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# ENHANCING DIGITAL INCLUSION IN MULTILINGUAL EDUCATION: EXPLORING THE ROLE OF TECHNOLOGY IN SOUTH AFRICAN HIGHER EDUCATION

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**ABSTRACT**

The Fourth Industrial Revolution has significantly impacted teaching and learning in higher education worldwide. However, many developing countries have continued to face challenges in embracing digital transformation within their education systems. This study explored strategies to enhance digital inclusion through multilingual education, focusing on South Africa and the integration of technology into multilingual learning environments. The Technology Acceptance Model (TAM) was used to understand how digital tools could be successfully incorporated into multilingual education to improve access and inclusion. A systematic review of relevant literature was conducted, drawing from databases such as Scopus and Google Scholar, focusing on studies published between 2020 and 2024. Thematic analysis was used to identify key themes from 72 articles, published in English language and in peer-reviewed journals, which informed the findings and recommendations. The study aimed to offer practical strategies for improving digital literacy and inclusion in multilingual education, particularly in developing countries. The results provided valuable insights for policymakers, educators, and stakeholders, offering ways to promote equity and access to digital resources in multilingual learning environments.

**KEYWORDS**

Multilingual Education, Digital Inclusion, Technology Acceptance Model, Digital Literacy, Higher Education, South Africa

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## Introduction

In recent years, the integration of digital technologies in education has transformed how teaching and learning take place globally, particularly in higher education (Ajani, 2023). The emergence of the Fourth Industrial Revolution (4IR) has ushered in an era where technological innovation reshapes traditional educational models, offering unprecedented opportunities for improving access, engagement, and efficiency in learning processes (Maphalala & Ajani, 2024; Schwab, 2017). However, while developed nations have embraced these advances with relative ease, many developing countries continue to face significant challenges in achieving full digital transformation within their educational institutions. This disparity is especially pronounced in countries like South Africa, where socio-economic inequalities, limited resources, and infrastructure gaps create substantial barriers to digital inclusion (Govender & Msiza, 2020).

One critical aspect of digital transformation is the integration of multilingual education within digital platforms. In multilingual societies like South Africa, the role of language in education cannot be overlooked. Language is not only a medium of instruction but also a key factor in promoting inclusivity and equitable access to education (Ajani & Ntombela, 2024; Alexander, 2006). Despite the constitutional recognition of 11 official languages in South Africa, the digital space in education remains largely dominated by English. This

creates significant obstacles for non-English speaking students, limiting their ability to fully participate and benefit from digital learning resources (Van der Walt, 2013).

Research has shown that language barriers in digital education often result in lower academic performance, reduced engagement, and increased dropout rates among students whose first language is not the medium of instruction (Cummins, 2000). As digital education continues to expand, ensuring that learning materials and digital platforms are accessible in multiple languages is crucial to fostering an inclusive educational environment (Ajani, 2022). This is particularly important in a country like South Africa, where linguistic diversity is both a strength and a challenge (Makalela, 2018).

The introduction of multilingual education in digital platforms not only improves access but also promotes social cohesion by recognising and valuing linguistic diversity. According to Hornberger and Vaish (2009), multilingual education can help bridge cultural divides and enhance students' sense of belonging, particularly in diverse and stratified societies. The inclusion of multiple languages in digital platforms is also closely linked to digital literacy and equity, as it ensures that all students, regardless of their linguistic background, have the opportunity to engage with digital learning tools effectively (Grosfoguel, 2011).

However, achieving digital inclusion in multilingual education presents its own set of challenges. In South Africa, these challenges are exacerbated by unequal access to technology, a lack of digital infrastructure in rural areas, and disparities in the quality of education (Blignaut & Els, 2010). Additionally, many educators lack the training and resources to implement multilingual education effectively within digital platforms (Ajani, 2022; Mafu & Van Der Merwe, 2021). These challenges highlight the need for a comprehensive approach that not only focuses on the availability of digital tools but also addresses issues of language, equity, and access.

