International Journal of Learning, Teaching and Educational Research
Vol. 23, No. 11, pp. 487-503, November 2024
https://doi.org/10.26803/ijlter.23.11.25
Received Sep 7, 2024; Revised Nov 9, 2024; Accepted Nov 23, 2024

Students' Perceptions in the Integration of E-learning at a Free State TVET College in South Africa

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Abstract. The increasing demand for Technical Vocational Education and Training (TVET) colleges in South Africa to align with economic growth and technological advancements has intensified, particularly post-COVID-19. The government's White Paper on e-Education outlines a strategy to make the education system more efficient and equitable through digital transformation. This qualitative interpretive study explores the experiences of TVET students using open-ended questionnaires to gather in-depth insights into their perceptions of e-learning. Participants were purposefully selected from a predominantly rural campus, with data analysed thematically to identify critical challenges and opportunities faced in e-learning environments. The study engages with the pertinent issue, emphasising the perceived difficulties and prospects of TVET students while learning via e-learning platforms. By analysing student responses through the TAAA model, the study outlines critical factors for improving digital literacy and infrastructure, which is essential for scalable e-learning solutions in resource-limited settings. The findings derived from this qualitative interpretive study have disclosed that many obstructive elements exist, simultaneously giving rise to opportunities associated with e-learning. These findings can establish a basis for the extant body of knowledge and are recommended for the consideration of relevant stakeholders capable of addressing the challenges linked to e-learning environments in TVET college education.

Keywords: e-learning; Technical Vocational Education and Training; integration; teaching and learning; Technology Access, Acceptance and Application Model

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1. Introduction

The necessity to embed e-learning within the teaching and learning processes at Technical and Vocational Education and Training (TVET) colleges has increased significantly after the outbreak of the COVID-19 pandemic, which has changed education systems across the globe. As these institutions cope with emerging technologies and the changing needs of the global market, it has become crucial to know what students think about e-learning. Such perceptions directly influence student participation, level of satisfaction and learning outcomes in general. In Bappa-Aliyu (2012), e-learning is described as using electronic technologies and media to facilitate and provide content and aid for independent education. For this reason, the strategic plan's focus emphasises using e-learning in TVET colleges to improve the effectiveness and efficiency in delivering education and training (Igberaharha, 2021).

The public TVET system in South Africa comprises 50 colleges with 253 campuses and 673,490 students in 2019 (DHET, 2021; Zwane & Setlalentoa, 2020). These institutions follow curricula based on the National Technical Education (NATED) Report 191 and the National Curriculum Vocational (NCV), which encompass a more comprehensive range of vocational topics. Nevertheless, students are skilled computer and internet users primarily for social and research interaction (Singh & Samah, 2018); unfortunately, those skills are not implemented within the e-learning environment. The challenge of e-learning implementation in TVET colleges is attributed to many factors, including infrastructural and technological challenges and students' inability to use such technologies (Bagarukayo & Kalema, 2015).

According to Surma and Kirschner (2020), e-learning is a game changer as it deploys different modalities of teaching and learning, which, if integrated appropriately, can yield positive learning results. E-learning can transform students from passive recipients to active participants as it offers a sense of control over learning processes even when interactions are not simultaneous (Pardamean et al., 2021). However, such delivery methods as e-learning are to be implemented concerning the stakeholders, including students, teachers, and administrators.

However, although there is an increasing amount of literature on e-learning, the issues related to its effective realisation in TVET context remain unexplored, especially in South Africa. Such studies focus on the majority of the topics in a most skewed disciplinary focus not addressed in the following critical subjects:

- Student Perspectives: There is little consideration as to how students see the use of e-learning technologies, especially in rural and poor regions, which are the most under-provided technologies in the regions.
- Diverse Challenges: The literature in the previous section tends to generalise challenges without settling on the various barriers that different student populations face in e-learning technology utilisation.
- Contextual Factors: Many studies do not consider the socio-economic and contextual variables that mediate the use and success of e-learning interventions, such as the availability of hardware resources.

