-pointing to indicate text direction. This implies that the professional experiences that teachers were engaged in in the regions categorized as USAID regions were helpful as compared to those experienced by their counterparts.

Moreover, in both categories of regions, teachers demonstrated poor teaching and learning skills in facilitating students to identify and sort pictures of words into categories, sets, or groups; developing pupils with reading comprehension (Using word structure and use in a sentence to infer word meaning); and inadequately engaged pupils to develop knowledge of print and printed material (e.g., identify book cover; title of the book, author; and contents). This would further lead to the conclusion that higher-order reading skills were inadequately paid attention to by teachers from all sides involved in this study.

The in-service training with effective learning of the pupils with special needs

In this section, the research team explored the extent to which in-service training helped teachers gain the knowledge they needed to support pupils with special needs to develop reading skills. Table 3 illustrates the three categories of respondents who shared their views regarding the benefits of the training in helping pupils with special needs develop reading skills.

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Table 3: Practices Commonly Used to Ensure Inclusion in Reading Instruction

Categories	Responses	WEOs, Number of Responses (%)	Teachers, Number of Responses (%)	HTs, Number of Responses (%)
Classroom management	Classroom arrangement	7 (9)	23 (9)	6 (8)
	Equality in learning	16 (21)	97 (36)	23 (32)
	Gender-responsive	16 (21)	44 (16)	12 (16)
	Mixing pupils	1 (1)		
Support	Professional support	5 (7)		
	Teacher-parent	2 (3)	9 (3)	
	Infrastructure	1 (1)		
	Pupil-pupil cooperation	(<1)	11 (4)	2 (3)
	Parent-pupil	(<1)	2 (<1)	
Monitoring	Pupil progress	2 (3)	2 (<1)	2 (3)
	Attendance	1 (1)	(<1)	1 (2)
	Learning attainment	(<1)	16 (6)	3 (4)
	Lesson preparation	(<1)	(<1)	1 (1)
	Remedial teaching	1 (1)		2 (3)
Teaching and learning strategies	Differentiated instructions	11 (15)	22 (8)	13 (18)
	Peer-assisted learning	(<1)	5 (2)	
	Individualized learning	(<1)	7 (3)	
	Group learning	10 (13)	15 (6)	8 (11)
Not aware	Not aware	3 (4)	19 (7)	
Grand Total*		76 (100)	272 (100)	73 (100)

Note: This table classroom practices commonly used by early-grade teachers in ensuring teaching and learning is inclusive. The presentation constitutes of the responses from the implementers and education administrators (HTs and WEOs) of the schools involved in this study. As Table 3 depicts, in-service training mostly developed teachers' classroom management skills for helping children with special learning needs. To a lesser extent, teaching and learning strategies were also enhanced.

Classroom management skills

The analysis of the data shows that teachers and quality assurance staff had a similar view that in-service training equipped teachers with classroom management skills for helping pupils with special learning needs develop reading skills. Among the aspects revealed by teachers and quality assurers were ensuring equality in learning (21%

- WEOs, 36% - Teachers, and 16% - HTs of their responses), adhering to gender responsiveness (21% - WEOs, 16% - Teachers, 16% - HTs) and classroom arrangement (9% - WEOs, 9% - Teachers, 8% - HTs).

Explaining the concept of equality in learning, participants believed that the training they received enabled them to increase their understanding that each learner has the right to access quality services and that respecting all pupils, regardless of their ability in the classroom, was necessary. To achieve it, teachers reported that through the in-service training, they were sensitized that identification of pupils with special learning needs such as limited vision or blindness is necessary for positive adjustment of the instruction and learning materials so that no pupil lags behind others. Due to different learning needs, exposure to the design of tactile materials was among the training benefits that teachers had for helping children with visual impairments develop their reading skills, as they could not access braille books. One teacher said:

> *During the training, we were trained on how to use the beads to make letters or numbers by glueing them on the cards so those unable to see could touch and feel the shapes. The letters made on beads enable visually impaired pupils to develop the concept of the letter made through touching, says the teacher* (Teacher, Singida).

Teachers reported also that the training helped them with the skills to deliver learning experiences that are gender-responsive, so every learner, regardless of gender, equally develops targeted learning competencies in reading. Teachers said that they group and assign roles to pupils by mixing them regardless of their gender and learning needs. One teacher argued:

> *Yes, when it comes to instruction and learning, I ensure both boys and girls are mixed where necessary and do group tasks within and outside the class by mixing so they work cooperatively* (Teacher, Morogoro).

The use of instruction and learning experiences that promote inclusion and not discrimination because of one's gender is crucial to closing the learning gap between boys and girls.

Discussion

The study findings reveal that the training provided to teachers was inadequate in the sense that it is provided to a limited number of the target population and the time used was not sufficient to meet the needs of the trainees. Cordingley (2015) notes the direct relationship

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between teacher subject professional knowledge and pedagogical knowledge obtained from pre- and in-service training and better pupil outcomes across the curriculum. The provision of in-service training for teachers in different countries is not promising compared to pre-service training (Mufti, 2024). This is because most of the training takes a short time or has limited content impacting the translation of skills, thus a failure to meet the participants expectations. The lack of enough time and other facilitation to teachers during their engagement in professional development, as cited by this study's participants, impact their effectiveness in delivering phonics-based lessons. It therefore, necessitate the call for the use of a bundled intervention that involves the provision of lesson plans and learning materials, combining training with coaches who visit teachers regularly to observe teaching and provide feedback (Taylor et al., 2019). The bundled intervention has proved successful in many countries for teachers teaching grades one and two

Training provided should strengthen teachers' pedagogical and subject content knowledge through instructional methods and learning materials (International Reading Association, 2010; Lenski et al., 2013). Unlike other studies, none of the teachers in this study reported whether the training helped them develop phonics teaching and learning materials. In addition to other cited inputs in teacher professional development, phonics-based training is crucial in developing teachers with assessment knowledge (Sailors & Price, 2010; Lenski et al., 2013). This is contrary to this study's findings, where the effectiveness of in-service training assessment skills was not identified. This means that teachers may have inadequate skills in assessing phonics content for pupils, and therefore teachers may not know the status of pupils' reading ability (Flynn et al., 2021). This request ensures the provision of comprehensive in-service training to teachers to meet teachers' expectations in teaching phonics. Different from the experiences explained by teachers from the non-USAID Jifunze Uelewe schools, Darling-Hammond et al. (2017) identify that an effective teacher professional development programme is content-focused, incorporates active learning, supports collaboration, uses models of effective practice, is of sustained duration accompanied by coaching and expert support, and offers feedback and reflection.

In-service training and special needs pupils

On the effectiveness of the in-service training to equip teachers with rich and applicable knowledge and skills, this study learned from informants that teachers had

very limited knowledge of how to help pupils with special needs develop reading skills. The situation elsewhere is different as there is the use of peer-assisted learning (Hargreaves et al., 2022) and the use of group learning (Fernández-Villardón et al., 2021), which all assist pupils with special needs develop reading skills. Therefore, their limited use by teachers in the studied areas limits the rights of the pupils with special needs to gain reading ability. Limited use of peer-assisted learning indicates that differentiated learning characterizes the ineffectiveness of teachers. Therefore, if teachers are provided with in-service training focusing on special needs students, they may be in a good position to enable pupils with special learning needs to develop sufficient reading skills.

Conclusion and recommendations

The delivery of phonics-based lessons by teachers would continue being low unless the teacher professional development, especially in-service training, adequately develops them with pedagogical and content knowledge for supporting pupils to develop higher-order reading skills. Importantly, the effectiveness of the teacher professional development would be at scale when the number of those attending it is large, accommodating all eligible teachers. Engagement of teachers in inclusion and pupils' assessment practices are crucial components of the teacher's professional development; excluding them impacts the quality of the in-service training and effectiveness of the delivery of phonics-based lessons and learning outcomes of the early-grade pupils. The study recommends providing comprehensive in-service training to teachers to meet teachers' expectations in teaching phonics.

In-service training enhanced teachers' ability to create and use learning materials in inclusive classes in the USAID Jifunze Uelewe regions compared to their counterparts in non-USAID Jifunze Uelewe. Therefore, this study recommends that designing and provision of in-service training for teachers in other regions should take care of better programming and implementation as done in other regions.

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Understanding Multi-layered Conceptualisations of Innovation in Education

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Understanding Multi-layered Conceptualisations of Innovation in Education

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Abstract

Innovation is a difficult concept to pin down. Indeed, there are intense debates and deep disagreements about this topic. The same can be said for innovation in education. While it is agreed that education is vital for creating a sustainable future, innovation in education has disparate meanings for various actors involved in education. Innovation in education may be driven by a host of factors ranging from sociological constructs such as equity or gender to global phenomena such as COVID-19. Innovation also varies in nature and degree. It can be in the form of an augmentation on current educational practices or artefacts, or in terms of a radical change. Innovation can be building on existing or disrupting current educational practices and artefacts. It can be inspired or imposed by educational authorities. This paper seeks to understand how various stakeholders of the education sector conceptualise what innovation is in education, and how it impacts their sector. The stakeholders include policymakers, educators, educational cadres that oversee policy implementation and teacher educators. The data has been produced through online questionnaires and focus group discussions. These data were analysed through the lens of different taxonomies of innovation that constitute the conceptual framework of the paper. The findings indicate that each stakeholder has a unique conceptualisation of what innovation in education entails. These conceptualisations do have commonalities among them. More importantly, the findings indicate gaps that exist among the different views that need to be bridged for the successful implementation of innovative projects in education.

Key words: Innovation, innovation in education, educational innovation, evolutionary innovation, frugal innovation, technological innovation, product innovation

Introduction

Innovation is a contested concept (Marques Morgan & Richardson, 2017). There is little agreement on what is innovative and what is not. These debates often occur when there is no shared understanding of the concept. Indeed, innovation happens in different ways, typologies, scales and degrees of impact (Von Schomberg & Blok, 2021). The education sector is not immune to the debates around innovation. Debates sometimes turn into critical events that spur academics to further explore concepts and constructs. The claim that the beliefs of stakeholders in the sector on innovation are multivarious and are shaped by various elements needs to be backed up by data. Therefore, the focus of the study is to gather insights on the numerous conceptualisations of innovation of education held by various stakeholders in the field of education in Mauritius. The research questions are:

1. What are the conceptualisations of innovation in education held by various stakeholders in the education sector in Mauritius?
2. How do these conceptualisations influence innovation in different sectors in the education sector in Mauritius?

To this effect, the literature review presents the various conceptualisations of innovation in education. These conceptualisations range over a host of criteria such as categories, degrees, effects and scales of innovation. These constructs have been considered in the development of research instruments such as questionnaires and interview schedules to produce data from various stakeholders. The responses were analysed through the lenses of the literature, and the outcomes were remarkable in terms of sectoral (Primary, Secondary, and Higher Education) conceptualisations of innovation of education, overall conceptualisations of innovation in education and factors influencing innovation in education.

Literature review: Conceptualisations of innovation in education

This section has been purposefully named *conceptualisations* rather that *definitions* of innovation in education. The term definition was not deemed appropriate as it denotes a clear and specific explanation of the phenomenon under the research lens. A definition attempts to provide clarity, precision, and objectivity that would usually culminate in a shared understanding. Scholarship on innovation in education explicates the phenomenon as meaning and experience being deeply rooted within

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contexts (Wittgenstein, 1976) and cannot be solely determined by standardised, sanitised definitions. Indeed, as the following paragraphs expound, there are several meanings, characteristics and perspectives on innovation in education. The section starts with the importance of innovation in education and subsequently discusses several conceptualisations.

Innovation in education is indispensable for the growth of societies and to continually face upcoming challenges. It is believed that the quality of education imparted to citizens has a direct bearing on their life chances and standard of living (Serdyukov, 2017; Powdthavee, et al., 2015). Moreover, there is a constant pressure to innovate to solve issues posed by globalisation, climate change and technological progress, thus informing different conceptualisations of innovation in education (Vieluf et al., 2012; Cornali, 2012). Adding to the above, sociological pressure to deal with issues such as equity and the eradication of poverty are also driving the need for innovation to ensure quality education for all. Therefore, considering its importance, it is crucial for policymakers, higher education professionals and other key stakeholders in the field to have a broad understanding of what innovation is in education.

However, before considering *innovation* in *education*, it would be appropriate to delve into what innovation is. It would seem to be a very complex undertaking as innovation has been qualified as vague and multifaceted (Bar-El, 2023) and multidimensional (Edwards-Schachter, 2018). Indeed, there are 81 variables in the Global Innovation Index (GII) and 31 variables in the European Commission Summary Innovation Index (SII). This highlights the composite nature of innovation; there are multiple factors involved. To illustrate attempts to understand and promote innovation, there is even an emerging field called Innovation Studies in Higher Education (Fagerberg & Verspagen, 2009). Innovation Studies, located within social sciences, draw from areas such as cognitive and organisational factors that promote innovation.

It would also be useful to delineate innovation from other concepts such as creativity which refers to the process of thinking up something new while innovation is doing something new (Levitt, 1960). Therefore, the purpose of innovation is to make something differently as compared to what was being traditionally done, in terms of quantity and/or quality. To summarise the above argument, innovation would be conceptualised as the successful inception of a new thing or method (Brewer & Tierney, 2012). Departing from traditional ways of doing things requires inputs from what is labelled as the Triple Helix: government support, private sector engagement and contributions from academic institutions (Mercier-Laurent, 2011).

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In fact, academic institutions are crucial for both creativity and innovation to happen. Higher education institutions are essential in creating knowledge for new artefacts and methods to emerge (Perkmann et al., 2013). In particular, healthy links between industry and academic institutions through collaborative forms such as consultancies and access to research facilities are indications of an innovative set-up (Motohashi & Muramatsu, 2012; Jackson, 2018). However, it should be noted that some social actors lie beyond the ambit of the stakeholders described in the Triple Helix. Indeed, the civil society and other players also innovate in education (Kēpa & Manu'atu, 2011) and their contributions should also be taken into consideration.

Furthering this delineation process, some authors have distinguished between educational innovation and innovation in education (Mykhailyshyn, et al., 2018). Educational innovation refers to improvements in procedures or methods of educational activities that would increase efficiency. Educational innovations include pedagogical innovation that covers the style of teaching, integration of ICT and use of educational technologies. Improvement in teaching programmes also falls under educational innovations. Innovation in education is a wider concept. It encompasses things such as the implementation of a new learning strategy that departs from traditional ones and focuses on creation, not mere replication of knowledge. The focus of innovation in education is the realisation of human potentials, intellectual capabilities with the aim of enhancing creative thinking. These initiatives could be aiming at improving dispositions, autonomy of learners, assessment, collaboration and communication among educators or strategies to improve student engagement. Both educational innovations and innovations in education require the participation of multiple stakeholders such as students, parents, educators, the state and educational administration. Figure 1 illustrates the nuances between Innovation in Education and Educational Innovation.

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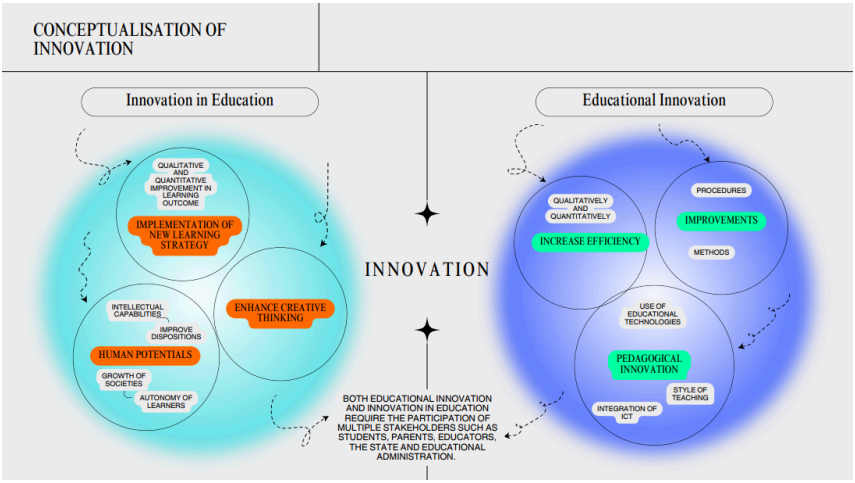
Figure 1: Innovation in Education vs Educational Innovation



Building on the introductory literature, an analysis of innovation can be called for in terms of the different categories, degrees, effects and scale of innovation. Innovation can be classified in three broad categories namely evolutionary and revolutionary, sustaining and disruptive, tangible and intangible. Evolutionary innovation would normally happen incrementally while revolutionary innovation would imply a complete overhaul of the old to be replaced by the new (Osolind, 2012). Sustaining categories usually focus on continuous improvement, contrasting with the radical nature of disruptive innovation. With disruptive initiatives, the whole field could change in a short lapse of time (Hang, et al., 2010). The last categorisation refers to tangible innovations that could be in the form of tools and devices, and intangible innovations represented by methods, strategies, techniques and new content.

Next to be considered is the degree of the impact of innovation. This classification includes two types of innovation, the small *i* (referring to small innovation) and the capital *I* (referring to significant innovation), and three levels. Level 1 and the small *i* refer to initiatives that could be described as adjustments or upgrading of a process within the education system. These initiatives may help stakeholders to perform their daily routines with more efficiency, but do not produce any new tool or method (Okpara, 2007). Level 2 is still within the ambit of the small *i*. However, Level 2

is a notch up as it describes modifications that are made to processes and methods with the aim of significantly improving performance. Some examples could be blended learning or a flipped classroom. Level 3 and the big areis about transformative enterprises that seek to dramatically alter the system. It refers to breakthroughs and a disruptive nature that could trigger systemic change. One example could be the impact of AI in education.

Basically, innovation in education aims at bringing a qualitative and quantitative improvement in learning outcomes. Qualitatively, education policy makers and other actors would like initiatives to generate better knowledge, skills and values (Benzies et al., 2024). Measures that boost motivation and foster positive learning attitudes are desired outcomes. Quantitative goals, on the other hand, focus on results, enhanced productivity in terms of learning more in the same time frame and cost efficiency, meaning less cost per student. Also, it is useful to consider the scale of the implementation of innovations. Scale refers to the size and location or geographical spread of an initiative. Location could be local or nationwide. Innovations could be a one-off singular event or occur multiple times. It can also be limited (to given sectors, for example) or total, encompassing all sectors. The origin of innovation has also been mentioned as either driven by the grassroots (bottom-up) or top-down, as most educational innovations are (Serdyukov, 2017). Innovations can also be homegrown or imported from another context. (Hervas-Olivier, et al., 2021)

Moreover, the literature also describes typologies of innovation. In this paper, the multilayered conceptualisations of innovation in education will be analysed drawing from the experiences of different stakeholders in the education sector. Some innovations are labelled as frugal innovation (Jayabalan & Dorasamy, 2024). It refers to making something with the means at one's disposal. This type of innovation is low-cost and can be contrasted with high-end, expensive innovations that might not be within the financial capabilities of developing contexts (Zhang, 2018). Frugal innovations are driven by the grassroots and sometimes go unnoticed. Or they may happen in contexts that are not accessible, such as the classroom. Teachers, for example, are involved in a lot of invisible, dark innovation (Martin, 2013). Teachers, as users of educational technologies and even scrap materials, engage in innovative activities that are invisible, hence the term invisible innovation (Miles & Green, 2008).