The Technology Acceptance Model (TAM) offers a useful theoretical framework for understanding how students and educators perceive and adopt digital tools in multilingual education. TAM posits that perceived usefulness and ease of use are key determinants of whether individuals will adopt new technologies (Davis, 1989). In the context of multilingual education, TAM can help explain how language barriers and digital literacy impact students' willingness to engage with digital learning platforms (Venkatesh & Bala, 2008). Understanding these perceptions is essential for developing strategies that enhance digital inclusion and ensure that technology is effectively integrated into multilingual education.

To address these issues, it is important to explore strategies for enhancing digital inclusion through multilingual education. A systematic review of the literature will provide insights into best practices and identify the key challenges and opportunities associated with this approach. This study aims to contribute to the growing body of knowledge on digital inclusion in higher education by focusing on the unique context of South Africa. By doing so, it seeks to provide practical recommendations for policymakers, educators, and technology developers on how to enhance digital inclusion through multilingual education.

In conclusion, digital inclusion in multilingual education is a critical issue in South Africa, where language diversity and socio-economic inequalities intersect with the growing demand for digital education. This study will explore how digital platforms can be used to promote multilingual education, identify the key challenges faced by students and educators, and propose strategies for enhancing access and equity. The research objectives of this study are threefold: (1) to examine students' and educators' perceptions of digital platforms in multilingual education; (2) to identify the challenges and barriers to digital inclusion in this context; and (3) to develop strategies for enhancing the effectiveness of digital multilingual education in South Africa.

By addressing these objectives, this study aims to provide valuable insights into how digital inclusion can be enhanced in higher education, ensuring that all students, regardless of their linguistic background, have access to quality education in the digital age.

**Theoretical Framework**

The theoretical framework for this study is grounded in the Technology Acceptance Model (TAM), which provides a robust lens through which to explore how digital platforms are adopted and perceived within multilingual education. The TAM, developed by Davis (1989), offers a framework for understanding how individuals come to accept and use technology. It posits that perceived usefulness and perceived ease of use are the two main factors that influence users' acceptance of technology. In this study, the TAM is particularly relevant as it helps to unpack the perceptions of students and educators regarding digital platforms for multilingual education, a context where both technological and linguistic variables are at play.

Perceived usefulness refers to the degree to which a person believes that using a particular technology will enhance their performance (Davis, 1989). In the context of multilingual education, this could relate to how

students perceive the ability of digital platforms to improve their learning outcomes in languages they are familiar with. For educators, it could relate to how effective they believe these platforms are in supporting their teaching goals across different languages. As such, understanding perceived usefulness is critical in identifying whether multilingual digital platforms are seen as beneficial tools in enhancing educational outcomes (Venkatesh & Davis, 2000).

Perceived ease of use, the second major factor in TAM, refers to the degree to which an individual believes that using a technology will be free of effort (Davis, 1989). This is especially important in multilingual education, where the complexity of managing multiple languages could potentially make digital platforms harder to navigate. If students and educators find these platforms cumbersome or difficult to use, their likelihood of adoption diminishes, no matter how beneficial the platforms might be. Therefore, investigating how easy these platforms are to use in a multilingual setting is crucial to understanding their overall effectiveness (Venkatesh & Bala, 2008).

In the context of multilingual education in South Africa, where multiple official languages exist, TAM provides a useful framework to explore the intersection of technology and language. South Africa's educational landscape is highly diverse, with many students coming from non-English-speaking backgrounds (Makalela, 2018). As such, the perceived usefulness and ease of use of digital platforms are likely influenced not only by their technical capabilities but also by their ability to support multilingualism. By applying TAM, this study seeks to understand how the technological and linguistic aspects of these platforms interact to shape user acceptance.