This research seeks to fill these significant voids by analysing students' perceptions regarding e-learning, especially the problems they encounter and the possibilities that emanate from its adoption and use in a TVET college in South Africa. Employing the Technology Access, Acceptance, and Application (TAAA) model developed by Pitso et al. (2024), this research seeks to address the following questions:

1. How do Free State TVET College students view the embedding of e-learning in their learning practices?
2. How do students encounter challenges using e-learning technologies, and what opportunities do they highlight?

In exploring such issues, this research seeks to unravel the puzzle of learner interaction with e-learning to understand the confrontations and prospects of e-learning in the TVET scenario. The study uses the Non-Affirmative Theory of Education to empower learners' independence and cosmopolitanism, which fosters the students' inclusivity and global consciousness.

1. Literature review

1.1 Global Perspectives on TVET Colleges

Technical Vocational Education and Training (TVET) systems across the globe exhibit significant variations in their objectives, structure, and outcomes. Maclean and Pavlova (2013) provide a broad overview, noting that countries such as Germany, India, and South Korea recognise the vital role of vocational education in economic productivity and skills development. While Germany's dual system combines apprenticeships with part-time vocational schooling and is widely regarded as effective in producing a highly skilled and adaptable workforce, this model may not be directly transferable to other contexts due to differing socio-economic environments. For instance, although this system reduces youth unemployment and aligns education with industry needs, it assumes a high level of industrial cooperation and existing infrastructure that may not be present in other countries (Maclean & Pavlova, 2013).

In contrast, South Korea and India have adopted vocational training models tailored to their unique socio-economic challenges. South Korea's approach, which includes vocational high schools and junior colleges, is underpinned by robust government policies aimed at addressing specific labour market needs (Kingombe, 2011). However, emphasising formal education pathways may overlook the informal sector's role, which is particularly significant in developing countries. With its vast and diverse population, India faces challenges in ensuring consistent quality and accessibility in vocational education. While addressing local industry demands, the reliance on vocational training centers and polytechnics also highlights regional disparities and the uneven distribution of educational resources (Maclean & Pavlova, 2013).

These global examples suggest that while vocational education is universally recognised as essential, the effectiveness of TVET systems is highly contingent on their alignment with local socio-economic contexts (Vaz,

2012); this raises questions about the adaptability and scalability of such systems, particularly in contexts like South Africa, where historical inequalities and resource constraints pose significant challenges. However, the current literature does not sufficiently explore how these global models can be adapted to South African conditions, particularly regarding integrating e-learning within existing frameworks. This gap is pivotal, as the success of TVET in South Africa may depend on lessons learned from international contexts, yet these lessons remain underexplored.

1.2 The Role of TVET Colleges in South Africa

In South Africa, TVET colleges are positioned as key players in addressing economic challenges and skills shortages, yet their potential remains underutilised. Kuehn (2019) argues that the historical context of inequality necessitates a more transformative approach to vocational education that not only provides technical skills but also addresses the broader socio-economic needs of the population. This perspective is critical, as it highlights the dual role of TVET colleges in both economic development and social equity. However, much of the existing literature tends to focus primarily on the economic aspects, often neglecting the social and equity dimensions. This oversight suggests a significant gap in understanding how TVET can effectively promote social equity alongside economic goals (Zulu & Mutereko, 2020).

Moreover, the South African government's emphasis on aligning TVET programs with industry needs (Bisschoff & Nkoe, 2005) is essential to make vocational education more relevant. Yet, this approach risks being overly narrow if it does not also foster entrepreneurial skills and innovation. Theories such as effectuation (Sarasvathy, 2001) and ideational bricolage (Pitso & Lebusa, 2014) suggest that entrepreneurial skills are not merely by-products of vocational training but should be explicitly integrated into the curriculum. This gap in the literature points to the urgent need for a more holistic approach to TVET education in South Africa, one that combines technical skills with entrepreneurial training. Without addressing this gap, graduates may find themselves ill-equipped for the demands of an evolving job market, limiting their potential for job creation.

This study seeks to fill this gap by exploring how e-learning can be integrated into TVET curricula to support both technical and entrepreneurial skills development, thereby enhancing the role of TVET colleges in social and economic transformation.