There are types of innovation that appear familiar. Technological innovations, for instance, an outcome of industrial change or a paradigm shift in science, can cause some

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sectors to completely overhaul or even be erased (Schumpeter, 1942). The promotion of technological innovations is reliant on proper set-ups such as government funding, private sector involvement and a vibrant research environment in higher education (Lam, 2006; Gault, 2018). Another common form of innovation is product innovation. Product innovation refers to a product that is new and/or significantly different from its predecessors (Gault, 2018). Product innovation is closely linked to process innovation as part of a product lifecycle. Process innovation is the development of new ways of doing things that are significantly more cost and/or time-effective. However, increasingly, user-driven innovations are taking centre stage. This has been described as the democratisation of innovation (Von Hippel, 2005) whereby the initiatives taken by users to shape the use of products are highlighted. For example, the use of computing to create other products, such as games and social media platforms implies that users are engaged in a creative and innovative process using computing devices.

Service innovation is another avatar that includes innovation in fields such as transport and logistics, healthcare, business and education. These innovations are sometimes intangible and respond to efforts made to satisfy customer needs (Goldstein et al., 2002). For example, the decreasing time to make deliveries or safer means to make payments could be strategic innovation goals of an organisation. In education, service innovation could facilitate access to learning. Another example illustrating the intangibility of innovation could be the elaboration of a new business model. In the same vein, solving societal issues has been a key driver of innovation. This is coined as social innovation. Social innovation involves changes in social practices. Examples could be voting rights for women or the implementation of waste recycling. All social innovation initiatives involve a collective process of learning and necessitate the participation of the whole community (Edwards-Schachter & Wallace, 2017). Figure 2 represents an overview of the conceptualisations of innovation in Education.

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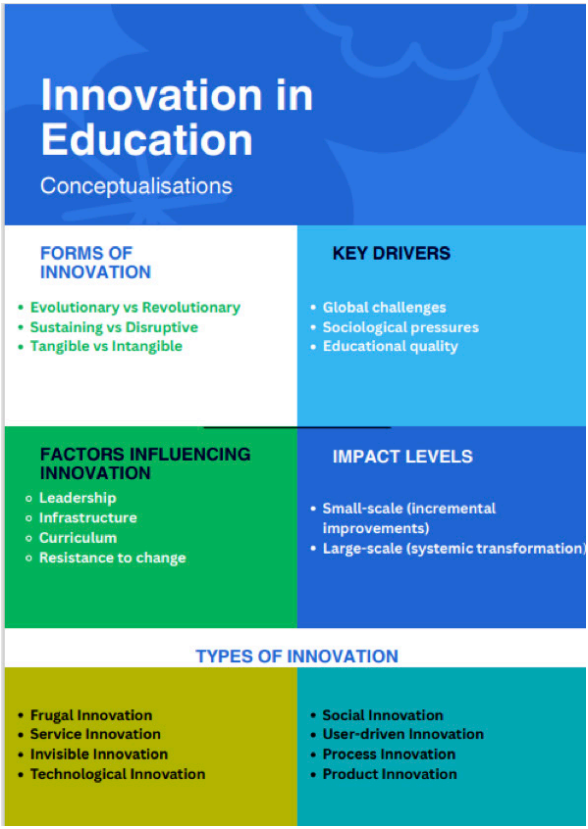
Figure 2: Conceptualisations of Innovation in Education



Ultimately, the categories, scale and different types of innovation are interconnected. For instance, social innovation is often the basis for technological innovation. As we have seen above, technological innovation is often reliant on process innovation. It would be appropriate to end this section by considering factors that promote innovation in education. The education sector is multifaceted and relies on multiple stakeholders and has interconnections with other sectors such as finance, environment and political systems. Therefore, innovation in education might also directly impact these other fields (Freeman & Thomas, 2005). Indeed, lack of finance or lack of political will might discourage innovations, and innovations in education could positively impact

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these above-mentioned sectors. Also, it has been contended that education systems are conservative and resistant to change, which is generally not the mindset required to innovate (Kerby et al., 2014). Leadership in educational organisations are also critical for fostering a climate for innovation. Leaders need to promote freedom of action, the emergence of ideas and a respectful and supportive environment. For instance, integration of ICT in teaching and learning is reliant on leadership at the school level (Polka & Kardash, 2013).

Even though a wide variety of innovations happen every day over different scales and locations, the yardstick for measuring successful innovations remains their diffusion. The diffusion of innovation (DOI) theory of Rogers (2003) identifies five factors that influence the adoption of innovations. They are the relative advantage in comparison to existing technologies, affinity with the organisation's ways of working and knowledge, complexity to implement, trialability and the possibility to observe the innovation being implemented. Rogers (2003) also explained who the potential adopters of innovations were: innovators themselves, early adopters, early majority, late majority and laggards. Rogers' (2003) study is still relevant today to help to understand why some innovations fail to be adopted by professionals or people in general (Abdelrehim, 2013). In a nutshell, Rogers (2003) argues that innovators must decrease the proportion of late majority, who are basically sceptical about the innovation and laggards who usually cling to traditions and base their decisions on what is usually done rather than what could be the new ways of doing things.

However, innovating in the education sector is not a straightforward process. The literature abounds of case studies that explain factors that promote and hinder innovation in education. For instance, Sumathi (2022) posits that the accessibility to technological advancements can be transformative and encourage teachers to adopt innovative teaching methods. Furthermore, it has also been contended that curricular reforms should lay the foundations for innovation in education. Indeed, strategic curricular orientations such as focus on 21st century skills can be the driving force promoting innovation in education. This can trigger more engaging approaches, where the learner is more a knowledge creator than a knowledge consumer. Innovative approaches are also adopted in teacher empowerment where the role of the educator is more of a facilitator rather than a coach (Jagtap, 2016). Adding to the above, Mupa (2015) argues that there is a need for leadership with vision creating an organisational culture whereby every person in the organisation thinks of new and innovative ways

of doing things. Indeed, how schools and educational institutions are led and managed could be a key element in promoting innovation in education. To summarize, some key areas of innovation in education are technology integration, innovation in teaching and learning practices, including a reform in the assessment practices. Innovative assessment practices may help to better attain the learning outcomes and also tailor instructions according to the students' preferences and needs (Falchikov & Thompson, 2008).

Leadership could be a determining factor in dealing with issues such as resistance to change. At times, institutions are so comfortable with a way of working that they show resistance to shifting from traditional beliefs and methods to innovative ones. Secondly, sometimes a lack of required infrastructure and funding can impact the adoption of innovation in education. Another factor is the curricular limitation, where the curriculum does not favour innovation. A rigid and linear curriculum does not leave space for innovative practices. Teachers lacking training or motivation can also result in not integrating innovation in their practices. What is important to understand is that innovation is not solely about adopting technologies, but rather a rethink of the pedagogy and curriculum (Helen et al., 2007).

There is a need to scale successful innovations and explore new areas of innovation in education that would help in addressing the needs and preferences of the learners. This study allows us to fill the gap in the literature by researching different conceptualisations of innovation in education and thus informs how these conceptualisations will help in the adoption of innovation in education. This review has provided a multi-pronged view of innovation and discussed them in the context of education where possible. The following section will outline the methodology employed to produce data from multiple stakeholders to develop multi-layered conceptualisations of innovation in education.

Methodology

Our ontological stance is pragmatism, as we view reality as something which can be interpreted in multiple ways depending on the context and purpose of the research. Epistemologically, this suggests that knowledge is both constructed and discovered. The aim of this paper was to develop, through mixed-methods research, a general way to explain what conceptualisations of innovation in education were held by

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different stakeholders in the field of education. Mixed-method research highlights the importance of considering multiple perspectives and values in the research process. This approach ensures that the research considers the impact on various stakeholders. The stakeholders come from various levels of the education sector, namely, Primary, Secondary, Higher Education and policy makers (hence the term "multilayered" in the title). The research design chosen for this study was mixed methods. The research was two-phased, comprising firstly engaging the stakeholders in responding to a questionnaire and secondly, a smaller sample of stakeholders was chosen for a Focus Group Discussion (FGD). The first phase of this study was establishing an informed knowledge about the diverse conceptualisations of innovation in education. The questionnaire provided us with statistical data on the diverse conceptualisations of innovation in education among the different stakeholders. Data for this first phase was collected through online questionnaires where the pre-determined questions aimed at gathering specific data on the conceptualisations of innovation in education. The aim of the second phase was to probe deeper into the phenomenon of the research. These tools and methods used, allowed us to garner data to answer the research questions. They allowed us to have better insights into the phenomenon "innovation in education".

The questionnaires provided data on what the conceptualisations of innovation in education are, while the FGDs guided us on how these conceptualisations influence innovation in various sectors in education in Mauritius.

Following the above research design, the sample of the study was constituted. It is not realistic to send questionnaires or conduct interviews with all persons in the population. To this effect, a non-random sampling technique was used. The convenient sampling technique was used to select the participants. The participants were easily accessible to the researchers. The researchers could make use of their extensive networks in the various levels of education. For practical purposes and due to time constraints, a convenient sampling was ideal (Bhardwaj, 2019).

These were the primary data. A sample of different stakeholders from Education was considered for this study: a sample of 30 primary educators, 20 secondary educators, 20 educational cadres from Higher Education and 8 Policy makers in Education. Online questionnaires were distributed among the participants from the primary, secondary and a tertiary sectors group of 6 participants was chosen for a Focus Group Interview.

In line with the idea of convenience, the questionnaire was administered online.

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Online questionnaires and surveys have taken much prominence during the COVID-19 pandemic. Administering questionnaires and surveys used to be a tedious affair with printing questionnaires, sending them and receiving them back by post. However, today with online tools such as MS Forms and Google Forms, questionnaires can be designed rapidly and dispatched at a click to respondents. Even one level of analysis possible with online tools (Ball, 2019). The software automatically generates statistical information that can be represented graphically. Online questionnaires were even found to be convenient to respondents (Nayak & Narayan, 2019). Furthermore, data can be downloaded in multiple formats, and errors pertaining to delivery and data entry are minimised (Callegaro et al., 2015).

While designing the online questionnaire, a survey design tool was used, and all the conventions of questionnaire design were respected. For instance, the respondents were given a clear explanation of why this survey was being conducted. The respondents were also provided with key ethical guidelines and assured that this research had received ethical clearance from the researchers' organisation. With an online questionnaire, researchers run the risk of overlooking important aspects of using this tool, namely, sampling issues (discussed in the paragraphs above) and question validation. Question validation cannot be discussed in isolation from ethical issues of informed consent. Some questions in the survey were mandatory, meaning that it was compulsory for the respondents to answer them. Their informed consent was sought, and it was done on a separate information sheet as recommended by Mahon (2014).

The second phase of the research required the use of FGD to further deepen the discussion on innovation in education with respondents. As mentioned above, a smaller sample of the original sample was chosen for this exercise. Online tools were explored to conduct FGD as early as 2001 (Ping & Chee, 2001). The purpose of conducting FGDs is to create an interaction among participants around the phenomenon under the research lens. The idea is to generate in-depth discussions on the topic, leveraging on the participants' experiences and opinions (Morgan, 1998). An FGD should also have an able moderator to ensure that discussions remain on-track and all participants have a fair chance to expose their views (Fontana & Frey, 2005). Care must also be taken that participants are respected and discussions remain civil despite possible disagreements.

Over the years, the development of digital tools and platforms has allowed the scheduling of online discussions for the purposes of research. In fact, the restrictions imposed by the COVID-19 pandemic have forced many researchers to adopt online

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tools for data production (Saarijärvi & Bratt, 2021). Even after sanitary restrictions were over, the use of video interviews through online platforms remained in use. One reason for this could be that this format is closest to the face-to-face interviews (Krouwel, et al., 2019). They even have the advantage of including people regardless of where they are located and over different time frames. To cater for technological issues that could crop up, it was ensured that participants were briefed on the procedure of the FGD and that their equipment was responsive to the video interview. This process of equipment verification is in lieu of the tasks that the researcher/interviewer had to perform to ensure an inclusive interview setting in a face-to-face context (Gibson, 2007).

Accordingly, a convenient date and time were agreed upon with the participants. This is an important factor to pay attention to (Beyea & Nicoll, 2000). The study was intended to investigate the multi-layered conceptualisation of innovation in education. Insights from educators/academics/policy makers in the field of education were important to us as researchers as they enabled a comparative analysis of the conceptualisations of innovation in education held by each stakeholder, as discussed in the research findings. The research informed how different stakeholders in the sector view what is and what is not innovation, what the limits and possibilities are to innovate and the facilitators and challenges to innovation in education. Semi-structured questions guided the FGDs, and they were the same for all participants. This ensured that the comparison was reliable.

Taking part in this research was entirely voluntary, and participants could withdraw from the research at any time. The interview was carried out on MS Teams. Everyone could join using a link generated by the software. The participants were briefed by the moderator before the start of the interview. They were told that their opinions mattered and that of others as well. Respect, despite disagreements, was essential for the good conduct of the session. They could also opt out of the interview if they wished. They were finally briefed about the length of the interview (they were notified in the consent forms as well). The participants would be able to view a recording of the interview. To ensure rigour in data production, the participants were asked to confirm the accuracy of the transcription (Morse et al., 2002). They were also told that it was not compulsory to turn their cameras on. This was deliberate on the part of the researcher as it was believed that non-verbal cues would act as a distractor and influence the discussions in an irrelevant direction. It was also a means to maintain some privacy (Saarijärvi & Bratt, 2021), though full confidentiality was not possible. The data generated from the questionnaires and interviews were anonymised by removing all identifying information

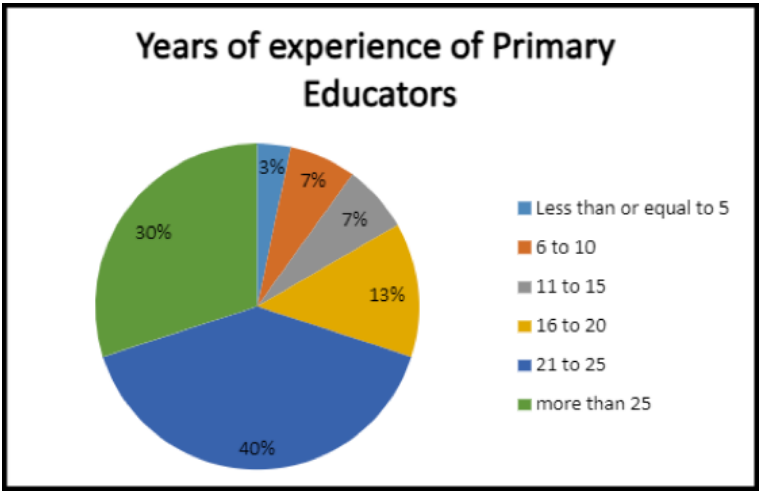
and treated confidentially using a coding system. Only the researchers and persons holding an official and ethically bound role at the MIE in the context of this research had access to the anonymised transcripts. Anonymous extracts may be quoted in any publications made on this project, such as conference papers and scholarly publications. The consent forms and original recordings will be kept within the research team and retained at MIE.

Result and Discussion: sectoral conceptualisations of innovation of education

Primary Education Sector

The response rate was 100% as all the 30 primary educators responded to the questionnaire. Most of the Primary School Educators that responded to the questionnaire had a substantial amount of experience, as shown in Figure 3. Seventy per cent of them had over 20 years of teaching experience. Hence, they have seen the implementation of several ICT projects such as Tablets for learners (the Early Digital Learning Programme since 2017) and Interactive Projectors in classrooms (the Sankoré project, 2011-2015).

Figure 3: Years of experience of Primary Educators



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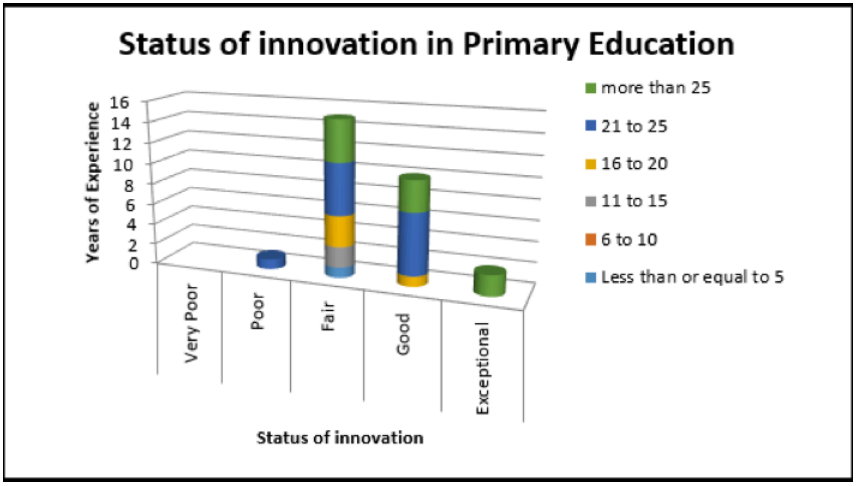
Their experiences influenced their conceptualisations of innovation in education. As indicated in Figure 4, only 1 respondent described the status of innovation in primary education as poor. It can be extrapolated that due to these abovementioned projects, they had an overwhelmingly positive outlook on the status of innovation in their education sector.

Figure 4: Status of innovation in Primary Education



The Primary Educators were the only respondent group to describe innovation in their sector as exceptional, citing the provision of equipment (projectors, tablets and digital learning resources) to all students and educators. The mere presence of these technological innovations in the sector prompted them to believe that innovation was being studied. Respondents suggested that learners' and teachers' perspectives were taken into consideration while referring to the design of digital learning solutions that are uploaded on the tablets. However, in some subject areas, such as Asian Languages and Arabic, educators complained that they had restricted access to digital tools. Generally speaking, educators recognised that there was a marked difference between classrooms of the past and now. It is noteworthy that Primary Educators were almost exclusively focused on tangible innovation. Nevertheless, the picture is not entirely rosy. Educators mentioned that they did not have enough support to troubleshoot equipment. Therefore,

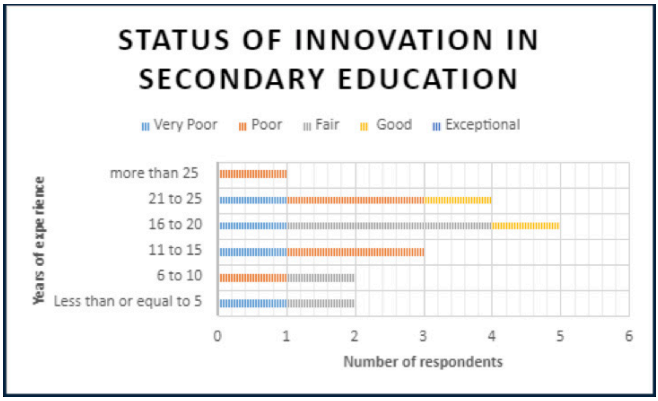
this resonates with the fact that a technological innovation needs to be followed up by a service innovation as well. Notably, few of them pointed out that the distribution of equipment was not supported or followed by a change in teaching methods.

Secondary Education Sector

The Secondary Educators were less optimistic about innovation in their sector. Over half of them (56%) felt that the status of innovation in Secondary Education was either poor or very poor (see Figure 5). None of the respondents chose "exceptional" and only 2 chose "good". These 2 outlying responses focused on the availability of technological tools and the possibility to combine these with new teaching and learning methods. However, it was difficult to ignore the primarily critical outlook of the Secondary Educators. They highlighted that there was "nothing" in their sector (no projects as compared to Primary Education). They also highlighted missing intangible and qualitative aspects of innovation in education by mentioning that teaching methods have barely changed over the years. The educators mentioned that some progress has been made in terms of using ICT for educational administration purposes. However, they underlined that this had little impact on pedagogies and were "cosmetic" changes at best.