Social constructivism is another critical element in this theoretical framework, providing insight into how students and educators construct meaning through their interactions with technology in a multilingual environment. Social constructivism posits that learners construct knowledge through social interaction and shared experiences, and language plays a vital role in this process (Vygotsky, 1978). In a multilingual setting, language becomes both a tool for learning and a cultural marker. The integration of digital platforms into this environment thus presents unique challenges and opportunities for facilitating inclusive and equitable learning experiences (Ajani & Ntombela, 2024).

Digital platforms in education often reflect broader socio-cultural values, and the way language is incorporated into these platforms can either promote inclusivity or reinforce existing inequalities (Grosfoguel, 2011). By considering social constructivism alongside TAM, this study explores not only the technological aspects of digital inclusion but also the cultural and linguistic dimensions. This is important in a country like South Africa, where historical inequalities have left many students from non-English-speaking backgrounds at a disadvantage in the education system (Alexander, 2006).

The TAM and social constructivism framework also allows for the exploration of barriers to digital inclusion. For example, students from rural areas may have limited access to digital technologies, and their perceptions of the usefulness and ease of use of these platforms may be shaped by their prior experiences with technology (Blignaut & Els, 2010). Similarly, educators may face challenges in implementing digital multilingual education due to a lack of training or resources. By understanding these barriers, this study aims to identify strategies that can enhance digital inclusion for all students, regardless of their linguistic or socio-economic background (Mafu & Van Der Merwe, 2021).

One of the key advantages of using TAM in this study is its flexibility in being adapted to different contexts. While it was originally designed to understand user acceptance of workplace technologies, it has since been applied in various educational settings, including e-learning and digital education (Teo, 2011). In the context of this study, TAM is particularly useful in examining how different languages, as well as the digital divide, influence the acceptance of technology in multilingual education.

The inclusion of social constructivism in this framework also highlights the role of collaboration and communication in digital learning environments. Multilingual education naturally lends itself to collaborative learning, as students from different linguistic backgrounds work together to construct knowledge. Digital platforms can facilitate this process, but only if they are designed in a way that supports meaningful interaction and communication across languages (Hornberger & Vaish, 2009). By applying social constructivist principles, this study seeks to explore how digital tools can be used to enhance collaboration in multilingual education.

Both TAM and social constructivism also shed light on the ethical considerations of digital inclusion. Ensuring that all students have access to digital platforms, regardless of their language or socio-economic status, is not just a practical issue but an ethical one (Selwyn, 2016). By investigating how technology can support multilingual education, this study addresses the need for more equitable educational practices in a digital age. The ethical implications of digital inclusion will therefore be an important consideration in the recommendations provided at the end of this study.

In summary, the theoretical framework for this study is based on the intersection of TAM and social constructivism, providing a comprehensive lens through which to explore the adoption and effectiveness of digital platforms in multilingual education. TAM helps to explain the technological aspects of digital inclusion, focusing on perceived usefulness and ease of use, while social constructivism highlights the social and cultural dimensions of learning in a multilingual context. Together, these theories offer a robust framework for understanding the challenges and opportunities of digital multilingual education in South Africa.

By adopting this theoretical framework, the study aims to explore how digital platforms can be better designed and implemented to promote inclusivity, equity, and access in multilingual education. The findings from this study will contribute to the broader discourse on digital inclusion in higher education, providing valuable insights for policymakers, educators, and technology developers who seek to enhance the learning experiences of students in diverse linguistic environments.

**Literature Review**

Digital inclusion and multilingual education in higher education have become increasingly significant as educational institutions strive to meet the needs of diverse student populations in a rapidly digitising world. Scholars have noted that technological advances, particularly since the Fourth Industrial Revolution, have provided immense opportunities for transforming educational practices (Schwab, 2017). However, for developing nations, digital inclusion remains a challenge, particularly in contexts like South Africa where socio-economic inequalities persist (Mafu & Van Der Merwe, 2021). The integration of multilingual education into digital platforms presents both a challenge and an opportunity for ensuring equitable access to education.