1.3 Integration of E-Learning into TVET Colleges

The integration of e-learning in TVET colleges is increasingly recognised as a solution to the limitations of traditional teaching methods, yet the literature reveals mixed results regarding its effectiveness. Igberaharha (2021) emphasises the potential of e-learning to enhance the flexibility and efficiency of education, particularly in accommodating diverse learning styles. However, Zwane and Setlalentoa (2020) caution that without adequate support structures, the benefits of e-learning may not be fully realised. They argue that while digital technologies can provide personalised learning experiences, they also

require significant investment in infrastructure and teacher training—areas many TVET colleges lack.

Surma and Kirschner (2020) highlight the transformative potential of e-learning, particularly in fostering a more interactive and dynamic learning environment. However, this optimistic view often overlooks the implementation challenges, such as the need for robust digital literacy among students and instructors. The existing literature assumes a certain level of digital readiness, which may not be present in many TVET contexts, particularly in rural or under-resourced areas. This study contributes to the literature by critically examining the barriers to e-learning integration in a South African TVET college, focusing on how these challenges can be addressed to maximise the benefits of digital learning.

1.4 Challenges of E-Learning Platforms in Setting up TVET Colleges

The challenges associated with e-learning in TVET colleges are well-documented. Yet, there remains a gap in understanding how these challenges can be effectively mitigated in South Africa. The Technology Access, Acceptance, and Application (TAAA) model (Pitso, 2023) provides a valuable framework for analysing these challenges. Still, it does not fully account for the socio-economic disparities characterising the South African education system.

Access to Technology: The literature highlights significant barriers to technology access, including inadequate infrastructure and the digital divide (Mohamed & Zeehan, 2012). Schultz and Litchfield (2016) emphasise that these barriers are particularly pronounced in rural and underserved areas, where reliable internet connectivity and access to devices are limited. However, while these studies identify the problem, they often stop short of offering concrete solutions. This study seeks to address this gap by exploring practical strategies for improving technology access in a resource-constrained TVET college, such as public-private partnerships and community-based initiatives.

Acceptance of Technology: Acceptance is another critical factor, yet the literature often conflates access with acceptance, assuming that once technological resources are available, they will be readily embraced by students and instructors. Saud et al. (2021) challenge this assumption, arguing that various factors influence acceptance, including perceived ease of use, perceived usefulness, and the broader cultural context. This study builds on this critique by investigating the specific cultural and institutional barriers to technology acceptance in a South African TVET college and exploring how these barriers can be overcome through targeted interventions.

Application of Technology: The application of technology in educational settings is often discussed in broad terms, but Pitso (2023) and Pitso et al. (2024) differentiate between adaptive, optimal, and addictive applications. While this framework is useful, the literature does not adequately explore the implications of these different application levels for student outcomes. This study seeks to fill this gap by examining how various levels of technology application affect

learning outcomes in a TVET college, with a particular focus on identifying best practices for achieving optimal application.

Overcoming Challenges in E-Learning Integration at TVET Colleges

While integrating e-learning into TVET colleges offers many opportunities to improve education, this study shows that these benefits can only be fully realised if significant challenges are addressed. The literature suggests that although digital technologies can make learning more flexible, engaging, and dynamic, their effective use is often blocked by significant barriers, such as limited access to technology, varying levels of digital skills, and mixed acceptance of new tools by both students and educators. These challenges are particularly evident in South Africa, where socio-economic inequalities and poor infrastructure widen the digital divide.

This study highlights the need for a comprehensive approach beyond only providing technology to address these gaps, calling for targeted strategies, like building strong support systems, improving digital literacy, and creating e-learning platforms that are culturally and contextually relevant to the specific needs of TVET college students. Additionally, as Pitso (2023) and Pitso et al. (2024) noted, understanding how different levels of technology use — adaptive, optimal, and addictive — affect student outcomes is crucial for developing effective e-learning strategies.

Overcoming these challenges requires a thoughtful and context-specific approach that includes collaboration among stakeholders, continuous investment in infrastructure and capacity building, and using proven practices. By tackling these barriers, TVET colleges in South Africa can make better use of e-learning to provide inclusive, fair, and effective education, meeting students' diverse needs and supporting broader national development goals.