Remarkably, one educator mentioned that research done in the local context on innovative practices is not implemented. Overall, an overwhelming majority in the respondent group (17 out of 18) did not believe that innovation in the secondary education sector was being studied/researched.

Figure 5: Status of innovation in secondary education



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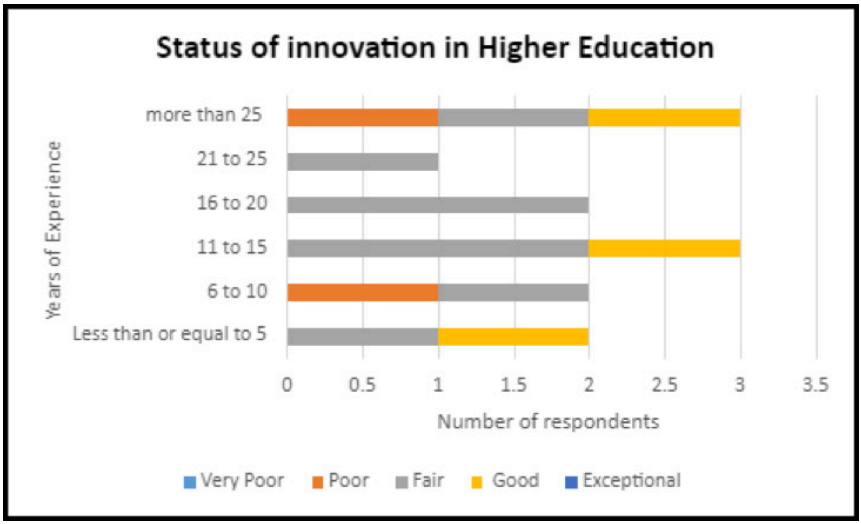
Higher Education

Higher Education respondents who positively appraised innovation in their sector were also tool-centric and focused on digital technologies, citing hybridisation of learning and educational technology. Superficial mention was made of innovative teaching strategies. The academics who had a more mitigated view on innovation in higher education warned that innovation must be equated with the introduction of digital technologies and tools only. Availability of funds was also repeatedly mentioned as a significant blocker for innovation to happen. Academics also underlined that all stakeholders must be involved when innovative projects are undertaken. Those who believed the status of innovation in Higher Education was poor did not substantiate their claim. Figure 6 serves as illustration.

Figure 6: Status of innovation in Higher Education

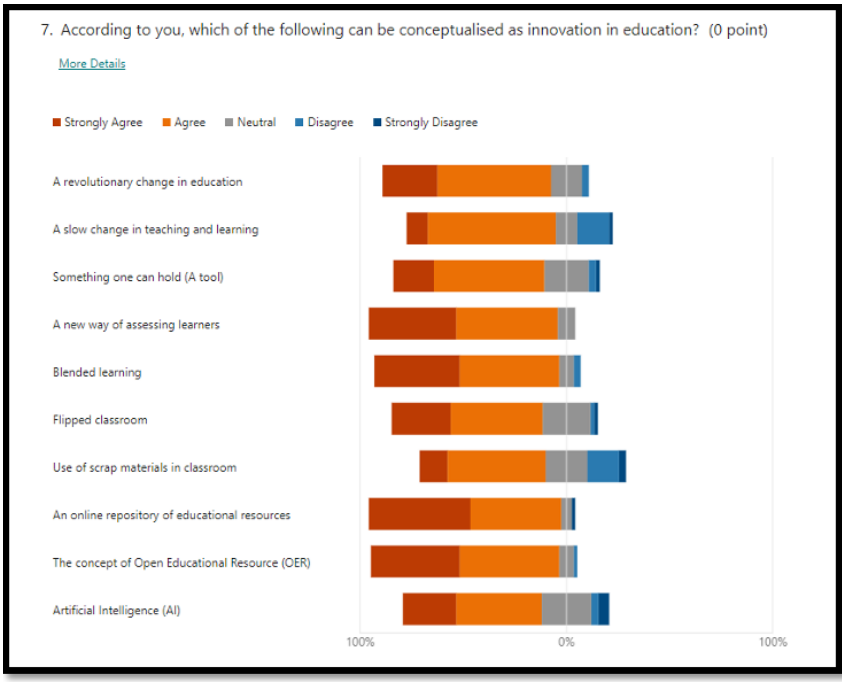


Moreover, 62% of the respondents from Higher Education were either not aware whether innovation was being studied in their sector or did not believe that it was being done at all. Those who thought that research initiatives were directed towards innovative practices tended to equate research to research proposals and studies on classroom practices and adapted teaching and assistive technologies.

Overall conceptualisations of innovation in education

Sectoral conceptualisations of innovation in education show that respondents were influenced by the volume of investment and projects initiated and implemented in their sector. The next sets of responses give more insights into educators' appreciation of what innovation is in education. Figure 7 explains.

Figure 7: Conceptualisations of innovation in education



The revolutionary vs evolutionary continuum (Osolind, 2012) was suggested to the respondents. Most of the respondents agreed or strongly agreed that innovation in education can be both revolutionary and evolutionary. However, there was some disagreement/neutrality (28%) with regard to evolutionary innovation. The next questions dealt with tangible/intangible innovation. There was more inclination to liken new methods as innovative. There was some disagreement/neutrality (27.8%) about considering tools as innovative. Moreover, this was possibly confirmed by the next set of

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data as the respondents strongly agreed/agreed to consider Blended Learning (87.7%) and Flipped Classroom (73.2%) as innovative practices. The same can be said for the OER concept. However, 39% were either neutral or disagreed with including the use of scrap materials to innovate. Therefore, it can be said that frugal innovation is not yet ingrained in the minds of educators. They are more liable to consider high-end product innovation, such as the introduction of tablets in teaching and learning. AI as a concept was also met with some scepticism, as indicated by the high level of neutrality (24.1%). Possibly, AI being a recent development, educators are in a wait-and-see mode.

Factors influencing innovation in education

The next data set rendered some rather unexpected results (as shown in Figure 8). For instance, funding was not considered a stimulating factor for innovation by 15% of the audience. Though Mauritius is quite vulnerable to climate change, it was not considered to engender innovation. The data confronts the triple helix belief that government, academia and industry should collaborate to foster a climate of innovation, with 31.7% stating that industry involvement has a moderate impact and 10% qualifying the impact as low. This could indicate that the industry is kept separate from the education realm. Another notable data point was the consideration given to *macro* and *meso* factors that focused on the education sector. *Macro* factors such as Teacher Education and Curriculum Design (both at 41%) were deemed to have a very stimulating effect on innovation in education. Therefore, not only were trained teachers believed to be important in the eyes of the respondents, but a well-designed curriculum is also considered to be a catalyst for innovation in education. This suggests that human resources must be empowered to make use of innovative approaches proposed by institutions, resonating with Rogers' (2003) claim that the workforce must develop affinity with the organisation's ways of working and knowledge.

Interestingly, policy elements such as Political Will were considered to have a very high bearing on the innovation climate (43.3%). Education research received similar levels of approval (50%). It was noted that a large chunk of the respondents was doubtful about innovation being driven by foreign forces. Indeed, 31.7% of respondents thought that support from foreign countries and organisations had a moderate impact on innovation.

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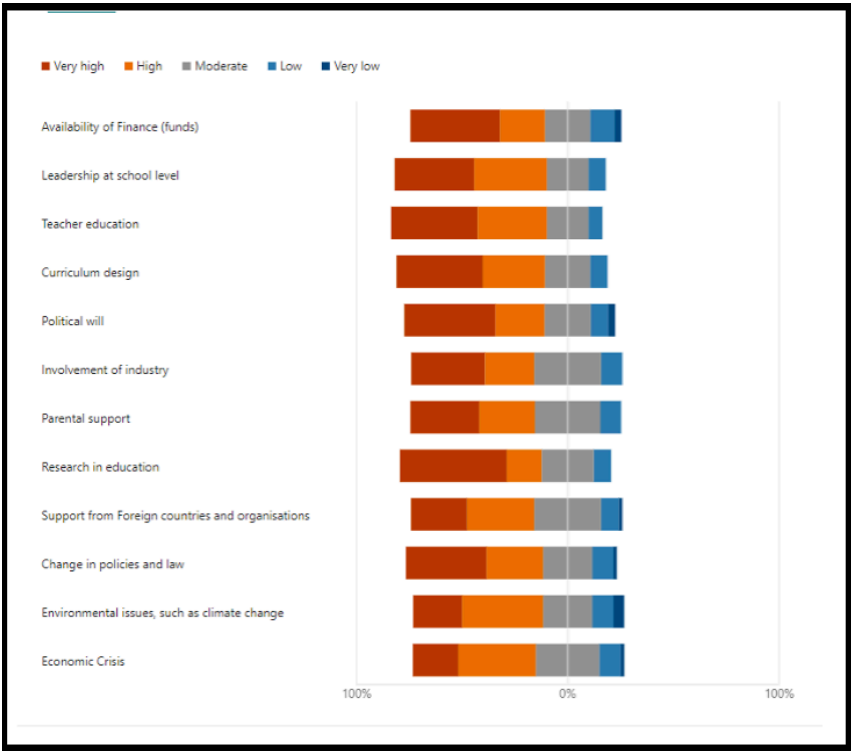
Figure 8: Potential to stimulate innovation in education



Meso factors such as Parental Support and Leadership at the school level received high approval ratings regarding their capacities to stimulate innovation. Parental support was discussed in the FGD.

The FGD exercise was carried out with three academics, one participant from the industry and one participant working in policy making in the education sector. They focused, amongst other things, on the resistance of the education sector to change by highlighting the fact that the Education system in Mauritius is still very conservative at its base and would stay in a comfort zone, relying on methods that have been used in the past. Moreover, this mindset was deemed to be problematic for the country as one participant stressed the fact that if teachers continue to use traditional methods, learners from this generation will be "cut off" from learning. All participants agreed that the

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world had changed a lot and felt that education had not followed the pace of change and trends as they would wish. They also discussed the fact that there is much focus on tangible innovations and less on intangible innovations of pedagogical nature, and encouraging capacities to reflect and think critically. For instance, the respondents highly rated innovations in teacher education, research in education and curriculum design (figure 8). This can be contrasted with the views expressed by the educators regarding tool-centric additions to the teaching and learning environment. However, for all the respondents, innovation requires the development of the 21st century skills, including critical thinking, communication, collaboration, creativity and lifelong learning. So, an intersection between tangible and intangible innovation could be identified from the data obtained.

Adding to the above, they pointed out that there is an urgent need to train educators to embrace these technologies. The technology with the adapted pedagogical approach will have to be incorporated into our education system. It was deemed essential to motivate champion educators as per the initiatives taken by industry people to promote innovation in education. However, champions need to have a supportive environment to be able to sustain innovation over time. Indeed, it appears that innovation is a one-off event that occurs during extra-curricular activities. On the brighter side, these events embraced frugal innovation as indicated by the findings; scrap materials and OERs point to low-cost solutions for innovation (Figure 7). Moreover, the policymaker believed that pressure from out-of-school stakeholders, such as parents and media, discourages educators from innovating, redirecting their focus towards *producing results*. This observation was shared and confirmed by the academics, who stated that educators do have the knowledge to be able to innovate in the classroom. It is either that their innovations go unnoticed (invisible innovation) or that they are constrained to use traditional methods because of a host of factors such as pressure to complete the syllabus, examinations and expectations from parents and students.

The analysis points to a recurring fusion of innovation with technological adoption. Innovation is often narrowly viewed as the integration of ICT or digital tools, while pedagogical and process-related innovations are underexplored or overlooked. Indeed, this was confirmed by the data obtained from interactions with educators who often linked innovation with the availability of technological tools in the classroom. This is evidenced by the data from Primary and Secondary Educators. Furthermore, Higher Education's respondents identified a lack of funds that discourages innovation in

education. This could indicate a lack of focus on frugal innovation, where funds are not of paramount importance. Therefore, the data points to conceptual gaps in the respondents' understanding of innovation in education. More worryingly, there was no evidence of any cross-sectoral collaboration to promote innovation in education.

Lastly, the data points to a lack of decisive actions from leaders in the education sector as the system and beliefs are left unchallenged. Conservatism in educational institutions and reliance on traditional methods impede innovation. Educators, hence, face systemic and cultural resistance to adopting new practices, compounded by pressure to meet examination and syllabus completion demands.

Conclusion

From the discussion above, what comes to light is that all share the innovative mindset. However, there is a disconnect between education stakeholders and what parents and the media want. There needs to be a shared understanding of what innovation in education means and why it is important for the future of the country. Indeed, it makes no sense to demand capacity building to face 21st-century challenges and better life chances while at the same time denying educators space, time and funds to innovate. As mentioned by Vieluf et al (2012) and Cornali (2012), there is an urgent need to find solutions to pressing issues of climate change, technological acceleration and rampant globalisation. We cannot afford not to innovate, especially in education. An education system that is unresponsive to these (and many others) can have dire consequences for a society (Diamond 2005).

As researchers, we would recommend that innovation be taught as a subject. It would help to instil the proper mindset in students. By integrating innovation into the curriculum, educators can equip students with the tools and skills they need to navigate and shape the future effectively. It could be in the form of a body of knowledge known as innovation studies that would encourage both teachers and students to move boundaries and go beyond the curriculum. It is desirable that the subject is infused in a transdisciplinary manner with the school curriculum. Moreover, the triple helix of Government, Private Sector and Education should be strengthened to foster setups and initiatives that are conducive to innovation. From the data, the role of policymakers is seen as important and spoken of by the respondents. They were, however, quiet as far as the role of the industry is concerned during the interviews. This silence of all three sets of

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respondents tells a lot about how they conceptualise the role of the industry. Therefore, there is room for more industry involvement to stimulate innovation in education from many angles, such as financial help, sustainable and more productive industrial solutions.

Possibly, the triple helix must evolve into a quadruple helix model to include media so that innovative enterprises are brought into the limelight and receive due consideration. It is vital to raise public awareness to encourage and support innovators.

Innovation in education requires a delicate balance between adopting new technologies and reimagining pedagogical practices. While supportive curricula, technological integration, and empowered teachers drive innovation, resistance to change, resource limitations and rigid traditional systems act as significant barriers. Addressing these challenges holistically is essential for fostering an innovative and adaptive educational environment, taking into consideration the fact that most of the literature comes from the Global North. There are no equivalent studies, no indigenous conceptualisations of innovation in education as far as Africa is concerned. Therefore, as we continue to use Global North yardsticks, African innovations in education will continue to go under the radar.

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Experiences with interactive video assessment in higher education to enhance teaching and learning

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Abstract

When designing quality educational experiences, decisions must be made based on the latest educational technologies available. Interactive videos are one of the most advanced digital information technology and multimedia content developments. Therefore, using interactive videos requires significant investment in technology and human resources, which could be challenging in countries experiencing socio-economic or digital inequalities. Using a four-phased sequential exploratory mixed-method research design, this study aimed to explore lecturers' (n=20) and students' (N=800) experiences with interactive videos in South Africa to discover the underlying drivers for adopting interactive videos and identify factors that could hinder adoption. During the exploration, the Community of Inquiry (CoI) framework informed the study on instructional design principles to consider when creating educational experiences (i.e., social presence, cognitive presence, and teaching presences) and the Technology Acceptance Model (TAM) provided insight into determinants (i.e., perceived usefulness; perceived ease of use; behavioural intention to use technology) that directly or indirectly could explain lecturers' behavioural intentions to adopt interactive videos. This study found that interactive videos have significant benefits and advantages that can positively impact teaching and learning experiences, making them a valuable application for lecturers and students. Findings also show the diverse possibilities for using interactive videos to promote a teacher and cognitive presence online. Findings from this study could help support and guide the adoption of interactive videos in higher education.

Keywords: Cognitive presence, Community of Inquiry model (CoI), experiences, higher education, interactive videos, social presence, teacher presence, technology acceptance model, technology integration.

Introduction

In the twenty-first century, instructional design, technology integration, and selecting Information Communication Technology (ICT) tools to create quality educational experiences within higher education have become a subject of debate. Various aspects, including Artificial Intelligence (AI), ICT, online and distance learning, blended and hybrid learning, digital literacy, and the use of flipped classroom pedagogy, have been central to this ongoing discussion. The COVID-19 pandemic further intensified the demand for technology integration during the instructional design process in higher education. Owing to this demand and significant technological advances, novel and innovative applications for teaching and learning have been introduced, such as interactive videos that offer students the opportunity to engage more meaningfully with the content that is being delivered (Althwaini & Mahmoud, 2021; Dart, 2020; Halupa & Caldwell, 2015). This study, therefore, explores *students' and lecturers' experiences with interactive videos in their educational context*. By examining recent developments and existing research, this study aims to address gaps in understanding and provide insights into the effective implementation of interactive videos in higher education, especially in South Africa.

Problem Statement, Background, and Research Contribution

Integrating technological advances, such as interactive videos, can potentially enhance students' teaching and learning experiences in higher education. However, adopting these advances often requires substantial investment and human resources, which can be challenging in socio-economically disadvantaged contexts (Research ICT Africa, 2020). In South Africa, socio-economic challenges, a digital divide and high data costs, as well as inadequate training for lecturers and teachers, hinder the effective implementation of technological advances, such as interactive videos. Only about 51% of the South African population has internet access, with those from low-income households facing additional barriers like high data costs (Research ICT Africa, 2020). These challenges often also lead to the underutilisation of technological advances which underscores the need to understand the factors influencing the adoption and use of interactive videos in this context.

There is a gap in the literature regarding the context-specific factors influencing the adoption and utilisation of interactive videos in higher education. This includes an

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understanding of lecturers' and students' educational experiences when being exposed to interactive videos. Therefore, the main research questions that drove this study were as follows: *How do South African students and lecturers experience using interactive videos in their educational context?*

Additionally, secondary research questions involve the exploration of (i) underlying drivers that could encourage or hinder the adoption of interactive videos; and (ii) how interactive videos can enhance teaching and learning experiences in a context marked by significant digital divides.

Technology Integration in Higher Education: Benefits, Challenges, and the Need for Behavioural Change

Technology integration in higher education is a multifaceted and evolving concept that lacks a clear and unified definition (Dziuban et al., 2018). This ambiguity stems from the complex, dynamic, and multidimensionality of educational environments and the rapid pace of technological advancement (Akcil et al., 2021; West & Malatji, 2021). Various scholars conceptualize technology integration differently, leading to inconsistencies in implementation and assessment across institutions.

Despite definitional disparities, Higher Education Institutions (HEIs) have, over the years, increased technology integration to enhance and sustain students' teaching and learning experiences with maximum efficiency using the infrastructures, applications, digital tools, and equipment available. Overwhelmingly positive results have been reported in recent literature, which has increased technology integration in teaching and learning (Du Toit & Verhoef, 2018; Waghid & Waghid, 2014; West & Malatji, 2021). Some of the advantages include flexibility in time and space for learning, superior learning outcomes compared to traditional pedagogy (Ma'arop & Embi, 2016; Ejikeme & Okpala, 2017), stimulating social interaction and critical thinking and improving the internationalisation of higher education (Adams Becker et al., 2017). Technology integration has furthermore been associated with students gaining ownership, being creative and becoming problem solvers in the fourth industrial revolution (Gardner, 2014; Skhephe et al., 2020; Wankle, 2011; West & Malatji, 2021).