One key aspect of digital inclusion in higher education is access to technology. Studies highlight that students from rural or disadvantaged backgrounds often struggle with limited access to the internet and digital devices, creating a digital divide (Selwyn, 2016). In South Africa, this is exacerbated by historical inequalities, where previously marginalised groups continue to face barriers to accessing quality education and technological resources (Makalela, 2018). As such, digital inclusion is not merely about providing technology but ensuring that all students, regardless of their socio-economic background, can engage with and benefit from these tools. This study aims to explore how digital platforms can support multilingual education while addressing the issue of equitable access.

A second consideration is the role of language in digital education. Multilingualism is an essential feature of many educational systems, particularly in countries like South Africa, which recognises 11 official languages (Alexander, 2006). Despite this linguistic diversity, English remains the dominant language of instruction in higher education, placing non-native English speakers at a disadvantage. Scholars argue that multilingual education, supported by digital platforms, can help bridge this gap by providing learning materials in multiple languages, thereby enhancing comprehension and inclusivity (Hornberger & Vaish, 2009). This study will investigate how digital platforms can be designed to support multilingual education effectively, ensuring that all students can access learning materials in their preferred language.

In the context of multilingual education, the use of digital platforms offers several opportunities for enhancing learning experiences. Digital platforms allow for the integration of multimedia resources, which can cater to different learning styles and language preferences (Muller, 2017). For instance, videos, interactive quizzes, and translated texts can help students grasp complex concepts in a language they are comfortable with. However, the success of these platforms depends on their usability and accessibility, both of which are influenced by the students' perceived ease of use and usefulness of the technology (Davis, 1989). By examining students' perceptions of digital platforms in a multilingual context, this study seeks to uncover key factors that influence their effectiveness.

The Technology Acceptance Model (TAM) provides a useful framework for exploring how students and educators adopt digital platforms in multilingual education. According to Davis (1989), the perceived usefulness and ease of use of a technology are critical factors that determine its adoption. In multilingual education, these factors take on added significance, as students must navigate not only the technology itself but also the linguistic barriers that may exist. Recent studies have shown that when digital platforms are perceived as easy to use and beneficial, students are more likely to engage with them, regardless of the language in which the content is presented (Teo, 2011). This research will explore how TAM can be applied to better understand the adoption of digital platforms in multilingual education.

Digital inclusion is also a matter of equity, particularly in multilingual contexts. Equity in education refers to the provision of equal opportunities for all students, regardless of their background or circumstances (Blignaut & Els, 2010). In the digital age, this includes ensuring that students have access to the necessary

technology and that the platforms they use are designed to accommodate diverse linguistic needs. This study will address the issue of equity by examining how digital platforms can be tailored to support students from different linguistic backgrounds, with a particular focus on South Africa's multilingual education system.

Another significant factor to consider is the role of educators in facilitating digital inclusion. Research indicates that educators play a critical role in shaping students' experiences with digital platforms, particularly in multilingual education (Muller, 2017). Educators must be trained to use these platforms effectively, ensuring that they can support students in navigating both the technological and linguistic aspects of digital learning. Furthermore, educators must be equipped with the resources and tools necessary to create inclusive learning environments that cater to students' diverse language needs (Makalela, 2018). This study will explore the role of educators in promoting digital inclusion and identify strategies for supporting them in this endeavour.

Despite the potential benefits of digital platforms in multilingual education, challenges remain. One such challenge is the lack of culturally relevant content available on many digital platforms (Grosfoguel, 2011). In a multilingual and multicultural society like South Africa, it is essential that digital platforms reflect the diverse cultural backgrounds of students. This includes providing learning materials that are not only available in multiple languages but also sensitive to the cultural contexts in which students live and learn. This study will explore how digital platforms can be adapted to meet the cultural and linguistic needs of South African students.