2. Methodology

2.1 Research Design

This study used an interpretivist research philosophy, which is well-suited for exploring students' complex social contexts and experiences in a rural TVET college setting (Shek & Wu, 2018). The interpretivist approach emphasises understanding individuals' experiences within their specific environments, making it an ideal framework for examining how students perceive and engage with e-learning technologies (Hiller, 2016). Since this research aims to gain deep insights into students' understanding and perceptions of e-learning, a qualitative research design was chosen; this approach allows for collecting detailed, descriptive data reflecting participants' experiences (Almajali, Al-Okaily, Barakat, Al-Zegaier, & Dahalin, 2022).

The qualitative nature of this study aligns with its objective of building a solid understanding of how e-learning is integrated into the TVET curriculum and how students interact with this learning mode. An inductive approach allowed patterns and themes to emerge from the data rather than imposing predetermined categories. This method ensures that the findings are based on the participants'

perspectives and experiences, providing a solid foundation for understanding the challenges and opportunities associated with e-learning in this context.

2.2 Population and Sample

The study was conducted at the most rural campus of Maluti TVET College, located near the Maluti and Motse mountains in Tseki, an area characterised by economic disadvantage and low education levels. This rural setting offers a unique and vital context for understanding the challenges and opportunities of e-learning in underserved areas, where access to resources is often limited.

A purposive sampling technique was used to select 43 student participants. This method was chosen because it allows for intentionally selecting participants with direct experience with e-learning at their respective colleges, ensuring they can provide relevant and insightful data (Creswell & Poth, 2017). The relatively small sample size is considered appropriate for qualitative research, focusing on depth rather than breadth of understanding. The participants were chosen based on their enrollment in courses that included e-learning components, making them well-positioned to offer insights into the educational aspects of e-learning integration.

2.3 Research Instruments

The primary data collection tool was an open-ended questionnaire specifically designed to gather detailed responses from participants (Patton, 2014). Open-ended questions allowed participants to express their views freely, enabling the collection of rich, qualitative data essential for thorough analysis. The questions were written clearly and concisely, ensuring that participants could respond fully without being influenced by the wording of the questions (Anney, 2014).

Data collection occurred during the final examination period, a time chosen to ensure maximum availability of participants. Students who were not scheduled for exams on the day of data collection were invited to participate. Ethical considerations were carefully followed; each participant signed a consent form before completing the questionnaire, ensuring that they were fully informed of their rights and the study's objectives. The distribution and collection of the questionnaires were facilitated by two lecturers from the campus, whose involvement helped ensure the process was smooth and respectful of the participants' time.

2.4 Data Analysis

Data analysis was conducted using a systematic four-step process to ensure thoroughness and accuracy in interpreting the collected data (Ritchie & Spencer, 2002). The steps are as follows in Figure 1 below:

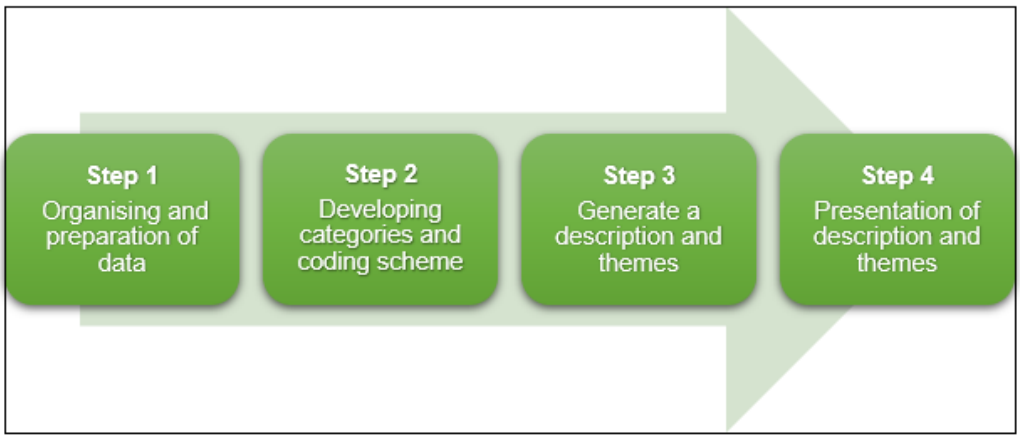


Figure 1: Data Analysis Process

The data analysis process began with organising the data into manageable units by identifying recurring patterns, key themes, and significant meanings. This initial step laid the foundation for more detailed analysis and data categorisation based on emerging themes from the participants' responses. Following this, open coding was employed to identify and name conceptual categories within the data (Mason, 2017), a crucial step in qualitative research as it developed a preliminary framework to capture various aspects of the data. The next phase involved thematic analysis, which explored the data further by identifying patterns or themes that provided a comprehensive understanding of participants' experiences and perceptions (Yin, 2015). Finally, themes of particular interest were selected and presented, linking the findings to broader theoretical concepts and existing literature. Throughout this process, the researcher maintained objectivity, ensuring that interpretations were firmly based on the data, thus preserving the credibility and trustworthiness of the findings (Carter & Little, 2007).

This rigorous methodological framework provides a detailed understanding of the participants' experiences with e-learning in a rural TVET college setting. The approach ensures that the findings reflect the participants' social contexts and contribute valuable insights for future educational practices and policies, especially in resource-constrained environments like rural South Africa.

2.5 Ensuring Trustworthiness in Data Collection and Analysis

In seeking to enhance the credibility, confirmability, transferability, and dependability of the findings, the study employed the strategies suggested by Creswell (2013) and other experts on qualitative research.

Credibility: Credibility refers to confidence in the truth of the conclusions deduced from the research. In this study, a method such as member checking was employed, whereby the research subjects verified the meaning and themes coming up in the study, thus ascertaining that the findings represented their experiences (Creswell, 2013). It was also accompanied by peer debriefing,

wherein conversations with peers were made to reduce researcher bias and enhance data comprehension (Lincoln & Guba, 1985).

Confirmability: Confirmability involves the test control of accounting: shareholder bias as opposed to that of the researcher and his other interests. Confirmability was enhanced through an audit trail by which every aspect of the collection and treatment of data was documented, promoting transparency (Creswell, 2013). The study also employed triangulation when it analysed the open-ended questionnaires to cross-validate the literature review scope of the study to explore the findings (Denzin, 2009).

Transferability: Transferability is the proportion of the findings that can be used in other contexts. The study stated the context in which it was carried out, namely the rural environment of the Free State TVET College and relevant background data about the students to facilitate transferability (Creswell, 2013). Lastly, the study intends to add value to the body of knowledge about other research settings as it offers comprehensive data describing the research settings to enable further researchers to see how the findings could be relevant in similar contexts or settings (Lincoln & Guba, 1985).

Dependability: Dependability is the degree to which the findings can be repeated over time. Dependability was maintained as the researcher employed inter-coder reliability, where two researchers examined the data and the coding process to achieve the same outcomes (Creswell, 2013). The methodology and procedures were described in detail to enable the replication of the study. Another critical technique utilised by the researcher was reflexive journaling, where biases are reconsidered in analysis to prevent or effect distortions of intentions (Mason, 2017).