However, these positive outcomes are not universally guaranteed and often depend on factors such as the quality of technological infrastructure, the digital literacy of both educators and students, and the pedagogical approaches employed (Du Preez & West,

2020). Challenges such as resistance to change, insufficient training, and the digital divide can hinder effective integration, potentially exacerbating existing educational inequalities (West & Malatji, 2021). Moreover, some studies suggest that technology can sometimes distract from learning objectives if not thoughtfully integrated (Adams Becker et al., 2017). Also, for lecturers and students to transition from traditional approaches to technologically advanced methods requires behavioural change (Ajzen, 1991, 2012, 2020; Mesuwini & Mokoena, 2024).

Given the complexities involved with behavioural change, there is a need for more nuanced research that explores not only the benefits but also the contextual challenges of technology integration in diverse educational settings.

Roles, Challenges, and Opportunities in the Integration of Videos and Interactive videos in Higher Education

Videos have become an indispensable part of both traditional face-to-face, online, and blended learning experiences (Cooper & Higgins, 2015; Nadelson et al., 2015; González-Gómez et al., 2016). Videos supply verbal and non-verbal stimuli, which make processing information for human cognition easier but also more engaging (Paivio, 1986; Shanmugasundaram & Tamilarasu, 2023). Videos provide students with flexible learning opportunities to engage with the learning content at their own pace (Leo & Puzio, 2016), as they can pause, replay, and rewind the learning content (Howard, Meehan, & Parnell, 2018). Owing to videos' pedagogical functions (Bétrancourt & Benetos, 2018), their popularity has recently increased in educational environments (de Koning, Hoogerheide, & Boucheix, 2018). With increased video-related technological developments (Bétrancourt & Benetos, 2018), interactive videos have emerged as a new way of watching videos. Unlike traditional videos limited to basic playback controls, interactive videos offer clickable spots that reveal information or questions (e.g. multiple choice, true or false, or essay questions) to be answered (Henrikson, 2024).

The literature reports on the benefits of using interactive videos for teaching and learning; for example, interactive videos positively impact students' understanding of information, concepts, and facts in an easy-to-understand manner (Althwaini & Mahmoud, 2021). They have also been described as stimulating active learning (Sinnayah at al., 2021), increasing motivation, engagement, interaction and excitement, and contributing to better knowledge communication and improved guidance (Bonafini,

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2017). A key benefit and driver of video learning over traditional classroom lectures or videos is its unrestricted nature and flexibility, as students can engage in learning at a place and time of their choosing (Althwaini & Mahmoud, 2021; Dart et al., 2020; Dziuban, et al., 2018; Sinnayah, et al., 2021). Furthermore, interactive videos increase students' agency by enabling them to self-pace and self-guide their learning by controlling the speed and pathway they take through content (Henrikson, 2019).

Interestingly, it has also been reported that student academic performance and pass rates improve, and withdrawal rates decrease when using video resources (Dziuban et al., 2018). Improved academic performance could be due to increased viewings since Pinder-Grover et al. (2011) found the number of web hits (in other words, number of viewings) on such videos correlated to higher test performance. Performance improvements are also attributed to active learning pedagogy, which strongly correlates with academic performance (Biggs, 1996; Deslauriers et al., 2019; Sinnayah et al., 2021). Findings related to active learning also align with inquiry-based learning principles since students work alongside the videos to answer questions and solve the presented problems (Barns et al., 2017; Martin, 2016; Onyema, 2019). A few factors need to be considered when discussing the effectiveness of using interactive videos to increase students' academic performance. For example, the quality, alignment with module objectives, and video length could also affect performance. Videos should tie directly to a module's objectives and curriculum. Videos should be interesting as well as engaging and should not convey information students can read in a text. Furthermore, a video's optimal length is four minutes (Hibbert, 2014). Guo (2013) notes that the videos should be 5-10 minutes at most. Therefore, lectures should shorten the length of lecture videos and provide the students with multiple short clips (Guo, 2013; Hibbert, 2014). However, caution must also be taken with the number of videos provided to students so that they are not inundated with so many additional resources that they cannot access all of them and feel overwhelmed (Halupa & Caldwell, 2015).

Although most researchers have found student attitudes toward videos positive, some factors can negatively impact their experiences (Dart, 2020; Martin, 2016; Henriksen, 2024), especially within low socio-economic environments and developing countries. Equality with regards to technological infrastructure (access to necessary devices, applications, electricity, and internet availability and speed), lack of technical support, and student ability and confidence with technology (Adams Becker et al., 2017), have all been reported as factors that have a detrimental impact on student satisfaction.

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Instructional design, associated with lecturers' ability, awareness, skill, and technological and digital literacy, has also been reported as a possible challenge. Lecturers' instructional design is often affected by the complex and time-consuming nature of integrating instructional materials, such as interactive videos (Halupa & Caldwell, 2015; Mesuwini & Mokoena, 2024).

Furthermore, students' concentration, mindfulness and focus have also been listed as possible challenges when using interactive videos, as learning via video necessitates audio and visual information processing, which can result in cognitive overload (Shanmugasundaram & Tamilarasu, 2023). Interactive video learning also requires active and self-directed learning, which requires a shift from passive delivery formats and can make students resistant (Shekhar et al., 2015). Resistance to active learning approaches can also be due to students taking greater responsibility for their learning, often requiring increased engagement and participation (Dart et al., 2020). Students with limited exposure to active learning pedagogy might also not recognise the benefits thereof at first and can therefore also become anxious and develop self-doubt around their abilities when engaging with active learning approaches, such as interactive videos (Dart et al., 2020; Deslauriers et al., 2019; Shekhar et al., 2015).

Another possible factor that could negatively impact students is related to video-recorded lectures. Often, lecturers use their own video-recorded lectures as a central feature of their online learning platforms (Breslow et al., 2013). Considerable research has indicated that students overestimate their learning from video-recorded lectures, which makes them overly confident about their performance (Choi & Johnson, 2005; Means et al., 2010). Overconfidence can harm long-term retention (Szpunar et al., 2014).

Finally, students' cognitive load when engaging with videos requires careful consideration (Polat, 2020). Lecturers should pay attention to issues relating to the design of videos to reduce extraneous cognitive load and facilitate essential processing during learning (Shanmugasundaram & Tamilarasu, 2023). The cognitive theory of multimedia learning (CTML) and cognitive load theory (CLT) provide several strategies to make videos more suitable for human cognitive architecture (Fiorella & Mayer, 2018; Sweller et al., 2019). However, little is known about students' cognitive load when engaging with interactive videos. With all this in mind, it is evident that although interactive videos have many benefits, various factors could negatively affect students' experiences with interactive videos and hinder or prevent lecturers from adopting them as part of

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their instructional design (Key & Paskevicius, 2015; Shanmugasundaram & Tamilarasu, 2023).

Contextualisation of the study and the research sites

This study was a scholarship of teaching and learning (SoTL) project that focused on students' and lecturers' experiences with interactive videos. As part of this study, two HEIs in a metropolitan area in South Africa participated, one public and one private. The public HEI was used a hybrid module of delivery, whereas the private HEI used only an online mode of delivery. Across the two HEIs, interactive videos were used in five official languages and over 800 students were involved in this project as well as 20 lecturers.

Theoretical framework

Two theoretical frameworks helped shape this study, namely the Community of Inquiry (CoI) developed by Garrison et al. (2010) and the Technology Acceptance Model (TAM). The CoI offers structure when designing educational experiences using online applications such as interactive videos (Garrison et al., 2010). The CoI framework model, rooted in Dewey's educational philosophy and social constructivism (Garrison, 2017), is a research-based and process-focused approach (Zehra et al., 2009), which informs lecturers' decision-making when designing educational experiences (Du Preez & West, 2022). When designing an educational experience, the CoI model posits that three elements called presences—cognitive presence (CP), social presence (SP), and teaching presence (TP)—need to be integrated in a meaningful way for a successful higher education learning experience. A cognitive presence refers to how learners can construct knowledge and confirm understanding through collaboration and reflection. A social presence refers to the ability to do collaborative online learning where one can establish personal and purposeful relationships. A teaching presence refers to the ability to design and facilitate content engagingly and satisfactorily to maintain a sense of community (Castellanos-Reyes, 2020; Garrison et al., 2010). The CoI has received critique which argues for including more presences such as a learner, emotional, and autonomy presence. However, these presences have not been validated yet and are therefore not included (Castellanos-Reyes, 2020).

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The CoI was initially meant to act as a model in an online learning environment but has recently also been used to facilitate learning experiences in hybrid and blended models where technology also plays a crucial part. In this study, how the use of interactive videos supports each CoI element in an entirely online as well as hybrid learning environment is explored to make recommendations on enhancing teaching and learning in higher education.

During instructional design of educational experiences, there are other factors to consider especially when using or introducing new and novel technological applications. Various theoretical models have been developed and adapted to understand the acceptance and use of technology within education, especially when considering the dilemma of selecting appropriate teaching and learning technologies (Dwivedi et al., 2020). The TAM, initially developed by Davis (1989), is one of the most widely used theoretical frameworks for explaining the adoption of technology in educational contexts (Sivo et al., 2018). The TAM considers perceived usefulness and ease of use of technology to be the main determinants that directly or indirectly explain behavioural intentions to adopt new technology. Bandura's extensive research (1982) on self-efficacy (i.e., perceived ease of use), defined as "judgments of how well one can execute courses of action required to deal with prospective situations" (p. 122) and "outcome beliefs" (p. 140) (i.e., perceived usefulness) supports the theoretical underpinnings of the TAM. The TAM was also built on other theoretical grounds, such as the cost-benefit paradigm, expectancy theory, behavioural decisions theory, diffusion of innovations, marketing, and human-computer interaction to establish why ease of use and usefulness are important determinants of behaviour.

Methodology

This study used a four-phased exploratory sequential mixed-method approach. Mixed-methods research, frequently referred to as the 'third methodological orientation' (Teddlie & Tashakkori, 2008), draws on the strengths of both qualitative and quantitative research. Sequential exploratory mixed-method research design refers to a research approach with multiple datasets that purposefully build on one another (Ivankova et al., 2025). A pragmatist paradigm guided this study which provided a more comprehensive ontology and epistemology which supports a pluralistic stance to address the multiplicity and complexity of all human experiences (Dawadi, 2021). The pragmatist paradigm

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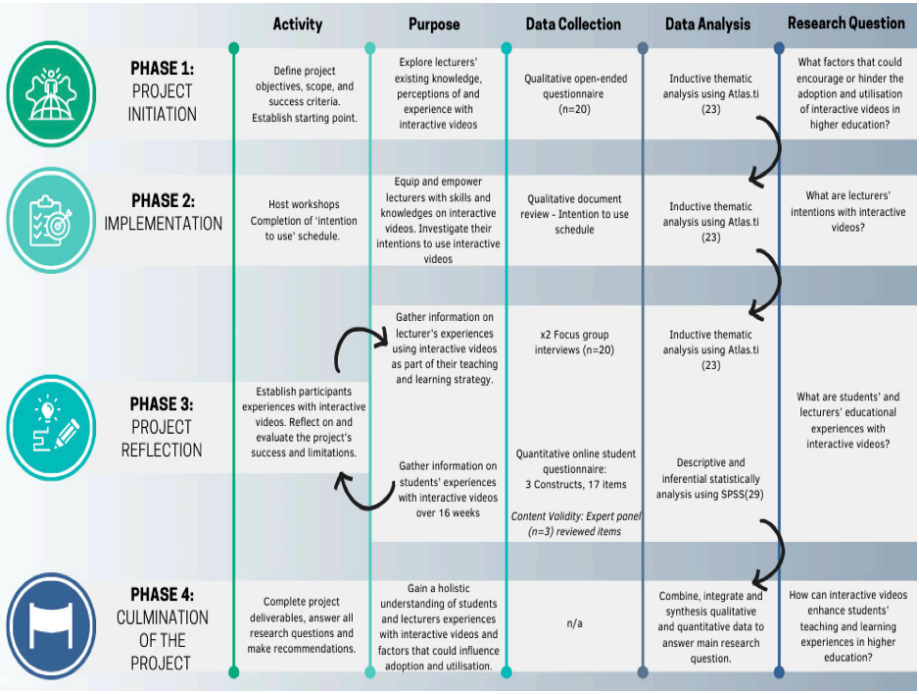
also supported using an exploratory sequential mixed-method research approach to investigate the complexities of a research problem from both a qualitative and a quantitative design (Creswell & Plano Clark, 2018; Ivankova et al., 2025). Combining quantitative and qualitative research designs led to gaining "synergistic value" (Lieberman, 2005, p. 435) in the study that assisted in answering complex, real-life research questions that a singular research approach would be unable to do (Ivankova et al., 2025).

Data was collected using various methods to achieve data saturation and methodological triangulation. Owing to the exploratory nature of this study, only qualitative data were collected in the first two phases, which were then used to inform the third phase, where both qualitative and quantitative data were collected. In the final phase (4), the qualitative and quantitative data findings were combined, integrated, and synthesised to answer the research questions and draw comprehensive conclusions. See Figure 1 for an outline of the research process of this study.

Figure 1: Four-phased exploratory sequential mixed method approach



Important to note from Figure (1) is that only lecturers were involved in the first two phases. Only in phase 3 were the students of the lecturers who were exposed to interactive videos over +16 weeks invited to voluntarily and anonymously complete an online quantitative questionnaire that focused on three variables: their experiences with interactive videos (1), technology integration within modules (2), and their experiences with the LMS (3). The questionnaire consisted of 17 items in total.

The design of the quantitative questionnaire was informed by existing literature on technology integration and interactive videos as well as the two theoretical frameworks, the CoI and TAM. Furthermore, experts reviewed the survey items to increase the questionnaire's face and content validity. Furthermore, this study also used quantitative data, such as student analytics provided by the LMS on student progression and participation.

Atlas.ti (23), a qualitative analysis software package was used to conduct inductive thematic analysis on all three qualitative datasets gathered over three phases. Statistical analyses were conducted in SPSS (29), a quantitative data analysis software package on the responses from the student questionnaire in phase 3, such as descriptive statistics and inferential statistics such as Exploratory Factor Analysis (EFA); correlational analysis and Wilcoxon Two-Sample Tests were conducted to establish if significant differences exist in the sample. Finally, in phase 4, the qualitative and quantitative data were combined, compared, and contrasted to answer the research questions comprehensively and holistically.

Sampling

Non-probability, purposive sampling was used by purposefully inviting specific lecturers (n=20) and their students (N=800) to participate voluntarily. Nieuwenhuis and Jacobs (2025) state that purposive sampling requires critical considerations regarding the parameters of the population of interest and choosing participants based on these criteria. In this study, the lecturers and students were purposefully selected from two HEIs (one public and one private). The purpose of sampling lecturers from two different HEIs was to get a diverse view on using interactive videos in different contexts. The one HEI's students were only exposed to online learning, whereas at the second HEI, students were exposed to hybrid learning. All of the purposively selected lecturers were from the faculty of education but with different specialisations, however, of the total

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population of lecturers, 50% (n=10) were in Early Childhood Education. Furthermore, 80% of the total sample of lecturers were female, which is common in South Africa (Wills & Böhmer, 2023). The student population included 1st to 4th year Education students studying towards a four-year degree. A few of the students who participated have extended their four-year degree with a year or two.

Ethical Considerations

The universities involved in this study provided ethical clearance before the study commenced. All aspects of ethical standards and scientific integrity were adhered to by offering full disclosure regarding the research design, regulation, procedures and processes; ensuring non-maleficence; obtaining informed consent; protecting participants' anonymity; confidentiality; and proper storing of data.

Results

Owing to the sequential nature of the study, the qualitative findings of phases 1 to 3 will be discussed first using inductive thematic analysis. For every direct quotation, an Atlas.ti (23) code will be reported in brackets representing the number of the question and the document number in which the code was identified as an attempt to increase the credibility and trustworthiness of the study. After the qualitative results, the quantitative student research questionnaire's (phase 3) descriptive and inferential statistics are reported. Finally, in the discussion section, the qualitative and quantitative data are combined, integrated, and synthesised.

Qualitative results

Although copious research supports the use of interactive videos, the research question of this study focused on how students and lecturers experience interactive videos in the South African context that struggle with various socio-economic circumstances. Furthermore, another study objective was to establish how interactive videos could enhance students' teaching and learning experiences in higher education through the lens of the CoI. It was also necessary to explore the factors that could encourage or hinder lecturers' behaviour in adopting interactive videos, such as perceived ease of use

and perceived usefulness, as described by the TAM (Davis,1989).

In the qualitative data sets of both phases 1 and 2, lecturers made it overwhelmingly clear that they enjoy using interactive videos. For example, the word "fun" was coded 32 times. One lecturer said, "*I got really good feedback from the students that asked for some more, so I'll definitely implement that more in the future*" (5:4). Other lecturers said, "*it makes the work more understandable and it's so much fun!*" (6:134) and "*I love using interactive videos*" (6:19). One lecturer believed that using interactive videos led to students being "*more enthusiastic*" (5:186) about learning.

Although it was clear that high levels of enjoyment created a positive experience for lecturers with interactive videos, it was necessary to delve deeper into how their students were experiencing it. Furthermore, it was also necessary to explore which factors could encourage or hinder lecturers' and students' behaviour in adopting or using interactive videos. When delving deeper into the qualitative data, five themes emerged that assisted in meeting these objectives.

Theme 1: Interactive videos promote a cognitive presence owing to interactive and inquiry-based learning

The first theme, associated with three categories, represents the lecturers' and students' experiences with interactive videos. The categories include interactive and inquiry-based learning as well as cognitive presence. The data showed that an increased cognitive presence can be ascribed to the interactive and inquiry-based learning that occurs when using interactive videos. For example, students described the use of interactive videos as "interactive" (6:11, 5:31), "active" (6:18), "engaging" (6:1), "interesting" (6:130), "not easily forgettable" (6:50), and "refreshing" (6:97). The students explained that the interactive videos contributed positively to their learning experience because of the inquiry-based nature of interactive videos. For example, the students said that questions in the interactive videos "*keep me engaged*" (6:54), "*help me engage more with my learning*" (6:115), "*encourages participation*" (5:58), and "*I enjoy the interaction with the videos… It allows me to understand better*" (6:11). One student explained: "*I interact more with the content and tend to understand my work better*" (6:14). Another student said: "*It allows me to think logically about the content and engage with the work*" (6:169). The students also mentioned that interactive videos "*… is a good way of challenging my concentration*" and that "*it grabs your attention*" (6:56). One student explained that interactive videos promote concentration

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and attention because they "*keep me focused and it is different than just a boring presentation*" (6:19).

The benefit of interactive videos using different questioning techniques that align with inquiry-based learning principles also emerged from the data. For example, one student said, "*you can answer questions whilst the content you have consumed is still fresh in your mind. Everything is easier to remember*" (6:90). Another student explained that "*they help me to pay attention to what is being taught in the video as there are questions asked. If I do not pay attention I will not be able to answer questions*." (6:42). Furthermore, students also felt that "*it is easy to learn from questions*" (6:3).

The lecturers also believed interactive videos promote a cognitive presence since "*it allows students the opportunity to internalise content rather than regurgitate information that might not be remembered after a set amount of time*" (6:48). One lecturer explained that "*it solidifies the content we are busy learning about*" (6:73). Correspondingly, another lecturer explained that it "*concretises learning*" (6:172). Furthermore, the lecturers believed that interactive videos promote a cognitive presence online as it supports learning by providing students with opportunities to "*experience success*" (5:194). The students and the lecturers also made it clear that interactive videos can serve as a "*form of revision…*" (5:193) and "*exam preparation*" (5:96), which could also promote a cognitive presence.