Moreover, the digital divide remains a significant barrier to digital inclusion in multilingual education. While some students have access to high-speed internet and the latest digital devices, others struggle with poor connectivity and outdated technology (Selwyn, 2016). This disparity can hinder students' ability to engage fully with digital platforms, particularly in multilingual education, where access to language resources may be limited. By exploring the challenges associated with the digital divide, this study aims to identify strategies for promoting digital inclusion in higher education.

The integration of social constructivism with TAM offers a more comprehensive understanding of how students construct knowledge in digital multilingual environments. Social constructivism posits that learning is an active, collaborative process where individuals construct meaning through interactions with others (Vygotsky, 1978). In multilingual education, digital platforms can facilitate this process by providing spaces for students to engage in collaborative learning across linguistic barriers (Hornberger & Vaish, 2009). This study will explore how digital platforms can support collaborative learning in multilingual education and how students and educators perceive the effectiveness of these platforms in facilitating such interactions.

Looking to the future, the prospects for digital inclusion in multilingual education appear promising. Technological advancements, such as artificial intelligence and machine learning, offer new opportunities for enhancing multilingual education by providing real-time translation services and personalised learning experiences (Muller, 2017). These technologies have the potential to bridge linguistic barriers, making education more accessible to students from diverse backgrounds. However, the successful integration of these technologies into multilingual education will require careful consideration of issues related to equity, accessibility, and cultural relevance. This study will provide recommendations for leveraging these emerging technologies to promote digital inclusion in multilingual education.

A final consideration is the role of policy in promoting digital inclusion in multilingual education. Governments and educational institutions play a critical role in ensuring that digital platforms are accessible and inclusive for all students (Grosfoguel, 2011). This includes providing the necessary infrastructure, such as high-speed internet and digital devices, as well as developing policies that support the integration of multilingual education into digital platforms. This study will explore the role of policy in promoting digital inclusion and identify strategies for policymakers to enhance digital inclusion in higher education.

In conclusion, the literature on digital inclusion and multilingual education highlights both the challenges and opportunities associated with integrating digital platforms into higher education. While digital platforms offer the potential to enhance learning experiences in multilingual contexts, significant barriers remain, including issues of access, equity, and cultural relevance. By exploring students' perceptions of digital platforms in multilingual education, this study seeks to contribute to the ongoing discourse on digital inclusion and provide practical recommendations for enhancing the effectiveness of digital platforms in higher education.

Research Objectives At the core of this study are several key research objectives. First, to investigate students' and educators' perceptions of digital platforms in multilingual education, with a particular focus on the South African context. Second, to identify the factors that influence the adoption and effectiveness of these platforms, including issues of usability, accessibility, and equity. Finally, the study aims to provide practical recommendations for enhancing digital inclusion through the use of multilingual digital platforms, ensuring

that all students, regardless of their linguistic or socio-economic background, can access and benefit from digital education.

**Research Methodology**

This study adopted a systematic literature review (SLR) to explore strategies for enhancing digital inclusion through multilingual education, focusing on the South African context. The methodology was carefully designed to ensure a comprehensive analysis of existing literature, enabling the identification of key themes and recommendations. A systematic review is well-suited for this type of research as it allows the synthesis of a large body of knowledge, providing a broad yet detailed understanding of the topic (Petticrew & Roberts, 2006). By reviewing existing studies, this research aimed to highlight effective strategies and identify gaps in the current literature on digital inclusion in multilingual education.

To gather relevant data, this study utilised two key databases: Scopus and Google Scholar. These databases were selected for their extensive coverage of peer-reviewed academic literature, which is crucial for ensuring the credibility and relevance of the findings. The search focused on articles published between 2020 and 2024, ensuring that the research reviewed was up-to-date and reflective of the latest trends in technology and multilingual education. Only articles published in English were included, given the global prominence of English in academic publishing. This decision was also aligned with the study's aim to focus on multilingual education within a digital framework where English is often the default language of technological platforms (Selwyn, 2016).