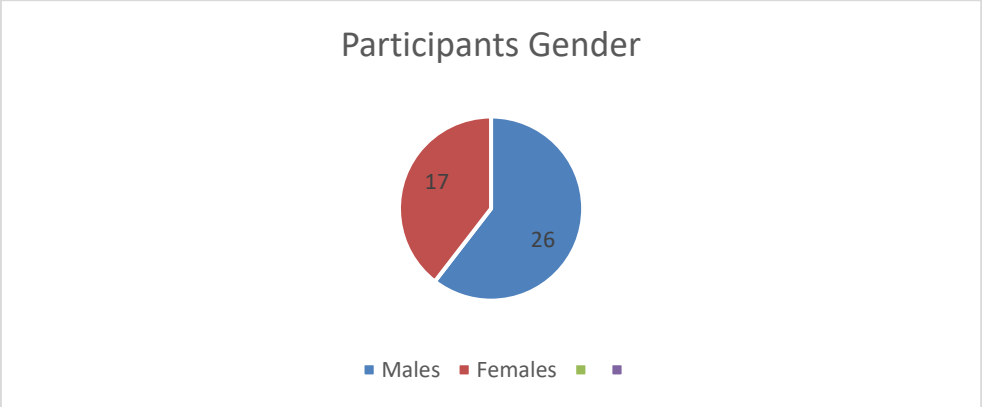
Authenticity: Authenticity means faithfully representing participants' multiple perspectives and voices. In this research, authenticity was pronounced through open questions, allowing study participants to present their views on e-learning without reservation and thus enabling their voices to be authentically depicted in the findings (Creswell, 2013). This helped guarantee that the study gave an all-round view of the students' problems and experiences.

3. Results and discussion

3.1 Biographical Information

The demographic characteristics of the student sample, as shown in Graph 1, reveal that the majority of participants (26) were male, while females accounted for 17 participants. This gender distribution is significant in understanding the dynamics of e-learning adoption, as existing literature suggests that gender can influence attitudes towards technology and learning preferences (Paechter & Maier, 2010). For instance, studies have shown that male students often exhibit more confidence in using technology for educational purposes, which could impact their engagement with e-learning platforms (Bolliger & Martin, 2018). Understanding the demographic makeup of the sample is crucial in interpreting the themes and sub-themes that emerged from the data,

as it may reflect broader trends in technology adoption across different gender groups.



Graph 1: Gender of participants

3.1.1 Main Themes and Sub-themes

The analysis of the open-ended questionnaire responses identified three main themes: comprehension of the purpose of e-learning, perceived benefits of e-learning, and challenges of working with e-learning technology. These themes provide a comprehensive understanding of how students perceive and interact with e-learning technologies in the TVET context.

The findings of this study are interpreted through the lens of the Technology Access, Acceptance, and Application (TAAA) model. Each model component — Access, Acceptance, and Application — provides a framework to explore the students' experiences and perceptions of e-learning at a Free State TVET College.

Theme 1: Comprehension of the Purpose of E-Learning

The first theme explores students' understanding of the purpose of e-learning, revealing how e-learning supports their educational goals. This theme primarily reflects the Acceptance component of the TAAA model, as it focuses on students' attitudes toward and engagement with e-learning tools. Most participants preferred using e-learning technologies to enhance their learning experiences, aligning with Paechter and Maier's (2010) assertion that e-learning enhances communication opportunities through electronic resources.

For example, P1 described e-learning as "an easy way to learn," emphasising its ability to provide more information and enhance learning accuracy, aligning with Cook's (2007) findings that e-learning allows students to study at their own pace and manage their workload more effectively. Similarly, P3 noted that "e-learning helps to gather various data from different sources," showcasing how e-learning can overcome the limitations of traditional textbooks and expand students' access to diverse academic resources, reflecting the Access and Application components.

Additionally, participants viewed e-learning as a means of improving learning standards. P16 remarked that e-learning "makes learning easier by using

educational technologies to improve the standard of learning," aligning with Kirkwood and Price's (2014) view that innovative educational technologies improve learning outcomes. This finding highlights the Application aspect of the model, as it focuses on how e-learning tools are applied to enhance learning quality.

Theme 2: Perceived Benefits of Using E-Learning

The second theme highlights the perceived benefits of e-learning, which are associated with various aspects of the students' learning experiences. This theme is closely tied to both **Acceptance** and **Application,** as it addresses students' willingness to engage with e-learning tools and how these tools impact learning outcomes.

Participants emphasised the flexibility and accessibility of e-learning, with P17 noting, "e-learning allows people to learn for personal accomplishment or earn a professional degree without physically attending a traditional university." This reflects the **Acceptance** component, where students acknowledge the value of e-learning as a tool for balancing education with personal responsibilities. P16 reiterated that e-learning "makes learning easier by using educational technologies to improve the standard of learning," which aligns with the Application as it speaks to the practical use of e-learning to enhance learning standards.