Furthermore, when analysing the learner analytics that the LMS of both HEIs provided, it was evident that participation spiked in the weeks that the students engaged in interactive video activities which could also indicate an increase in cognitive presence. The purple line in Figure 2 indicates how participation peaked in two modules during the weeks when interactive video was used.

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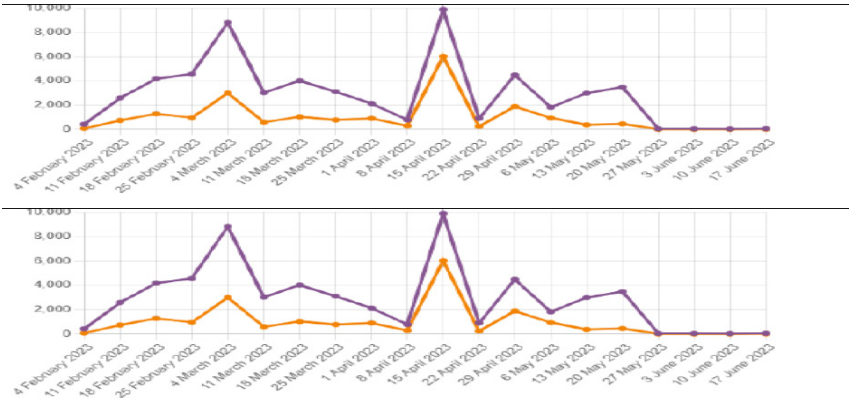
Figure 2: Examples of learner analytics and increased participation



Apart from interactive videos promoting interactive engagement and a cognitive presence, it was also evident from the data that it increases a teacher's presence; see theme 2 for further elaboration and evidence regarding this finding.

Theme 2: Interactive videos increase teacher presence owing to continuous assessment and self-reflection

The second theme is associated with four categories. The categories include teacher presence, continuous assessment, progress tracking, and self-reflection. The data showed that using interactive videos promoted a teacher's presence by providing students with immediate feedback continuously, which helped students self-reflect on their learning and track their progress and understanding within the different modules. For example, one student said: "*you can see how far you are and how much you need to improve on while using the interactive videos*" (6:27). Other students said: "*I enjoy using the interactive videos because they allow me the opportunity to check my own progress*." (6:138) and "*figure out where I might have gone wrong*" (6:7).

Here are a few examples of quotes from students, highlighting the benefit of using interactive videos as part of continuous assessment and self-reflection:

- *"I am able to identify my weaknesses when it comes to the content of the module and what I have to focus on more" (6:6)*
- *"they allow me to see myself where I'm lacking on a continuous basis" (6:30).*

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- *"it helps me know where my knowledge level is with certain concepts" (6:33).*
- *"they help me evaluate how much I have learnt and understood …" (6:59).*
- *"it helps me to be accountable to do better in my studies" (6:62)*

The lecturers also pointed out the usefulness of interactive videos in tracking student progress. For example, one lecturer said it is helpful because you can "*see how many students are productive*" (6:170) and another said, "*it helps them see with what content they are struggling with*" (6:188). It was also evident that further investigation is necessary into lecturers' perceptions of interactive videos regarding their usefulness and ease of use. Based on the TAM, perceived ease of use and usefulness could encourage or hinder their adoption of interactive videos. Theme 3 provides insight into the lecturers' perceived usefulness of interactive videos and how they are directly related to a cognitive presence and perceived ease of use.

Theme 3: Perceived usefulness of interactive videos is associated with diverse applications and perceived ease of use

The third theme emerged from data collected from the lecturers. This theme is associated with three categories. The categories include perceived usefulness, perceived ease of use, and diverse pedagogical approaches and subject matter. The data showed that perceived usefulness is directly related to interactive videos owing to the diverse pedagogical approaches that can be used when incorporating interactive videos in a module. It was also evident from the data that interactive videos can be used in diverse subject matter. The lecturers listed various ways in which they used interactive videos. One lecturer said she used it "*theoretically and practically*" (5:30). Another lecturer said she used it academically to teach postgraduate students "*How to craft a research problem*" (5:25).

The participants clarified that they believe interactive videos are useful and easy to use owing to their "*flexible*" (6:121) nature. One lecturer said, "*you can easily integrate any learning outcome into the video assessment approach*" (5:88). Some lecturers explained that they used interactive videos as a "*pre-lecture activity*" (5:33, 39), others used it "*during a lecture*" (5:38), and others used it after a lecture (5:49). For example, one lecturer explained: "*We discussed the approaches to teaching phonics in class and then they went to do the video assessment*" (5:49). Five lecturers mentioned that they used it as part of a "*flipped classroom approach*" (5:35, 41, 78, 81), so it "*encourages participation because after watching a video, they have an idea of what the lecture will be about when coming back to class*" (5:57).

Owing to the diverse pedagogical approaches that can be used, lecturers also found interactive videos useful because "*you're accommodating different learning styles*" (6:181, 6:177). Finally, perceived usefulness was also increased owing to the asynchronous nature of interactive videos where students can decide to do it at their "*own time*" (6:18) and "*own place and space*" (6:188) to complete the video activity.

It was also evident that perceived usefulness is directly related to perceived ease of use as the lecturers noted numerous times it was "*easy*" (6:3, 6:36, 6:64, 6:7) "*to use nature and navigate"* (6:74) which motivated them in adopting it in their modules. The lecturers also noted that the automation of grading students' work makes grading easier and increases its usefulness. Using interactive videos or continuous assessment "*saves time*" (6:173) by not having to "*grade by hand*" (6:167) or "*grade each student's work individually*" (5:70), "*the lecture does not have to waste time or struggle marking each student as the interactive video automatically grade students' answers*" (6:173).

However, four lecturers in the study did not use interactive videos because they felt that they still needed more training and did not find the H5P application easy to use. In the following theme (4), the issue of training is elaborated on, as well as how it could influence lecturers' and students' perceived ease of use.

Theme 4: To increase perceived ease of use, comprehensive training is essential

The fourth theme is associated with two categories. The categories include perceived ease of use and comprehensive training. The data showed that training influences perceived ease of use regarding interactive videos. For example, the lecturers noted that training is important (5:97, 5:99, 5:103). One lecturer said, "*I think if we didn't receive training, then I would have continued just putting my normal videos up*" (5:104).

However, when unpacking the need for training, it was evident that training does not only refer to using the H5P platform or creating interactive. Training has to be more comprehensive. For example, one lecturer explained that "*we don't just need training on technical issues, we need training on how to shoot a video… and editing software*" (5:151). Other lecturers said they need training on "*video quality*" (5:136), "how long the video should be" (5:116, 5:117), "how to distribute your questions" (5:122) and "*how to have your multimedia speak to your learning outcomes*" (5:127). One lecturer said she needed a "*quality assurance training session*" (5:155).

One central question that the lecturers raised was regarding "*how you choose videos*"

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(5:139). The lecturer said: "*I think one of my fears is that how do you pick your video?*" (5:113). This is a valid question as the lecturers explained that "*there's a lot of videos available*" (5:112) and "*there was tons of information, you know that's available on the Internet … I would have loved to use them all*" (5:105). "*How do you select the right video and what quality control measures should be in place before picking a video?*" (5:115).

It is therefore important to note that encouraging the use of interactive videos requires not only "technical support" (5:148) and training, but a more comprehensive understanding of different aspects related to using interactive videos, such as shooting and editing of videos, quality assurance criteria, choosing the right content, the appropriate length of videos, different pedagogical approaches, etc.

Theme 5: The adoption of interactive videos requires careful consideration and planning

The fifth theme emerged from data collected only from the lecturers and can be associated with three categories: (1) careful considerations, (2) perceived ease of use, (3) perceived usefulness. During data analysis, it became clear that certain aspects regarding the implementation of interactive videos require careful consideration before implementation as they could influence lecturers' perceptions regarding interactive videos' ease of use and usefulness. For example, "careful planning to use interactive videos" was a prominent code that was identified. Many of the lecturers who ended up not using interactive videos or did not use them as often as they intended indicated that the training took place after they had completed their instructional design plans. The lecturers said, "*it wasn't really part of my plan*" (5:7) or "*we already had set teaching activities which we had planned for…*" (5:22).

When analysing and comparing the schedules the lecturers completed during the workshop on how they intended to use interactive videos (phase 2) and the feedback they provided during the focus group interviews (phase 3), it became clear that training workshops are necessary well in advance to allow lecturers to plan for the use of interactive videos from "the beginning of the module" (5:6). Planning and training in advance was also highlighted as important due to time constraints and workload issues that lecturers listed as factors that could hinder the adoption of interactive videos. One of the lecturers mentioned that using interactive videos is "*time consuming*" (5:16). Similarly, other lecturers complained that they "*struggled a bit with time*" (5:8), "*time was*

just suddenly against us" (5:21) and "*it took me a lot of time to search for the appropriate video …for the lesson*" (5:130).

A final consideration that is needed when using interactive videos is related to module-specific requirements, "*terminology and the cultural relevance*" (5:144) that relates to the Africanisation of learning content. The lecturers mentioned that Afrocentric videos are not always easily accessible and that open-access videos are not always culturally relevant or only available in English. Therefore, an intention-behaviour gap was identified in the data because lecturers intended to use interactive videos but then struggled to find videos appropriate for the South African context or videos produced in languages other than English. One lecturer explained, "*something that's difficult in our African context… is that we don't always have African language video material*" (5:47). Other lecturers elaborate "*we find a lot of videos from a Western perspective or from an American perspective and they use terminologies that are familiar to students from America or from Europe*" (5:145) ..."*those videos and those contexts are not always, you know, familiar to our students*" (5:146).

The importance of careful planning and being mindful of factors such as time constraints, workload issues, and access to relevant videos was highlighted in this study. In the following section, findings from the post-research questionnaire completed by the students will be presented.

Quantitative findings

The quantitative results are based on the online student questionnaire that was voluntarily completed by 168 students (response rate of 21%) (N=800) at the two HEIs. It was hypothesised that there would be a significant correlation between three scales: (1) interactive videos, (2) technology integration within modules, and (3) the experiences with the HEI's LMS. It was also hypothesised that significant differences exist for students according to their year of study (1-2 years vs 3+ years), frequency in use of interactive videos (0-3 vs 3-5 times), and if they received training or not.

Reliability and Validity of the Student Questionnaire

Three scales were developed to investigate the experiences students have during teaching and learning, with a specific focus on the use of interactive videos, technology integration within modules, and their HEIs' LMS.

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An investigation was conducted into the construct validity of the three scales in the questionnaire through exploratory factor analysis (EFA). Sets of EFA were done on the following three scales: Experiences with interactive videos, experiences with technology integration within modules, and experiences with the HEI's LMS.

To extract the factors in the EFA, principal axis factoring extraction, with a quartimin (oblique) rotation, was conducted. To determine the number of factors, the following criteria were used: Eigenvalues greater than or near 1, the Scree plot, and the cumulative percentage of variance.

In interpreting the rotated factor pattern, an item was said to load on a given factor if the factor loading was 0.40 or greater for that factor and less than 0.40 for the other (Field, 2018).

Set 1: Experiences with interactive videos

The KMO of 0.88 and a significant Bartlett's test of Sphericity indicated that a factor structure exists, and it is viable to conduct EFA. EFA was applied to responses to the nine items related to the "Experiences with interactive videos" scale in the questionnaire. The findings showed that only one factor existed, accounting for 53% of the total variance. See Table 1 for the factor loadings. Items extracted had factor loadings above 0.4. All nine items were found to load on the factor, which was subsequently labelled "Experiences with interactive videos".

Table 1: Factor loadings for the factor "Experiences with interactive videos"

To what extent do you believe interactive videos can increase your productiveness	0.81
Beliefs regarding the usefulness and value of interactive videos for teaching and learning purposes	0.78
Confidence level in using interactive videos	0.74
To what extent you believe interactive videos can save you time and allow you to do more work	0.70
To what extent you believe interactive videos can increase your performance (marks)	0.69
Level of enjoyment when using interactive videos	0.63
Knowledge regarding interactive videos	0.62

How easy you believe it is to complete or use interactive videos	0.61
To what extent you believe your fellow students value the use of interactive videos in modules	0.60

Set 2: Experiences with technology integration within modules

The KMO of 0.79 and a significant Bartlett's test of Sphericity indicated that a factor structure exists, and it is viable to conduct EFA. EFA was applied to responses of the four items related to the "Experiences with technology integration within modules" scale in the questionnaire. The findings showed that only one factor existed, accounting for 53% of the total variance. See Table 2 for the factor loadings. The items extracted had factor loadings above 0.4. All four items were found to load on the factor, subsequently labelled "Experiences with technology integration within modules".

Table 2: Factor loadings for the factor "Experiences with technology integration within modules"

Confidence level in using technology in your modules	0.87
Level of enjoyment when using technology in your modules	0.84
Knowledge regarding the use of technology in your modules	0.83
Beliefs regarding the importance of using technology in your modules	0.75

Set 3: Experiences with the HEI's LMS

The KMO of 0.88 and a significant Bartlett's test of Sphericity indicated that a factor structure exists, and it is viable to conduct EFA. EFA was applied to responses to the nine items related to the "Experiences with interactive videos" scale in the questionnaire. The findings showed that only one factor existed, accounting for 53% of the total variance. See Table 1 for the factor loadings. Items extracted had factor loadings above 0.4. All nine items were found to load on the factor, which was subsequently labelled "Experiences with interactive videos".

The KMO of 0.89 and a significant Bartletts' test of Sphericity indicated that a factor structure exists, and it is viable to conduct Exploratory Factor analysis. Exploratory Factor analysis was applied to responses of the five-items related to the "Experiences with the HEI's LMS" scale in the questionnaire. A Scree Plot and Principal axis factoring, followed by a quartimin (oblique) rotation shows that only one factor exhibited

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Eigenvalues greater than or near 1; accounting for 53% of the total variance. See table 3 for the factor loadings. Therefore, only one factor was retained for rotation. All four items were found to load on the factor, which was subsequently labelled "Experiences with the HEI's LMS".

Table 3: Factor loadings for the factor "Experiences with the HEI's LMS"

Your level of activeness and engagement on the university's LMS?	0.90
Confidence level in using the university's LMS	0.88
Level of enjoyment when using the university's LMS	0.84
Knowledge regarding the use of the university's LMS	0.83
Beliefs regarding the importance of being active on the university's LMS	0.80

Further investigations were conducted on the reliability of the questionnaire's internal consistency using the post-research questionnaire. Internal consistency of responses of the scales was assessed by Cronbach's alpha coefficient. Reliability estimates were 0.88, 0.90, and 0.93 for responses to "experiences with interactive videos", "experiences with technology integration within the module" and "experiences with HEI's LMS" respectively. This indicated good reliability.

Scale scores were calculated by taking the average of the items that loaded onto that factor for each participant. The score must be interpreted as follows: a mean score towards 0 indicates poor experience and a score towards 100 indicates an excellent experience. For example, the scale score for the first scale was calculated by taking the average of nine item responses for each participant.

Descriptive statistics

For the sample of 168, descriptive statistics were calculated for the three scales. When investigating the histograms of the different scales, there was apparent skewness with a tail to the left. The skewness was also outside of the range of -1 to +1 (Field, 2018). Since the data was not normally distributed, both the mean and median are reported, and the median is used to measure location. See Table 4 for the descriptive statistics and measures of the distribution.

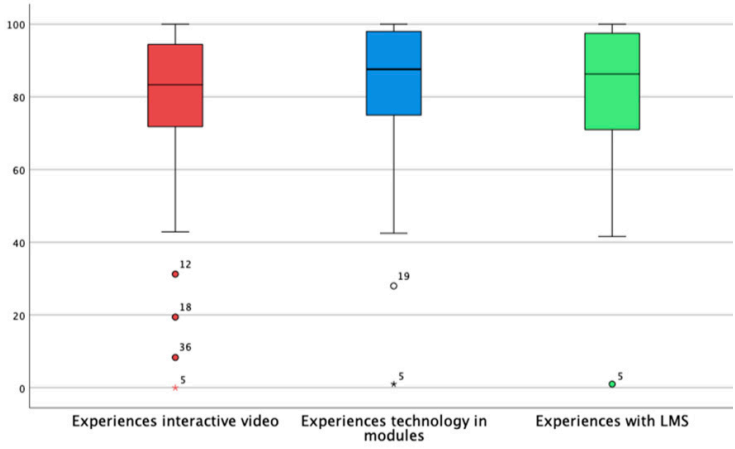
Table 4: Descriptive statistics of student's responses

	Experiences with interactive videos	Experiences with technology integration within modules	Experiences with HEI's LMS
Median	83	88	86
Mean	78	83	81
Std Devn	19.04	17.05	18.47
Skewness	-1.57	-1.53	-1.40
Kurtosis	3.51	3.31	2.71

Assessing the experiences of the students

Considering the Boxplot below (figure 2), when assessing the experiences of the students, the students showed overwhelmingly positive experiences with interactive videos (Mn=83), technology integration (Ms 88), and the LMS (Ms 86), with a few outliers.

Figure 2: Distribution of scores for all three factors



Assessing related experiences

To determine if their experiences with interactive videos and technology integration

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within modules and the LMS were related, a nonparametric correlation analysis using Spearman's ρ was conducted. Spearman's ρ was used to measure the strength and direction of association between the scales. Statistical significance was determined from a calculated p-value smaller than 0.05. In the following table (5), it is evident that there is a strong, positive and significant correlation between the scales.

Table 5: Spearman's ρ analysis of the three factors

Variable	by Variable	Spearman ρ	Prob>|ρ|
Experiences with technology integration in modules	Experiences interactive video	0.52	<.0001*
Experiences with LMS	Experiences interactive video	0.53	<.0001*
Experiences with LMS	Experiences technology in modules	0.59	<.0001*

Assessing the differences in experiences

To assess the difference in experiences, a nonparametric Wilcoxon Two-Sample Tests were conducted to establish if significant differences exist for students' years of study (1-2 years vs 3+ years), frequency in use of interactive videos (0-3 vs 3-5 times), and if they received training or not.

When investigating students' experience with interactive videos, no statistically significant differences were found between the first- and second-year students (Mn 84.7) and the 3+-year students (Mn 80.5) (Z= -0.09; p= ,0.93). When comparing how often students used interactive videos, no statistically significant differences were found between using it 0-3 times (Mn 86.1) and 3-5 times (Mn 81.9) (Z= 0.76; p= 0.44). Furthermore, no statistical difference was found between their experience with interactive videos and whether they received training (median 86) or not (Mn 82) (Z= 0.597; p= 0.55).

When investigating students' experience with technology integration in modules, no statistically significant difference was found between 1-2nd year students (Mn 87) and 3+-year students (median 91) (Z= 1,23; p= 0.22) or how often they used interactive

videos, 0-3 (median 87.8) and 3-5 (median 87.5) (Z= 0.02; p= 0.98). However, a statistically significant difference was found between students who received training (Mn 86) and those who did not (Mn 82) (Z= -2.17; p= 0.03, r= 0.18). Nonetheless, the effect size shows that the difference is small.