The selection of articles followed a rigorous inclusion and exclusion process. Initially, a broad search was conducted using keywords such as "multilingual education," "digital inclusion," "Technology Acceptance Model," "digital literacy," and "developing countries." From this search, 105 articles were identified. The titles and abstracts of these articles were then screened, leading to the exclusion of studies that did not directly address the intersection of digital inclusion and multilingual education. After this screening process, 72 articles were selected for full-text review. These articles were then analysed using thematic analysis, a qualitative method that allows for the identification of key themes across different studies (Braun & Clarke, 2006).

The thematic analysis involved coding the data from the selected studies to uncover recurring patterns and themes. This process was guided by the Technology Acceptance Model (TAM), which was used as the theoretical framework for this study. TAM focuses on two key factors influencing technology adoption: perceived usefulness and perceived ease of use (Davis, 1989). In this research, these factors were explored in the context of multilingual education to understand how digital tools are perceived by both educators and students. The thematic analysis identified five key themes: access to technology, language barriers, digital literacy, educator training, and equity in education. These themes provided a foundation for the findings and recommendations presented in the study.

To ensure the reliability of the findings, the selected studies were critically appraised using established quality assessment tools for systematic reviews (Higgins et al., 2011). This step was essential to ensure that the research included in the review was of high quality and provided reliable evidence. The assessment considered factors such as the methodological rigour of the studies, the relevance of the findings to the research question, and the clarity of the reporting. Only studies that met these criteria were included in the final synthesis, ensuring that the recommendations made in this research were based on robust evidence.

Ethical considerations were also taken into account in the design of the research methodology. While this study did not involve human participants directly, it relied on published academic work. Therefore, it was essential to ensure that all sources were appropriately credited, and no plagiarism occurred. Furthermore, the study adhered to the principles of transparency and integrity by clearly outlining the methods used and providing a detailed account of the inclusion and exclusion criteria (Booth et al., 2016). This transparency ensures that the findings can be replicated and validated by other researchers in the field.

In terms of limitations, it is important to note that this study was limited to articles published in English, which may have excluded valuable research conducted in other languages, particularly in multilingual contexts such as South Africa. Furthermore, while Scopus and Google Scholar are comprehensive databases, they may not cover all relevant literature, particularly non-peer-reviewed sources such as policy reports and grey literature. However, the systematic approach taken in this review ensured that the most relevant and high-quality studies were included, providing a solid foundation for the study's findings and recommendations.

Overall, the methodology employed in this study ensured a rigorous and comprehensive exploration of the strategies for enhancing digital inclusion through multilingual education. By adopting a systematic literature review, using thematic analysis, and grounding the research in the Technology Acceptance Model,

this study provides a robust framework for understanding how digital tools can be effectively integrated into multilingual education. The findings offer valuable insights for educators, policymakers, and other stakeholders looking to promote digital inclusion and equity in higher education.

**Presentation of Findings**

From a total of 278 literature sources that were first accessed, further screened to 78 articles published in English language that were thematically analysed, 5 themes were systematically reviewed for the presentation of themes as follows:

**1. Access to Technology in Multilingual Education**

The first theme emerging from the research is the critical role of technology access in promoting multilingual education. In many developing countries, including South Africa, access to digital resources remains unequal, limiting the potential for digital inclusion in education (Beukes, 2020). The research identified that, while digital platforms hold great promise for enhancing educational outcomes, disparities in access to devices and reliable internet are significant barriers. Particularly in rural areas, students often lack the infrastructure required to engage fully with online learning environments (Mlitwa, 2021). This limited access not only affects their ability to participate in digital group work but also perpetuates existing educational inequalities. To bridge this gap, policymakers must prioritise investments in digital infrastructure, ensuring that all students, regardless of their geographical location or socio-economic status, have equitable access to the tools they need for success in a digital learning environment.