Another benefit identified by P27 was that e-learning "allows students to get accurate and up-to-date information," underscoring the dynamic nature of e-learning content; this aligns with the **Application,** highlighting how e-learning tools provide timely, relevant learning resources. These findings support the view that e-learning offers a flexible, accessible, and responsive learning environment, consistent with Shah and Jain's (2017) assertion that e-learning provides continuous access to relevant information.

Theme 3: Challenges of Working with E-Learning Technology

Despite the benefits, several e-learning technology challenges emerged, particularly regarding **Access and Acceptance.** A significant barrier identified was **computer illiteracy**, with P4 stating, "Being computer illiterate can be one of the barriers as e-learning is more on the computer, which might discourage the person from e-learning", reflecting the Access component of the TAAA model, as students' ability to engage with e-learning tools is limited by their technological proficiency.

Other challenges related to limited technology experience and application failures were also reported. P5 noted, "limited technology experience is disadvantageous," which emphasises the Acceptance component, as students' willingness to adopt e-learning is influenced by their prior exposure to technology. P20 observed, "some applications fail to respond in time, which can lead to losing interest in online learning," highlighting the need for reliable technology, which directly impacts the Application component of the model.

Moreover, participants mentioned the lack of necessary resources, such as personal computers and internet connectivity. P35 stated, "Not having enough data to access the internet jeopardises my study progress," underscoring students' Access challenges, particularly in rural areas. This finding aligns with Schultz and Litchfield's (2016) research, which identifies the digital divide as a critical barrier to equitable e-learning access.

The challenges identified emphasise the need for targeted interventions to support students in overcoming these barriers. Addressing these challenges will maximise the effectiveness of e-learning and ensure equitable access to educational resources, in line with the TAAA model's components of **Access**, **Acceptance**, and **Application**.

3.2 Critical discussions

The results of this study highlight the significant potential of e-learning to enhance educational practices in TVET colleges, but they also reveal the complexities involved in its integration. The following discussion critically examines these findings through the lenses of the Non-Affirmative Theory of Education and Cosmopolitanism, both of which offer valuable perspectives for understanding the broader implications of e-learning.

3.2.1 E-Learning and the Politics of Knowledge

While e-learning provides a platform for broader access to knowledge, it does not inherently address the deeper ideological and political dimensions of knowledge dissemination. The study's findings suggest that without a critical framework, e-learning risks merely digitising existing educational paradigms rather than challenging or transforming them. The Non-Affirmative Theory of Education emphasises the importance of guiding students without dictating specific outcomes, allowing for a more reflective and critical engagement with content. This approach is essential to ensure that e-learning is not just a passive transfer of information but an active process where students critically engage with the material and develop their own perspectives.

3.2.2 Cosmopolitanism and Global Citizenship

The findings also align with the principles of cosmopolitanism, which advocate for education that prepares students to engage with global issues and diverse perspectives. With its capacity to connect students across different geographical and cultural contexts, E-learning is ideally positioned to promote cosmopolitan ideals. E-learning can help students develop a sense of global citizenship by integrating projects and encouraging cross-cultural dialogue and collaboration – particularly relevant in TVET education, where students are prepared to work in increasingly globalised industries. The study suggests that e-learning when combined with a cosmopolitan curriculum, can provide students with the tools they need to navigate and contribute to a complex global environment.

3.2.3 Non-Affirmative Education in E-Learning

The Non-Affirmative Theory of Education provides a framework for designing e-learning environments that are open-ended and student-centred. Rather than

simply transferring knowledge, e-learning should encourage exploration, critical thinking, and the development of individual perspectives. The study's findings support this approach, as participants reported that e-learning allowed them to take greater control of their learning and explore topics in greater depth, aligning with constructivist principles, where learning is seen as an active, meaning-making process. By applying the Non-Affirmative Theory to e-learning, educators can create learning experiences that empower students to become independent thinkers and problem-solvers.