When investigating students' experience with the LMS, no statistically significant difference was found between 1-2nd-year students (median 82.9) and 3+-year students (Mn 89.8) (Z= 1.73; p= ,0.08). Furthermore, no statistically significant differences exist between how often they used interactive videos, 0-3 (Mn 88.7) and 3-5 (Mn 84.6) (Z= 0.76, p= 0.44) or if they received training (Mn 82) and those who did not (Mn 89) (Z= -1.03, p= 0.30).

Discussion

To gain a deeper understanding of students' and lecturers' experiences with technological advances such as interactive videos to enhance teaching and learning in higher education, it is crucial to use a mixed-method approach to corroborate findings from both datasets. For example, both the qualitative and quantitative findings showed that the students and lecturers had overwhelmingly positive experiences with interactive videos. However, it was also necessary to explore how interactive videos could enhance students' teaching and learning experiences and establish factors that could encourage or hinder lecturers' behaviour in adopting or using interactive videos which required a more qualitative approach. Based on the qualitative findings analysed using the CoI and TAM frameworks, in themes 1 and 2, there is strong evidence suggesting that interactive videos not only support but promote cognitive, as well as teacher presence. This finding aligns with widespread literature reports (Althwaini & Mahmoud, 2021; Dart, 2020; Halupa & Caldwell, 2015; Green Pinder-Grover & Millunchick, 2012) on the positive impact videos have on students' understanding and processing of information, concepts, and facts (Paivio, 1986). However, interactive videos are different from passive videos as students work alongside the videos to answer questions (Martin, 2016; Barns et al., 2017; Onyema, 2019). The promotion of a cognitive presence when using interactive videos is ascribed to the interactive nature of the videos (Castellanos-Reyes, 2020; Sinnayah et al., 2021). Cognitive overload, concentration, and attention are listed by Shanmugasundaram & Tamilarasu (2023) as possible challenges when using interactive videos, which was not a concern raised by either the students or lecturers.

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Moreover, theme 2 suggests that interactive videos support or even increase a teacher presence owing to continuous assessment with immediate feedback resulting in self-reflection and progress tracking by the students. This is interesting, as Dart et al. (2020) and Shekhar et al. (2015) found that the requirements of continuous assessment and self-reflection, such as increased engagement, active participation, and self-directed learning, can lead to students being resistant, which was the opposite in this case. Similar to Henrikson's (2019) findings, the students in this study experienced more agency and "success" when engaging with interactive videos especially since they could track their learning. One limitation of interactive videos that were reported is that it does not necessarily support social presence. Therefore, lecturers cannot solely rely on interactive videos as a teaching and learning strategy.

Furthermore, keeping the TAM in mind, it was evident in theme 3 that the perceived usefulness of interactive videos is associated with its diverse and flexible application possibilities (Bétrancourt & Benetos, 2018; Leo & Puzio, 2016; Polat, 2020), pedagogical functions, and perceived ease of use. However, comprehensive training is essential to increase the perceived ease of use (theme 4). The quantitative findings also corroborated this finding by indicating that students who received training had a better experience with technology integration within modules.

In theme 5 of the qualitative findings, it was also found that adopting interactive videos as part of instructional design requires careful consideration and planning as it can be time-consuming (Halupa & Caldwell, 2015), which could influence lecturers' perceptions regarding the ease of use and usefulness of interactive videos. The quantitative findings elaborated on this finding by showing a strong positive correlation between students' experiences with interactive videos, technology integration within modules, and the LMS, which indicates the importance of also considering students' experiences with technology integration in general and their experiences with the HEIs LMS.

From the qualitative and quantitative findings, the argument can, therefore, be made that students and lecturers overall positively experience interactive videos, but that training for all users is required to ensure their perception regarding the ease of use and perceived usefulness remains positive. Lectures should also be mindful of how they use interactive videos and ensure that it is not their own teaching and learning approach.

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Insights from the CoI and TAM Frameworks

The benefits of students' and lecturers' experiences with interactive videos in higher education are related to the CoI and TAM frameworks. The qualitative analysis, guided by the CoI framework, revealed that interactive videos effectively enhance both cognitive and teaching presence which can be supported by existing literature (Althwaini & Mahmoud, 2021; Dart, 2020). The interactive nature of these videos promotes cognitive presence by encouraging active participation and meaningful interaction with the content (Castellanos-Reyes, 2020; Sinnayah et al., 2021). Additionally, the videos foster teaching presence by providing continuous feedback and allowing students to self-assess their progress, contrasting with findings from Dart et al. (2020).

The TAM framework helped elucidate how students and lecturers perceive interactive videos. In this study, the perceived usefulness of these videos was associated with their flexibility and pedagogical value, which is also supported by existing literature (Bétrancourt & Benetos, 2018; Leo & Puzio, 016). The ease of use improved with adequate training, confirming TAM's assertion that perceived ease of use influences technology adoption (Polat, 2020). The study additionally highlighted that the perceived usefulness and ease of use significantly influence the behavioural intention to use the technology. Students and lecturers who view interactive videos as both valuable and easy to use demonstrated a higher intention to incorporate these tools into their educational practices. Despite the overall positive reception of interactive videos, the study also uncovered challenges related to their adoption. The qualitative data highlighted the time-consuming nature of incorporating these videos, influencing lecturers' perceptions of their usefulness and ease of use (Halupa & Caldwell, 2015).

Overall, integrating the CoI and TAM frameworks provides a nuanced understanding of how interactive videos impact educational practices and highlights the importance of training and thoughtful integration in maximizing their benefits.

Conclusions

To conclude, interactive videos enhance teaching and learning in HEIs as they could increase students' academic performance by supporting a cognitive and teacher presence in an online environment. Interactive videos have also been found to enhance students' teaching and learning experiences because they align with active learning and inquiry-

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based learning principles that increase engagement, motivation, interaction, and agency. Although interactive videos were found to be mostly beneficial, it is important to note that a lack of comprehensive training (for lecturers and students) and insufficient consideration of aspects such as time management and planning could hinder the adoption and use of interactive videos. Without comprehensive training, lecturers might use videos that are too long, culturally irrelevant or of poor quality, which could negatively affect students' educational experience. It is also crucial that lecturers receive comprehensive training on not only the use of interactive videos but also on different aspects related to using interactive videos, such as shooting and editing of videos, quality assurance criteria, choosing the right content, the appropriate length of videos, different pedagogical approaches, etc.

The adoption of interactive videos is recommended as they are perceived to be valuable and easy to use by both lecturers and students. However, interactive videos do not seem to support a social presence online, which is a limitation of interactive videos. Therefore, when interactive videos are used in an online, blended, or hybrid-mediated environment, lecturers should be cognisant of how a social presence will be accommodated. Future research must establish how interactive videos can incorporate a social presence within the online classroom.

Overcoming existing challenges and limitations and harnessing the benefits of interactive videos, require further research. More research is also needed to establish best practices when adopting interactive videos in an online, blended, and traditional classroom environment. Moreover, research should be done on using different types of videos, i.e. volumetric, holograms, and 3D videos. Furthermore, research should also investigate students' cognitive load by considering the cognitive theory of multimedia learning (CTML) and cognitive load theory (CLT). Finally, research regarding students' understanding of the content and later performance must also be established.

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An exploration of course tutors' reported teaching practices in a distance learning institution in Ghana

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An exploration of course tutors' reported teaching practices in a distance learning institution in Ghana

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Abstract

Quality teacher education is contingent upon the pedagogical practices of teacher educators. While various studies have explored these practices, few have situated them in the broader framework of teacher education models. This article leverages tutors' perceived pedagogical approaches and learners' demographic characteristics to interrogate the implementation of transformative pedagogy within Ghana's distance learning setting. Through the analysis of semi-structured interviews with course tutors and senior leaders, rooted in the concept of transformative distance learning (DL) pedagogy drawn from Paulo Freire's work (1970), we highlight the model's effectiveness, emphasising the role of facilitation and dialogue, in the creation of empowering learning experiences. This study provides insights for comprehending, reflecting on, responding to, and learning from the evolving practices of course tutors in a distance learning institution in Ghana. Based on these insights, we propose recommendations to enhance the model's pedagogical potential, which offers valuable implications for advancing teacher education policies and practices in Ghana and other African countries with similar distance learning models.

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Introduction

In recent years, the global education landscape has witnessed a paradigm shift towards more inclusive, flexible, and accessible forms of learning (Cappiali, 2023; Bozkurt & Stracke, 2023; Senyametor et al., 2024; Abdallah & Alriyami, 2022). DL models, facilitated by technological advancements, have emerged as pivotal platforms for delivering education, particularly in regions facing logistical and infrastructural challenges. DL is a planned learning approach encompassing "a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both" (Honeyman & Miller, 1993, p. 68). DL is characterised by a high degree of variation, with its definition constantly evolving (Makoe & Mays, 2022). Such variation includes the types of media or technology used (e.g., print, radio, computer); the nature of the learning (workshop, seminar, degree programme, supplement to traditional classroom, levels of support); institutional settings (universities, community colleges, school districts, non-governmental organisations, ministries of education); levels of interactivity support (face-to-face, online, blended, none); and the degree of interaction (asynchronous, synchronous, and bisynchronous) (Burns, 2023).

DL has consistently been used for the professional development of pre-service and in-service teachers across both developing and developed nations (Khonou, 2021; Du Plessis, 2023). Within the African educational landscape, teacher education facilitated through DL has witnessed a remarkable surge over the past decade (Moon & Villett, 2017). With its diverse and dispersed population, Ghana has increasingly adopted DL models to overcome geographical barriers and enhance teacher education. DL addresses the need for inclusive and culturally responsive teaching practices to address the needs of the diversity of students. In Ghana, the DL model can outweigh the face-to-face model regarding student numbers involved in teacher education, making DL sustainable for meeting the need for new teachers (e.g., Zhang et al., 2021). However, disparities in educational opportunities and outcomes remain, particularly in remote and underserved areas (Mereku, 2014) and contexts where digital skills among pre-service teachers continue to be a concern (Kwaah et al., 2022). Nevertheless, distance learning has been identified as a strategic approach to bridge these gaps and offer scalable and flexible solutions for teacher education.

A successful DL model must embody new conceptualisations of teaching, the

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"transformation in didactic" (Branchetti et al., 2021, p. 33), and the move to distance learning infers both the transformation of existing pedagogies and the possibility of these new DL pedagogies transforming learning and teaching, especially in contexts in Africa with their emphasis on oral pedagogy (Assié-Lumumba, 2021). This transformative pedagogy is dialogic, the pedagogy of engagement, where students "participate in the deliberation and critical and dialogical engagement" (Pietersen, 2022, p. 5), where the pedagogy focuses its practice "on community and collaboration" (Becirovic, 2023, p. 7) and where the distance education should incorporate a wide range of students' linguistic resources enabling, for example, via students' multilingualism, to engage "actively in knowledge production" (Charamba, 2022, p.17).

Literature from both Western and non-Western contexts suggests that DL has the potential to provide quality education, especially to marginalised and post-traditional learners (Iloh, 2019; Pietersen, 2022), widening access and participation while responding to broader educational challenges (Lephalala & Makoe, 2012). This partly depends on the pedagogical approaches used in DL institutions. On the other hand, little is known about these approaches used by tutors in distance learning institutions (Dri et al., 2024). This gap in the literature informs this study, which seeks to contribute to understanding the pedagogical approaches of tutors in distance learning institutions in Africa, specifically learning from course tutors' perceptions of the pedagogical approaches they apply in their distance learning setting in Ghana.

Consistent with the goal of the paper, the following two research questions that seek answers to pedagogical practices that tutors in the distance learning institution in Ghana reported guide the paper:

1. What pedagogical approaches are used by course tutors for distance learners in a University in Ghana?
2. What factors do tutors perceive as limitations to their pedagogical approach in the distance learning institution?

The authors draw on the findings to argue for the potential of learner-centred pedagogy grounded in dialogue and facilitation to foster transformative pedagogy and transform learning for a diverse group of students in a distance learning setting. The findings are significant as learner-centred pedagogical approaches are key mechanisms or anchors of transformative DL pedagogy.

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Context

The field site for this study is a large national university, a provider of distance teacher education currently with 86 study centres across Ghana, and where since 2011 the number of students studying part-time at a distance outnumbers the full-time face-to-face student population on campus. DL teacher education in Ghana typically involves studying part-time in addition to maintaining a professional role—for example, tutorials on a Saturday or Sunday in dispersed study centres or weekend upgrade courses on campus with Friday and Monday for travelling purposes—but there is increasing recognition, for example, in the Ministry of Education, of the importance of technology in mitigating this concern. Ministry of Education agencies such as the Centre for National Distance Learning and Open Schooling (CENDLOS) are promoting the increased use of technology. Typically, face-to-face tutorials are held on pre-stated Saturdays and/or Sundays in designated study centres nationwide. Depending on where they stay, most learners start the journey to their study centres on Friday to be at the learning centres on time for learning to begin on Saturday. Thus, depending on the time, the sessions start on Saturday and end on Sunday, and students dedicate Friday and Monday to travel (Salifu, et al., 2023; Sampong, 2009).

Most students are teachers in full-time teaching-related roles in the country's public and private primary and senior secondary schools. However, fewer students pursuing distance learning programmes are unemployed or not in teaching-related roles. For these individuals, distance learning teacher education is used to gain teaching qualifications to move into teaching (Yirenkyi, et al., 2023). The students are typically mature learners.

The materials used by the tutors and students for engaging the DL are modules put together and validated by course experts who double as chief examiners for their designated courses. The chief examiners or course coordinators lead the design of courses, choice of faculty and lead assessment practices. The course modules contain the course description, content, illustrations, activities and tasks, and assessments and notes for further reading. The modules are printed and bounded hardcopies that inform the learners more about the course before their face-to-face sessions consolidate what has been learnt individually (Biney, 2023). The typical schedule for a course is every fortnight and delivered in a face-to-face lecture style. Within the delivery processes, there is an inbuilt mechanism for quality assurance of design, delivery, and graduation

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of service provision with a dedicated unit to oversee that mandate (Mensah, 2018).

As of 2017, over 3,000 students were enrolled in educational psychology or basic education programmes, taught by about 120 facilitators at the first centre in the Central region, Cape Coast. At the second centre in the Western regional capital, Takoradi, there were 140 students, with 17 tutors facilitating learning for these students. Students lack onsite library and internet access but have access to essential facilities like canteens and washrooms during face-to-face engagements on weekends. The study notes a significant increase in the number of learners undertaking educational programmes from 2017 to 2024.

Literature review

Distance learning has evolved from mail-based correspondence to interactive online models. Dron and Anderson (2023) describe the initial "postal system" model as one-to-many communication with minimal social presence, underpinned by cognitive behaviourist pedagogies focused on transmission-like training. The next generation, social-constructivist pedagogy, emphasises two-way communication and the social nature of knowledge, with the teacher as a guide and facilitator. The third generation, connectivism, views learning as finding and applying knowledge through continuous network access, characterised by participation and production. However, this can lead to unclear outcomes due to learner autonomy and collaborative teaching (Dron & Anderson, 2023).

In teacher education, Lu and Dzikria (2023) note that distance education often resembles the cognitive-behaviourist model, with limited student-tutor interaction and materials developed without feedback mechanisms, as seen in Africa (Sampong, 2009). Onuka (2015) highlights using well-prepared, self-instructing materials, a practice observed in other contexts (Gravani, 2018). Despite the importance of practical teaching experience, its inclusion remains limited (Du Plessis, 2023). While the learner-centred approach is perceived as helpful in creating empowering learning experiences for DL students, the literature reports on several challenges associated with tutors' use/desire to use this approach. These include resource constraints, lack of professional development/support, lack of student engagement, and the nature of assessment or examination (Vavrus et al., 2011). These make the role of teacher education through DL in fostering transformative learning and pedagogy limited. This study contributes to the literature on

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the constraints to applying learner-centred pedagogy in distance education.

Community of Inquiry in Transformative Pedagogy

Transformative pedagogy is a pedagogical approach that goes beyond traditional approaches to teaching and learning. The aim is to foster critical thinking and reflexivity and drive professional and personal change among learners. The concept draws from transformative learning theory and emphasises a shift in perspectives and beliefs. In the literature, transformative pedagogy is often associated with fostering social justice, equity, and learner agency (Wei, 2024).

Mezirow's (1991) seminal work in transformative learning theory, proposes that transformative learning occurs when learners critically examine and question their assumptions, leading to a shift in their perspectives. Mezirow's work informs the understanding of transformative pedagogy. It highlights the importance of creating DL models that can challenge learners to re-examine their beliefs and assumptions critically. Other scholars like Freire (1970) have explored critical pedagogy and its potential to inform transformative pedagogical practices. Freire, through his work, advocates for an education that creates spaces for learners to analyse critically and challenge practices that perpetuate social injustice. Freire's emphasis on dialogue, active engagement, and critical reflection aligns with the principles of transformative pedagogy and is well-referenced in the space (Scocuglia, 2024).

According to Isbell (2024), *cognitive presence* within the Community of Inquiry framework refers to constructing meaning through sustained communication and critical discourse. In the context of Ghana's distance learning model, this involves creating spaces that encourage learners to engage in meaningful dialogue with their peers and educators. These interactive learning spaces allow learners to reflect critically and share their learning experiences with others. Isbell's Community of Inquiry highlights the significance of intellectual interaction across diverse levels in the learning space and the implications these interactions can have on the development of positive learning outcomes, both of which are essential components of transformative learning experiences.

Establishing interactive learning spaces in distance learning environments is vital for fostering community and shared purpose. This social connectedness is crucial in transformative pedagogy, as it facilitates open communication, mutual support, and the

exchange of diverse perspectives. Garrison's (2011) emphasis on *social presence* aligns with the transformative pedagogical goal of creating inclusive and collaborative learning communities in Ghana's DL model. This is emphasised in recent studies of Ghana DL models where, for example, staff-student relationships, the quality of facilitation and the fostering of critical thinking are key to student perspectives of quality DL (Andoh et al., 2020).

The third element, *teaching presence,* encapsulates the role of the educator in navigating the learning process. In the context of transformative pedagogy in Ghana's DL model, pedagogical approaches extend beyond traditional teaching and learning to encompass opportunities for critical reflection and discourse. Given the context and limited resources, educators' ability to use methods that can fit into the available resources in the context whilst responding to the learning conditions and circumstances of the distant learners is critical to engendering teaching presence. Course tutors are central in shaping transformative pedagogy by designing engaging activities, providing meaningful feedback, and fostering a learning space that encourages learners to critically engage in the learning process.

Isbell (2024) argues that the interaction of these three elements in teaching and learning processes can foster meaningful interactions and collaboration, opening spaces for educators to facilitate transformative distance learning models that are inclusive and responsive to diverse learners' needs. This results in enriched engagement with learners, fostering personalised learning experiences and equitable educational outcomes.

Transformative potential of facilitation

Facilitation redefines the educator's role from a knowledge transmitter to a guide who empowers students in their learning journey. Rooted in constructivist theories, this approach views learning as an active, constructive process where learners build new knowledge upon their existing understanding (Vygotsky, 1978). It emphasizes creating a learner-centred environment where students engage critically with content, collaborate with peers, and take responsibility for their learning, fostering higher-order thinking skills, self-directed learning, and reflective practice (Isbell, 2024). In distance learning, facilitators play a crucial role in building a sense of community by fostering interactions, encouraging collaboration, and providing emotional support, aligning with the Community of Inquiry (CoI) framework. Activities like reflective journals,

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discussion prompts, and peer feedback are instrumental in this process (Brookfield, 2017). This shift from teacher-led instruction to student-led exploration is essential for developing lifelong learning skills and preparing students for real-world challenges.