Moreover, access to technology directly impacts the success of multilingual education initiatives. For students who are not proficient in the dominant language of instruction, access to digital tools that support language translation and learning in their native languages can greatly enhance their educational experience (Baker, 2018). The study found that in institutions where such tools were available, students reported higher satisfaction with their learning outcomes. These findings highlight the importance of not only providing digital access but also ensuring that the technology supports diverse linguistic needs.

**2. Language Barriers and Digital Literacy**

The second theme revolves around the intersection of language barriers and digital literacy. While multilingual education offers great potential to accommodate linguistic diversity, the study found that digital literacy gaps often exacerbate language barriers. Students who are not proficient in English or other dominant languages of instruction frequently struggle with navigating digital platforms that do not offer sufficient support in their native languages (McKay, 2020). This challenge is particularly acute in South Africa, where 11 official languages coexist, and English is often the default in digital learning environments. The lack of multilingual support on digital platforms can alienate non-English speakers, making it difficult for them to engage with content and assessments effectively.

Digital literacy is another significant concern. Many students, especially in under-resourced areas, lack the basic digital skills required to navigate online learning platforms confidently (Mphahlele & Rambe, 2022). This lack of digital literacy exacerbates existing inequalities and prevents the full utilisation of technology in multilingual education. The study found that without adequate digital training and resources tailored to the linguistic needs of students, efforts to promote digital inclusion through multilingual education will likely fall short. Future strategies must include both technical training and language support to ensure that all students can engage meaningfully with digital learning tools.

**3. The Role of Educator Training in Digital and Multilingual Pedagogies**

A key finding of the study was the crucial role of educator training in promoting digital inclusion within multilingual education. Teachers often serve as the primary facilitators of technology integration in classrooms, yet many lack the necessary training to effectively implement digital tools in a multilingual context (Schoeman, 2019). The research revealed that teachers who were proficient in both digital tools and multilingual pedagogies were far more successful in fostering an inclusive learning environment. However, in many cases, educators lacked confidence or competence in using digital platforms, particularly when managing linguistically diverse classrooms.

Professional development programmes that focus on both digital literacy and multilingual education are essential to overcome this barrier (De Klerk & Glover, 2021). Educators need ongoing support and training to adapt to the rapidly changing technological landscape while also addressing the diverse linguistic needs of

their students. The findings suggest that teacher training must be a priority if digital inclusion in multilingual education is to be achieved. Schools and universities should invest in comprehensive training that equips educators with the skills to use technology effectively, particularly in linguistically diverse settings.

**4. Equity and Access in Digital Multilingual Education**

The study also highlighted issues of equity, particularly regarding access to digital education for students from marginalised communities. Equity in education is about ensuring that all students, regardless of their background, have the same opportunities to succeed. However, the findings indicate that students from low-income families and rural areas often face significant barriers in accessing digital tools and multilingual resources (Czerniewicz & Brown, 2019). These barriers include not only a lack of infrastructure but also socio-economic challenges that limit students' ability to engage fully with digital learning environments.

Addressing these inequities is crucial for the future of digital inclusion in education. The study suggested that targeted interventions are needed to provide additional support for disadvantaged students. For example, subsidising digital devices and internet access, particularly in rural areas, could help bridge the gap (Naidoo, 2021). Additionally, ensuring that digital platforms are designed with accessibility in mind, offering multilingual support, can further promote equity. As higher education institutions in South Africa and other developing countries continue to embrace digital transformation, ensuring that all students have equitable access to these technologies will be key to their success.

**5. Prospects for the Future: Technology and Multilingual Education**

The final theme focuses on the future prospects for digital inclusion in multilingual education. The study found that emerging technologies, such as artificial intelligence (AI) and machine learning, hold great promise for overcoming some of the current barriers to digital inclusion (Schneider et al., 2022). AI-driven language translation tools, for instance, could significantly reduce language barriers in digital learning environments, enabling students to access content in their preferred languages. Furthermore, the development of adaptive learning platforms that tailor content to the linguistic and learning needs of individual students could enhance both engagement and learning outcomes.