3.2.4 Addressing the Gaps and Future Directions

While the study provides valuable insights into the benefits of e-learning, it also highlights areas that require further attention. The challenges related to digital literacy and the uneven use of e-learning platforms by lecturers suggest a need for targeted interventions. Future research should explore strategies for enhancing digital literacy among students and providing ongoing support for educators. Additionally, there is a need to investigate how e-learning can be more effectively integrated into the broader curriculum to ensure that it contributes to meaningful learning outcomes.

4. Conclusion

This study reaffirms the crucial role of TVET colleges in South Africa's education sector, particularly in addressing the skills gap and aligning educational practices with the demands of a rapidly evolving global economy. The findings underscore that e-learning has become indispensable in transforming teaching and learning at TVET colleges. By offering flexible, customisable, and accessible learning experiences, e-learning significantly enhances the educational process, catering to the diverse needs of students.

The empirical data from this study confirm that e-learning facilitates better communication and collaboration through electronic resources, creating active learning environments that foster knowledge and skills acquisition. The study also highlights how e-learning empowers students by improving their problem-solving abilities and supporting independent learning, aligning with the broader objective of enhancing educational outcomes by integrating innovative technologies.

Moreover, e-learning provides practical knowledge crucial for modern education, allowing students to engage with learning materials at their own pace and from any location. This flexibility is particularly beneficial in contexts where students face challenges with access and resource availability. The study's findings suggest that e-learning improves students' understanding of course content and supports the development of essential skills such as time management and self-directed learning.

However, the study also reveals that the successful integration of e-learning is contingent upon addressing significant challenges, including digital literacy and the varying levels of engagement among lecturers. These findings suggest a need for ongoing professional development for educators and targeted interventions to

support students in overcoming technological barriers. Future research should focus on strategies to enhance digital literacy and explore how e-learning can be more effectively integrated into the broader curriculum to maximise its impact.

5. Implications of the Study

The study highlights the importance of formulating cohesive national policies catering to TVET colleges' digitalisation. TVET colleges should, however, seek to prioritise providing additional digital infrastructure, especially in rural and resource-deficient campuses. Forthcoming research illustrates that access to digital infrastructure and technology remains a significant hindrance when attempting effective e-learning. As noted within the study, South Africa's White Paper on e-Education seeks to extend equal digital resources to all citizens. Policies should strive to supply technological resources and ensure that society, students, and educators have the training and assistance necessary for adequately using these resources.

The findings of this study compel the readers to reconsider the e-learning technologies available for use in TVET that are appropriate for all levels. This applies to TVET colleges in rural areas; therefore, investments in providing faster internet connections, adequate computers, and e-learning facilities are prerequisites. Additionally, the study's findings suggest that institutions should pursue partnerships with the private sector to enhance technology access to its students by making devices available at subsidised rates. They noted that providing Wi-Fi hotspots in such areas would strengthen the use of online resources and even reduce the existing gaps in rural areas with little or no internet services.

The research findings show that it is necessary to establish an institutional e-learning framework. TVET Colleges' management must ensure that professional development programs are conducted that provide educators with appropriate online education delivery skills. Furthermore, the conclusion of this study points out that the introduction of e-learning should go hand in hand with organised training on information technology for the students and the staff members. Such skills are required to ascertain the full benefits of e-learning. Institutions should further consider engaging local industries in developing e-learning programs so that the e-learning programs developed can be relevant to the immediate job market.

This paper aims to provide a basis and direction for future work aimed at e-learning in TVET colleges located in rural and under-resourced areas. Future research may involve using ex-post longitudinal designs to evaluate the impact of e-learning on student performance in areas such as e-learning, student retention, e-learning skill development, and ability to be employed. Furthermore, other research could determine the effectiveness of various forms of e-learning in vocational education and training, specifically blended and flipped classrooms. Investigating the efficiencies of these models in diverse TVET disciplines may accelerate the identification of best practices for strategically employing e-learning in specialised areas.

In conclusion, e-learning represents a powerful tool for transforming education in TVET colleges, offering the potential to make learning more responsive, inclusive, and effective. By addressing the identified challenges and leveraging the benefits of e-learning, TVET colleges can better equip students with the skills and knowledge needed to thrive in a dynamic and competitive global environment.

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