Methodology

This research adopted a qualitative research design (Creswell & Creswell, 2017) framed as a case study of providing distance teacher education from one university provider in Ghana. This design allowed us to take a 'pragmatic rather than a principled approach' in this study (Biesta, 2023).

The field site for this study is a large national university that provides distance teacher education in Ghana, consistent with Addae-Kyeremeh et al. (2019). A purposive and convenient sampling technique was employed to select the study's respondents. In purposive sampling, cases are chosen because they are information-rich and illuminative, as they both offer valuable manifestations of the points of interest and are relevant to the research questions. The selection of study centres was also driven by convenience because they were accessible and in close geographical proximity, making it a more straightforward process to recruit the participant numbers. The sample size covers three study centres (urban, semi-rural, rural).

Three groups of educators were interviewed for the study. These are the course tutors (eight), curriculum developers (three), and senior leaders (two) in the university. The data of the tutors and the senior leaders are drawn upon in this paper due to their relevance to the focus of this paper. All but one of the tutors were male. They were all experienced in distance education teaching, with a range of experience across the eight tutors of between four and fourteen years. A range of courses were taught by the tutors we interviewed. Most courses were focused on the Diploma in Basic Education, that is, for teaching in the primary and lower secondary age range. However, some courses were for mixed classes, for example, a course on resources and management being taught as an occasional compulsory course for a class studying a wide range of qualifications, from the Diploma in Basic Education to the Post Graduate Diploma in Education. The subject specialisms across the eight interviewees included mathematics, statistics, physics, social studies, geography, general education, and English.

The questions that guided the interviews with the tutors included questions about their background, role, the tuition model, and the affordances and constraints of the

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tuition model. We carefully selected twelve questions to address this concern, ensuring they comprehensively cover the necessary aspects. The questions for the senior leaders were about how they ensure tutors across these centres provide a consistent learning experience for the students and the extent to which distance learning meets the demands of teacher training. Each interview lasted about 45 minutes. The questions that guided the interviews with the tutors included questions about their background, role, the tuition model, and the affordances and constraints of the tuition model. Additionally, questions about learner demographics were included to understand how these factors influenced tutors' pedagogical approaches in the context of distance learning. The questions were constructed by three of the authors and the interviews were also conducted by these three authors. A professional transcriber transcribed it in Ghana.

Ethical approval was obtained from the first author's institution and distance learning institutions. Participants were informed about the research aims and objectives before providing written consent. Interviews were audio-recorded with permission and transcribed for analysis. Responses were qualitatively analysed using an iterative thematic approach (Braun & Clarke, 2023) and coded with NVIVO software. An inductive approach generated codes from the data, focusing on tutors' perceptions of their pedagogical approaches. Themes included pedagogical approaches (learner-centred approach and teacher-centred approach) and constraints (learner demographics and preparedness).

Limitations of the study

While we would have wanted to capture the voices of distance learners in this paper to hear their perspectives on the subject matter, in this instance, the project was solely focused on understanding the perspectives and practices of course tutors. A further study to capture the experiences and perspectives of learners in Ghana's distance education model is recommended to further enhance our understanding of the holistic impact and effectiveness of distance learning practices, particularly the approach taken by course tutors to situate their pedagogical practices within the learners' contexts and circumstances and how these practices are contributing to the learners' overall learning outcomes.

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Findings

The pedagogical practices reported by tutors in a distance learning institution in Ghana have been reported in this section. This is followed by the factors that tutors perceive as limitations to their pedagogical approaches within the distance learning context. The findings provide insights into the instructional strategies and challenges educators face in this setting.

Pedagogical Approaches - Learner-centred approach

The tutors described their approach to teaching as learner-centred, which focused on the use of group discussion. One of the tutors mentioned that:

> *So, I give them a project. Do this project and then bring the results to our next meeting. So, we do the discussion, all of us together. Yes, also it's participatory. We all share ideas until we get to a conclusion* (Tutor 7).

Other tutors added:

> *Well, for me here, as always, I always want to start from points where they know. Rather than using the lecture method, I believe in discussion. You start the discussion; they bring their views; where they fall short, you supply the information they need to bring them up* (Tutor 1)
>
> *…and sometimes, you see some of them coming to sit in your lesson; and they have forms they fill. Sometimes, they dialogue with you that "…I looked at you lesson; look at the things I wrote. See if you agree. If you don't agree, you discuss where you don't agree* (Tutor 5)

Learner-centred pedagogy is the approach that the senior leaders mentioned management expects the tutors to use

> *Yeah, well, the designated approach is supposed to be facilitation…So every course tutor is supposed to master the content and just, you know, facilitate in the interaction of the students [and] promote – you know – effective interaction. Facilitation, the way we use it here, it's like, you have foreknowledge of the contents. You know the meaning of the concepts [and] you know the questions that you have to raise. It is purely a discussion session directed by the course tutor. It is a discussion session but [a] discussion that is guided so that it doesn't go out of hand; it is structured, a structured discussion based upon the topic and the issues at hand* (Senior leader 1).

It marks a departure from the transmission model, prevalent in most higher education

institutions, including teacher education in Africa, where greater recognition is for academic and theoretical approaches to teaching compared to practical and engaging approaches to teaching and learning (Dembele & Miaro-Ii, 2013). Five of the tutors also acknowledged this to be their role and elaborated on how they facilitate the learning of the students.

> *The role of the teacher in learning, the teacher should be a facilitator, yes, not giving out knowledge because students know. It is only when your prompt them or give them the opportunity to contribute to the lesson that they will understand that they know. And therefore, we need to facilitate learning for them to also be part and parcel of the learning process"* (Tutor 3)

Also, the tutors highlighted some of the benefits of the learner-centred approach that they draw on to facilitate the learning of the students. Tutor 7 mentioned that "in terms of the contributions that they are able to provide when we enter into general discussion, it gives me the impression that they understand the concept very well". He continued that:

> *Okay, it, for me, I believe that that approach enables students to grasp the concept very well …and that usually shows in their ability to be successful in writing their examinations and other things* (Tutor 7)
>
> *So, you put them into groups, and then they read, and they come out with their understanding of whatever they have read. And then, when you do discussions with [them], it creates an opportunity for you to share ideas. We say, "Knowledge is not in the head of one person* (Tutor 3)

The excerpts above highlight the importance of effective interaction for enhanced distance learning delivery. Interaction, which can occur among students, between students and their course tutors, and between students and course content, is rapidly becoming a crucial focus in research and scholarship on learner satisfaction and engagement in distance learning courses (Muzammil et al., 2020). In the context of transformative pedagogy, this approach emphasises the development of each student's unique potential and capabilities. By focusing on these attributes, educators can create learning environments that empower students to take charge of their learning progress, engage deeply with their experiences, and cultivate their creative abilities.

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Teacher-centred approach

While facilitation, within the learner-centred approach, was found to be generally helpful among the course tutors, it emerged from the data that this pedagogical approach is unsuitable for some courses, especially mathematics and science. In these courses, a combination of student and teacher-centred approaches is used. Examples of these include demonstrations and teacher-led activities. A tutor in mathematics, for example, highlighted the difficulty he encounters in relying solely on the facilitation method:

> *You see, from the training or the in-service training that was given to us, we are supposed to facilitate it, but in Mathematics, it's difficult to facilitate… So, the students find it very difficult to study at home. So, when we come to the face-to-face [sessions], we …teach rather than to facilitate* (Tutor 4).

The challenge outlined by the mathematics tutor is representative of the difficulties encountered in teaching mathematics remotely via distance learning, as reflected in both recent and older literature (Cassibba et al., 2020; Lowrie & Jorgensen, 2012). This tends to push tutors to go back to the transmissive mode of teaching. Given this, the university has put in place structures such as the appointment of coordinators to monitor teachers' practices and ensure that they adhere to the institution's pedagogical expectations. However, one of the senior leaders mentioned that due to inadequate resources, monitoring does not occur as regularly as intended. Some tutors recalled the visits of coordinators who sat in their classes to monitor their teaching. For example, one of the tutors stated:

> *Then someone also from …also comes and sometimes… I remember very well that…., on several occasions, have come to sit in my class. Someone came to sit in my class to assess my teaching, after which one-on-one discussions ensued. There have also been situations where they have given students appraisal forms to appraise me. They also make sure that you start the class, and then when you finish, you go and sign as you are finished with class* (Tutor 6)
> .

Constraints to learner-centred pedagogy – learner demographics and preparedness

This section delves into how the backgrounds and preparedness of students influence their pedagogical choices and the potential for enacting transformative practices. The

findings of this study show that besides the subjects being taught, the demographic profile of the learners and, most importantly, their preparedness for their study impacts the pedagogical choices of course tutors and their potential to enact transformative practices. Concerning the occupational backgrounds of the students, discussions with the course tutors revealed that the distance learning programme included a diverse group of learners such as teachers, teacher trainers, teaching assistants, head teachers, and a student teacher. Additionally, the course tutors noted that most learners on the distance learning programme identify as professional educators. The interviews further revealed that many learners are burdened with other family and social commitments besides work. In addition, most of them are adult learners re-engaging with academic work after a long absence from higher education. These constrain their independent engagement with their studies and the time they spend on their research, leading to their unpreparedness for their classes. For example, one of the tutors stated: *"and we also know that these are mature students; some are working professionals. Okay? And therefore, the time for studies would be much reduced"* (Tutor 3). Other tutors added:

> *But those who have stayed in the house for quite too long and are taking advantage of the distance learning, they have the problems. Because it's like they're starting learning anew and the basic things that you expect them to know, they lack that. So, in teaching them, you need to go back to the basics, in order to build on it. That makes the work a bit difficult.* (Tutor 1)

The students' unpreparedness alters the facilitative pedagogy that teachers prefer to use. Two of the participants' excerpts on this are presented below.

> *Students are supposed to read the material before coming. That is the ideal situation; that is what is expected from them. But truthfully many students don't do that [making the workload] of the course lecturer become more complex. So, instead of facilitating, that is, you know, open discussion, [and] hammering on the problematic aspects, it becomes a teaching session. Facilitation is the ideal thing. [With over-talk] That is what we expected them to do, but now, they combine lecturing with facilitation, and that explains why some of them are not able to cover what they are supposed to cover within the weekend"* (Senior Leader 1)

> *But then, sometimes, too, you realise that students have virtually no idea about certain things you are teaching. So therefore, it demands that you give a little bit of lecturette for them to understand the concept that you are trying to teach with them; then they will understand, and then, from then on, you'll proceed with the discussion or the group work or the questions and answer [session]* (Tutor 2)

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The understanding of the demographic profile of the learners, especially their readiness for studies, and the challenges they face due to work, family, or other commitments, including their socio-economic conditions, age, gender, and other contextual factors, aligns with studies of Rizvi et al. (2019), who highlight how learners' demographic characteristics can have a significant impact on their academic success as learners progress through a course. Therefore, course tutors must find ways to integrate pedagogical practices that can suit learner dynamics, needs, and context (Bizami et al., 2023; Anlimachie et al., 2023).

Discussion

The findings from this study highlight the pedagogical approaches employed by course tutors in a distance learning institution in Ghana. Many tutors adopt a learner-centred approach, emphasising facilitation and interactive learning (Dron & Anderson, 2023; Isbell, 2024). This aligns with the second generation of distance learning models, which focuses on two-way communication and the social nature of knowledge. Tutors facilitate group discussions, projects, and participatory activities, enhancing students' understanding and fostering critical thinking and collaborative skills (Muzammil et al., 2020; Rajaram & Rajaram, 2021). However, the learner-centred approach is not always applicable across all subjects. In subjects like mathematics and science, tutors often find it challenging to rely solely on facilitation (Cassibba et al., 2020; Lowrie & Jorgensen, 2012). These subjects require a more structured approach, combining teacher- and learner-centred methods, including demonstrations and direct instruction, to ensure students grasp complex concepts (Dembele & Miaro-Ii, 2013). This underscores the need for flexibility in pedagogical approaches, adapting to the specific requirements of different subjects and learners (Rizvi et al., 2019).

Students' demographic profile and preparedness also play a crucial role in shaping pedagogical approaches (Doone et al., 2023). Many students in distance learning programmes are working professionals with significant family and social commitments (Sampong, 2009; Onuka, 2015), limiting their time for independent study and affecting their readiness for classes. Tutors often adjust their teaching methods to accommodate these constraints, sometimes reverting to more traditional, teacher-centred approaches to ensure all students can keep up with the course material (Ampofo & Somuah, 2021). Resource constraints and lack of professional development support further limit

tutors' ability to fully implement learner-centred pedagogies (Ewulley, 2023). The study highlights the need for ongoing training and support for tutors to develop and refine their facilitation skills (Brookfield, 2017). Additionally, better monitoring and evaluation mechanisms are needed to ensure tutors adhere to the institution's pedagogical expectations and continuously improve their teaching practices (Andoh et al., 2020).

Effective interaction between students, tutors, and course content is crucial for enhancing learner satisfaction and engagement (Ali & Khoza, 2023). This interaction can take various forms, including group discussions, peer feedback, and interactive online activities (Helula et al., 2024). By fostering a sense of community and collaboration, tutors can create a more engaging and supportive learning environment that promotes deeper learning and critical thinking (Freire, 1970). Consistent with the second generation of the distance learning model described by Dron and Anderson (2023), five course tutors in this study acknowledged their role in facilitating students' learning experiences. They described their learner-centred teaching approach, focusing on group discussions, as a shift from the prevalent transmission model in higher education, which often prioritizes academic and theoretical methods over practical, engaging ones (Dembele & Miaro-Ii, 2013). The tutors elaborated on how they facilitate student learning and the inherent benefits and uniqueness of this approach.

The excerpts in the findings section highlight the importance of effective interaction for enhanced distance learning delivery. Interaction among students, between students and tutors, and between students and course content is becoming a crucial focus in research on learner satisfaction and engagement in distance learning courses (Ampofo & Somuah, 2021). This transformative pedagogy emphasises developing each student's unique potential and capabilities, creating learning environments that empower students to take charge of their learning, engage deeply with their experiences, and cultivate their creative abilities. This approach, also called humanistic education, helps students become open to new ideas, highly creative, and self-directed (Anlimachie et al., 2023; Ferguson et al., 2017).

While facilitation within the learner-centred approach was generally useful among course tutors, it is not suitable for some courses, especially mathematics and science. In these courses, a combination of student- and teacher-centred approaches, including demonstrations and teacher-led activities, is used. A mathematics tutor highlighted the difficulty in relying solely on the facilitation method, reflecting the challenges in teaching mathematics remotely via distance learning (Cassibba et al., 2020). This

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often pushes tutors back to the transmissive mode of teaching. The distance learning programme includes diverse professional educators, many of whom face family and social commitments, affecting their study time and class preparedness, which in turn impacts the preferred facilitative pedagogy (Ewulley et al., 2023; Ampofo & Somuah, 2021). This finding contributes to existing literature on some constraints, including lack of learner engagement, to learner-centred pedagogy in distance education.

Conclusions and Recommendations

The study concludes that while learner-centred pedagogies hold significant potential for enhancing distance learning, their implementation is often constrained by subject-specific requirements, student demographics, and resource limitations. To address these challenges, distance learning institutions in Ghana should adopt a more flexible and adaptive approach to pedagogy, tailoring teaching methods to the specific needs of different subjects and learners. This approach can improve the quality and impact of distance education, contributing to educational equity and inclusion.

One key recommendation is to provide ongoing professional development and support for tutors. This could include training in facilitation skills, access to resources and tools for interactive teaching, and opportunities for peer learning and collaboration. By equipping tutors with the necessary skills and support, institutions can enhance the quality of teaching and learning in distance education programmes. Additionally, improving monitoring and evaluation mechanisms through regular assessments of teaching practices and student feedback can help identify areas for improvement and ensure adherence to pedagogical standards.

To enhance interaction and engagement in distance learning, institutions should invest in technology and infrastructure that support interactive and collaborative learning. This could include online platforms for group discussions, peer feedback tools, and interactive content delivery resources. By creating a more connected and interactive learning environment, institutions can foster community and support among students, enhancing their overall learning experience. It is also essential to consider the diverse needs and backgrounds of distance learning students by adopting inclusive and culturally responsive teaching practices. This could involve providing additional support for students with limited digital skills, offering flexible learning schedules, and creating opportunities for meaningful and relevant engagement with the content.

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Optimising Open Educational Resources and practises to Enable Inclusive Education

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TETFLE also publishes review articles and book reviews. The journal currently appears once in a year, with an additional special edition from accepted biennial conference papers, as applicable. The journal is the official journal of the Distance Education and Teachers' Training in Africa (DETA) biennial conference, hosted by the Faculty of Education, University of Pretoria, South Africa.

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Optimising Open Educational Resources and practises to Enable Inclusive Education

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Abstract

Globalisation, technology, innovation, and ever-changing customer needs have created an explosion of information for learners at Higher Education Institutions (HEIs). Developing science, technology, engineering, and mathematics (STEM) skills in students is critical to achieving the United Nations Sustainable Development Goals. However, although African universities have made progress in the quantity and quality of their research output in STEM subjects, the continent continues to lag behind much of the rest of the world. Therefore, engaging students today requires a paradigm shift to promote inclusivity, empower critical thinking, and allow students and educators to co-create knowledge. HEIs in developing countries such as South Africa still face many challenges arising from the digital divide, budget constraints, and increased power cuts. Advancements in online learning have led to new learning practices of using Open Educational Resources (OER). Information and communication technology (ICT) can provide effective and inclusive access to OER that can be used anytime and anywhere. UNESCO, which has been a precursor in advocating for the adoption of OER, has recognised the potential and efficiency of OER not only to permit remote learning but also to enable lecturer and learner collaboration and engagement. As these technologies continue to develop, we can expect to see even more innovative and effective ways to use them for learning. The study explores an open pedagogical approach that enables inclusivity, promotes access, and influences the use of OER tools and technologies by students in the classroom. The results of the outcome could increase awareness of the potential of using open pedagogical approaches to support teaching and learning activities that can enhance and assist educators in integrating technology and drive more inclusive, learner-centred approaches into the curriculum. However, currently, not many HEIs in South Africa are embracing or using OER and open practices effectively.

Keywords: Innovation, OER, inclusive education, STEM education

Introduction

The advent of the Internet and Web 2.0 has transformed the way people communicate, collaborate, and share information. However, despite the call for transformation at universities, Mkhize and Idahosa (2021) postulate that transformation remains elusive, while at the same time, Higher Education Institutions (HEIs) are expected to find innovative ways to prepare students for the world of work.

Research conducted by Tikly et al. (2018) suggests that low student achievement at the secondary level leads to poor performance at HEIs. To combat this, the African Union has set out targets for enrolment in STEM subjects, which will require addressing the quality of secondary education. Within the South African perspective, Du Toit and Roodt (2009) argue that South Africa requires vital skills in engineering, technology, and education to address future financial, environmental, educational, and health challenges. Technological innovation has become paramount for improving quality of life and eliminating the digital divide. In Africa, after the COVID-19 pandemic, many people still do not have access to education, basic sanitation, clean water, or even appropriate medical care. To address these concerns, the development and sustainability of our economy depend on the ability of HEIs to enable inclusive teaching methodologies and accommodate diverse learning. With HEIs offering both distance and classroom learning after the pandemic, the shift is to find more cost-effective ways of providing learning materials. Adopting Information and Communications Technologies (ICTs) and open pedagogical approaches can provide an inexpensive way to create and disseminate knowledge.

The World Education Forum declared that by 2030, 'Information and communication technologies (ICTs) need to be harnessed to strengthen education systems, knowledge dissemination, access to information, effective and quality learning, and more efficient service delivery' (UNESCO, 2015, p. 8). This paper reports on exploring the benefits of Open Educational Resources (OER) and open pedagogical practices to support learners and enable inclusivity, particularly for learners from more disadvantaged backgrounds.

Literature Review

What is an Open Pedagogy?

Open pedagogy is often pinned as a way to promote inclusivity in the classroom. It is

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described as an access-oriented path to learner-driven education that permits learners to create knowledge (DeRosa & Jhangiani, 2018). Wiley (2017) further states that open pedagogies are designed to encourage collaboration, flexibility, and accessibility by leveraging OER that anyone can use and disseminate. Schuwaer (2017) describes an Open Pedagogy as a didactical approach that allows for self-directed learning and encourages the assimilation and management of OER with the intent to improve teaching and learning. Overall, open pedagogy seeks to enhance teaching and learning by removing barriers to access and encouraging a more inclusive, collaborative approach to learning.

State of South African Education

The state of South African higher education is a complex one due to rising costs, inequality, colonial history, and limited access to funding. On 11 February 2021, the University of the Witwatersrand (Wits)[1] Student Representative Council president stated that there would be close to 8,000 students who cannot continue for the 2021 academic year due to their financial situation.

A lack of access to quality educational resources due to factors like cost adversely impacts access to education. In sub-Saharan Africa, textbook scarcity has been noted as a problem since the 1980s (Fredriksen et al., 2015). Although South Africa has an effective publishing industry, students' access to learning materials is a concern, and together with its colonial ties, prescribed learning material is not aligned with South Africa's transformation agenda. This is often coupled with a lack of computer labs, internet access, and power cuts (Mtebe & Raisamo, 2014).

In South Africa, approximately 17% of those who complete their Grade 12 (matriculation) school education, access higher education across 26 publicly funded institutions. Although the dawn of democracy promised equal opportunities for all, the issues of access, funding, graduation rates, quality of graduates, and equity of access are still a concern (Ramrathan, 2013). For a meaningful inclusive curriculum transformation within the South African higher education system, HEIs must find innovative and

[1] The University of the Witwatersrand, Johannesburg, commonly known as Wits University or Wits, is a public university situated in Johannesburg.

transformative approaches in the classroom. Caswell et al. (2008) argue that OER can enable inclusive education by providing free and accessible learning content to learners with limited access to traditional educational resources. UNESCO (2002, p. 24) defines OER as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes". In 2019, UNESCO (2019) further elaborated that OER should be freely available to the public under an open licence that permits reuse, repurposing, adaptation, and redistribution by others.

Social Justice and Higher Education

Social justice has been a pervasive issue throughout the history of humankind due to poverty, inequality, oppression, and differences in religion, ethnicity, wealth, gender, and sexuality. Therefore, students must understand these differences and oppressions experienced by humankind. Much of the discourse is about the role of higher education in building more equal and inclusive societies so that students become productive citizens in their communities. UNESCO (2015) advocates for social justice as the fundamental purpose of education and that it should encompass human dignity, equal rights, social justice, and shared responsibility for a sustainable future. Freire (1972) advocates that learning systems that alienate individuals should be rejected. According to Freire (1972), our education system has played a significant role in maintaining societal oppression and social injustices; it needs to be reformed through suitable education and critical thinking. In attempting to address the issue of social injustice in South Africa, Leibowitz (2017) states that HEIs can achieve social justice by recognising the values, knowledge, and attributes of students from various backgrounds and that knowledge should be freely shared and co-created by educators and learners alike.

In 2013, the Council on Higher Education (CHE) Proposal for Undergraduate Curriculum Reform argued that curriculum transformation was not only related to what is taught and how it is taught but also a systemic change that allows for the introduction of an extended curriculum that is a precondition for achieving the goals of equity of access and equity of outcomes. As Badat (2015) notes concerning the CHE proposal, much-needed academic transformations are required so that we do not deny opportunities to people from socially disadvantaged groups. Ramrathan (2016)

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argues that even though curriculum debates have been around for a while, curriculum transformation will only occur once the transformation process includes academics and students. This sentiment is further highlighted by Badat (2017) who argues that the transformation needs to include the worldviews of students and communities among key actors concerned with higher education. Additionally, Essop (2016) calls for an 'epistemological diversity', to encourage open dialogue that should extend beyond the curriculum itself.

Open Pedagogy and the need for transformation

A traditional classroom is generally teacher-centred; the teacher teaches, and the students listen, often resulting in less engagement during the learning process. At the same time, graduates are required to develop knowledge and skills that will allow them to become critical thinkers and problem solvers and achieve higher-level cognitive thinking (Jamieson & Shaw, 2020). Research conducted by many educational experts indicates that a paradigm shift is required to eliminate traditional chalk-and-talk classrooms where students and teachers become co-creators of knowledge through engagement, teamwork, and reflection (Brown & Croft, 2020).

The Education 2030 Framework also highlights a set of strategic approaches to improve the quality of education and encourage learner-centred and collaborative pedagogical approaches. For students and educators to be co-creators of knowledge, students must be invited to self-direct and shape their learning and thoughts in an open learning environment. According to Wiley (2017), an open pedagogical approach encourages the co-creation of knowledge where students and educators can work together to produce learning materials, projects, or research that can be shared openly. This approach not only enhances learning but also contributes to the broader learning educational community. According to Butcher (2015), OER pedagogical practises have great potential to support curriculum transformation. While its transformational value lies in the idea of reusing resources, its potential lies in the ease with which such resources can be hosted in the cloud. Butcher (2015) further highlights that the key differentiator between an OER and any other educational resource is that OER provides access to openly licensed materials in the form of textbooks, course materials, videos, software tools, and interactive simulations available for educational purposes that contribute to lifelong learning and reduce the cost to the learner. UNESCO (2015)

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also strongly advocates the drive for innovative pedagogical practices integrating OER to enhance teaching.

Africa and many other countries continue to face serious challenges due to globalisation, the Fourth Industrial Revolution (4IR), and Artificial Intelligence (AI). Research indicates that values and attitudes toward STEM subjects in African countries have contributed to poor performance, therefore, a change is required. Educators in Africa and globally face significant challenges in providing access to high-quality learning materials while containing or reducing costs. The use and reuse of high-quality OER can encourage innovative pedagogical practices that empower learners toward self-directed learning. The open licence and flexibility afford instructors and learners a multitude of resources. McGreal et al. (2013) state that free and open sharing of educational resources is crucial for creating ubiquitous learning networks and reducing the knowledge divide. With South African higher education being in a state of transition, using OER-enabled pedagogies, tools, and technologies should be considered in any discussion around curriculum transformation.

ICT Impact and OER

Innovative tools and technologies have the potential to increase access and remove many of the obstacles faced by learners as well as educators today. However, after the COVID-19 pandemic, there are still many potential challenges that depend on the ICT infrastructure at educational institutions, and ICT has great potential to facilitate effective and inclusive access to educational resources and other learning platforms. They open possibilities to introduce students to OER virtual labs which are digital tools and simulations that provide interactive, accessible, and cost-free learning opportunities in various disciplines that can be accessed anytime and anywhere, including learners from marginalised or disadvantaged societies. Institutions should consider solutions that require no licensing fees but instead, refer to resources that are already hosted on the web.

Downes (2019) argues that we need to explore the concept of 'Open Education Resources' changing from a concept of textbooks and libraries to a concept of exploring web services and applications. For this study, the lecturer adopted the use of virtual OER labs for students to provide hands-on simulations on networking technologies that could supplement the theoretical knowledge learnt in the classroom. Virtual OER labs were

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integrated with OER such as tutorials and instructional videos on YouTube to reinforce their understanding of networking concepts and techniques, whilst simultaneously preparing them for the world of work.

Methodology

An interpretive paradigm with an exploratory approach was adopted to address the research questions. The interpretivist paradigm is a philosophical approach that emphasises understanding and interpreting the meaning that individuals attribute to their experience (Mohajan, 2018). Mohajan (2018) further supports the assertion that qualitative research is a suitable approach in the social sciences for accumulating and interpreting non-numerical data and allows researchers to collect rich data and analyse the interpretations given by individuals. This study was used to understand the adoption of virtual labs for teaching purposes to explore factors that might affect OER tools and technologies usage at HEIs. YouTube videos and virtual labs that provide students with hands-on learning were used to explore how students engaged with OER.

This study was qualitative and collected data using focus group interviews with students from a private higher education institution (PHEI). As an initial point of entry into the study, the researcher engaged with the PHEI to introduce the concept of networking labs to supplement the textbook. As students had no access to actual networking devices and physical hardware, the idea of using virtual labs launched an exciting prospect of bringing fun and engagement to the classroom. Consultations also occurred with the academic to gain insight into how the academic usually teaches networking. Generally, the method was to cover the fundamentals to develop a solid understanding of the underlying concepts supplemented by YouTube videos.

The explorative study was then proposed, and ethical clearance was obtained. The qualitative study used semi-structured focus group interviews. The student interviews were aimed at inviting participants to engage and communicate openly about the experience using virtual labs. These interviews aimed to eliminate the point of view of the interviewee. This is particularly relevant in qualitative research, as it relies on conversations between the researcher and their participants and allows the researcher to engage. The interviews ranged between 15 to 20 minutes each.

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Participants

The participant focus groups of the exploratory study included two groups of five students each, enrolled in the module called Network Engineering. Ten students volunteered from a pool of 40 when interviews were requested. The ages of people in the student group ranged between 19 and 22 years old. The participants were purposively sampled; only students enrolled in a Network Engineering module at the college were invited to participate. Although the researcher did not ask about the student's economic status, it is noted that many students never use a personal computer.

Qualitative content analysis was employed to decrypt the interview recordings of participating students. Themes emerged and recurring texts were observed and generated in the quantitative phase. The results of the outcome of these objectives could increase awareness of the potential of cloud technology to reduce costs, support self-directed learning, and allow for further exploration of virtual computing labs.

Aim of the research

This research aims to explore the factors affecting the implementation of OER tools and technologies in HEIs, focusing on employing an open pedagogical approach. The research seeks to understand how we can optimise open pedagogical practices to influence the adoption of OER in HEIs and to identify any challenges and opportunities associated with this method.

Research questions

To achieve the aim of the research, the following two questions have been formulated:

I. What factors influence the implementation of OER tools and technologies, such as virtual labs, when using an open pedagogical approach?
II. How do students respond to and engage with OER that are implemented through an open pedagogical approach?

Results

The results of the thematic analysis revealed different themes within the responses:

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i. Accessibility and inclusivity
ii. Challenges with the use of virtual labs
iii. Learning anytime, anywhere

The following are descriptions of the main themes that emerged from the focus group interviews, including some examples of participant responses.

Accessibility and Inclusivity

The advent of the Web has brought a wholly transformed learning experience to educational institutions, allowing for more cost-effective and efficient computing by centralising the storage, memory, and computing capacity of personal computers and servers. With the tremendous advantages of technology, some participants felt that the experience using OER virtual labs was an easy and smooth journey as it could be accessed from anywhere. This was particularly beneficial for students who lived far from campus and had access to the internet.

Participant A:

I have experienced that using technology in learning makes life easy for us as students. E.g. I can submit my assignments via Google Sites wherever I am. I was also able to use the virtual labs to gain a better understanding of the networking environment.

Participant B:

Once you get used to it, the virtual labs allowed us to get practical experience with networking technologies.

Participant C:

I found it to be efficient and time-saving and you get to expand your computer skills and knowledge. It was an incredible experience, which came with a lot of exposure to modern technology, and alerted me of many things. It is fun to be able to create simulated network environments. I didn't know thus encouraging me into being more involved with the use of technology for academic purposes.

Participant D:

We should use more open educational resources in our curriculums as it will help us with textbook costs. The interactive labs make it easy to understand.

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Challenges with the use of virtual labs

A state of poverty results in many learners in South Africa and the rest of Africa being excluded from various learning opportunities. Effective use of virtual labs requires reliable internet access as poor infrastructure can limit the effectiveness and accessibility of virtual labs. Addressing these challenges requires an approach to ensure education becomes more accessible and inclusive for all learners, irrespective of their financial background. OER, however, does enable the extension of educational resources and allows access at a suitable pace for the learners. However, there was evidence that the experience using Virtual Labs had some shortcomings. Some participants had difficulty connecting and navigating through the high-bandwidth virtual labs. This can be due to the lack of access, bandwidth costs, and general computer skills of students whilst lecturers assume that all students are computer literate when they start to embark on an undergraduate programme. The comments from the participants were:

> *Not bad, just that it was my first time, so I had problems with working on the PC, accessing the Labs and how to upload documents.*

Another participant said that:

> *at first, it is hard to understand what is required of you. Some of the technical terms were confusing.*

One question was indirectly based on the participant's usage experience: 'What are the suggestions for improvement if you had to use the Virtual Labs again?'

This question revealed the thoughts of the participants towards the use of OER virtual labs for HEIs. Similar responses were for ICT skills, which was seen earlier in the experience of the participants. Responses included:

- *It must be friendly to us as students*
- *A step-by-step procedure would be necessary for beginners to get used to the labs*
- *Step-by-step tutorial lessons in class*

The focus group sessions revealed that there were challenges with the implementation of using Virtual Labs and navigating through the tutorials. Access to the Internet proved to be a vital component for the students' success using OER. As there is considerable availability of reliable Internet at the PHEI where the study was conducted, this matter may be overlooked. Off-campus where some of the participants reside, there is no such *'luxury of the Internet'*.

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Participant A said:

The issue about this is that some students are travelling to school and back to their households, they do not have data to connect to the Internet, thus getting announcements late.

This statement shows not the unaffordability of data alone; it also expands to the implications of no access. Thus, a participant said outright when asked about challenges:

I don't have data.

Participant E stated that:

due to people not having access to computers at home, it makes learning a bit challenging. I initially struggled with just using a mouse.

A connecting phrase from another participant echoed:

Having no access to the Internet.

These responses highlight the need to ensure that first-year students have basic computer skills to avoid feeling isolated or left out. This observation from the above analysis expresses the importance of not only improving basic computer skills but also that the digital divide still exists. In an attempt to close the digital divide among students, while OER tools and technologies may be 'free', the issue of access and computer literacy must be considered. To drive inclusivity, it is important to collaborate with students from the beginning to consider their voices and needs. In summary, this theme indicates that while much has been done to increase awareness of OER, OER needs to extend beyond retention, reuse, and redistribution; it should be used as a platform to address the inequalities that persist in our educational systems.

During the COVID-19 pandemic, one of the biggest challenges for students studying remotely has been the cost of data and network connectivity, especially for students who moved back to their homes in more remote and rural areas. The switch to remote learning has no doubt exposed inequalities among students, as access to a computer and Wi-Fi is still an expensive commodity for many South African families.

Learning anytime, anywhere

One key advantage of virtual labs is their accessibility, allowing students to engage in learning anytime and anywhere. By integrating technology with classroom learning, these labs enhance flexibility and collaboration. OER tools and technologies indeed come with many advantages. The advantages for students include the ease of use and the ability to work together in virtual labs and share documents and videos on Google

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Groups; however, the cost and dependence on an Internet connection and broadband access were essential for continuous learning and collaboration to occur.

Comments from participants include:

> *that you can submit assignments after completing the lab exercises if you are away from the campus, however, it would be great if we could access these labs in African languages.*

Another participant reiterated these phrases:

> *With OER materials students can learn everywhere outside the classroom thus not delaying academic progress for students, even though it comes with a lot of compromises. It is quite useful because it is easy to access the information and labs when you are home.*

The participant was not open or transparent about the word 'compromise'. Another participant said that it:

Allows me to work in the comfort of my own and whenever I'm connected to the Internet.

The question, 'Would you make use of OER virtual labs as a learning tool?' was strongly emphasised to gather the overall experience of the students:

> *Yes, it is useful and helps a lot, also makes things easier.*

From Group 2, another participant concurred:

> *Yes, it makes learning easier if you are a travelling student.*

Some positive responses overall were:

> *Definitely yes!*
>
> *Lectures should consider using the Cisco Networking Academy as well.*
>
> *Yes we do need more open resources, videos, and real-world scenarios to understand the theory*
>
> *Yes! All the time*
>
> *Yes!*

This section ends very abruptly, with a participant response. Instead, please complete this section with a comment relating to the heading

Conclusions

This research aimed to shed some light on the factors that influence the implementation of OER tools and technologies within HEIs, with a particular emphasis on the role of open pedagogical practices. The focus on open pedagogy highlights the potential of collaborative and inclusive teaching practices to optimise the effectiveness of OER in higher education. As we seek to navigate the intricacies of implementing these innovative tools and technologies, we must consider how HEIs can optimise the successful adoption

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and integration of OER effectively, particularly for disadvantaged students. From a social justice perspective, HEIs from both the public and private sectors need to explore the immense benefits of using OER tools and technologies to encourage students to become constructors of knowledge that may be relevant for learners and include the different languages and local contexts. Such adaptation is important to ensure that the content is meaningful and engaging and that virtual lab experiences align with the learning objectives of the curriculum.

Other factors to consider are to enable policy and provide the required technical support and access to OER platforms, portals, or websites. Without formal policies, an educator, as well as the researchers, work in isolation and continue to share content informally thereby restricting the ability of resources to be publicly shared. Butcher (2015) states that OER has the potential to bring clarity to educational development and establish a new model for acquiring and publishing learning materials. OER no doubt has the potential to enable educators and institutions to come together in a collaborative space to share materials without cost implications, thereby enabling inclusive education, fostering equal opportunities, and ensuring that everyone has access to quality education.

In this study, we explored ways to optimise the integration of OER tools and technologies in a classroom. Using a case study, we could explore the effectiveness of OER in adopting and creating future virtual learning environments to improve student engagement within STEM subjects. The learners could construct simulated computer networks and explore how computer networks operate. This finding was encouraging as it provided students with hands-on labs and virtual environments to test and experiment with various scenarios where the institution would have had budget constraints to purchase resources. Such simulated labs can also be crucial in exploring and understanding advanced topics such as the 4IR, robotics, AI, and the Internet of Things.

However, as encouraging as the future adoption of OER virtual labs within the Faculty of ICT is, what becomes evident to the researcher is that we cannot assume that all students have access to a basic personal computer or Internet. A key barrier to using OER virtual labs effectively in this study was a lack of internet access and resources such as laptops or personal computers. Hence, academics need to become more aware of the inequalities that persist. In future studies, it is important for academics not just to unpack OER pedagogies and their role in HEIs, but to consider strategies

that can dismantle the digital and knowledge divide. By leveraging OER pedagogies and technologies, educators can create more flexible, inclusive, and engaging learning environments that support diverse educational needs. Students should also be provided with the opportunity to co-create OER resources in their language of choice where they can engage with content that is relevant to their local context, thus working towards opening epistemological access for all.

Areas for Future Research

It is important when designing new learning experiences to acknowledge how students navigate new learning spaces, including the past marginalisation that is still pervasive in South Africa. As academics, researchers, and instructional designers, as we begin to explore new paradigms for student engagement and inclusive education, there are still many questions to be answered. Learning networks must be enabled to support the student experience so that they become confident in adopting new technologies. The potential benefits and implications outlined here are only the beginning. Further areas for exploration include applications and the variety of methods related to diverse content areas; a process which provides students to engage in a learning network and a language of their choice.

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