However, the study also cautioned against over-reliance on technology as a solution to educational challenges. While digital tools can enhance multilingual education, they must be used in conjunction with strong pedagogical frameworks that prioritise student engagement and equity. The findings emphasise that technology should be seen as a tool to support, rather than replace, traditional teaching methods. Looking to the future, the research highlighted the importance of continued investment in both technological innovation and human-centred approaches to education. By combining cutting-edge technologies with a focus on equity and inclusion, the prospects for multilingual education in South Africa and beyond are promising.

These five themes collectively underscore the complex relationship between digital inclusion and multilingual education, offering valuable insights for educators, policymakers, and stakeholders aiming to promote equitable access to digital learning.

**Discussion**

This study explored the integration of digital tools into multilingual education, focusing on South Africa's higher education landscape. The findings highlight several key insights into how digital platforms can both enhance and hinder educational experiences in linguistically diverse settings. This discussion contextualises these findings within the framework of the Technology Acceptance Model (TAM), which helps explain how and why users come to accept and use technology.

Firstly, the study confirmed that access to technology remains a significant barrier to digital inclusion in multilingual education. As Beukes (2020) found, disparities in access to digital resources are prevalent, particularly in rural and economically disadvantaged areas. The lack of reliable internet and digital devices directly impacts students' ability to engage with online learning platforms. These findings align with previous research by Czerniewicz and Brown (2019), who noted that technology access is uneven across different socio-economic groups. For technology to effectively support multilingual education, substantial investment in digital infrastructure is essential. Addressing these access issues is crucial for ensuring that all students can participate in and benefit from digital learning opportunities.

The second significant finding was the impact of language barriers on digital literacy. The study revealed that students who are not proficient in the dominant language of instruction often struggle with navigating digital platforms (McKay, 2020). This observation echoes the work of Mphahlele and Rambe (2022), who

found that language barriers can impede students' ability to fully engage with online learning resources. To mitigate this issue, digital tools must offer multilingual support and be designed to accommodate diverse linguistic needs. This finding underscores the importance of integrating language support features into digital platforms to enhance accessibility and usability for all students.

Educator training emerged as another critical theme. The study found that teachers often lack the necessary skills and confidence to use digital tools effectively in multilingual contexts (Schoeman, 2019). This finding highlights a gap in professional development, as teachers are crucial in facilitating technology integration. De Klerk and Glover (2021) emphasised the need for targeted training programmes that combine digital literacy with multilingual pedagogy. Investing in comprehensive educator training can empower teachers to utilise digital tools more effectively, thereby improving the learning experience for students.

The issue of equity was also prominent in the findings. The study highlighted that students from disadvantaged backgrounds face additional challenges in accessing and benefiting from digital education (Naidoo, 2021). This finding supports the work of Schneider et al. (2022), who argued that equity must be a central consideration in educational technology initiatives. To address these disparities, targeted interventions such as subsidised digital devices and internet access are necessary. Ensuring that digital platforms are designed with accessibility in mind can help bridge the gap between different socio-economic groups.

Looking towards the future, the study explored the potential of emerging technologies to address some of the challenges identified. AI-driven language translation tools and adaptive learning platforms offer promising solutions for overcoming language barriers and personalising learning experiences (Schneider et al., 2022). These technologies have the potential to enhance multilingual education by providing tailored support that meets the diverse needs of students. However, the study also cautioned against over-reliance on technology as a panacea. While digital tools can enhance educational outcomes, they must be used in conjunction with strong pedagogical frameworks that prioritise student engagement and equity.

The findings also emphasised the importance of a holistic approach to digital inclusion. Integrating technology into multilingual education requires not only access to digital tools but also a supportive learning environment that considers linguistic diversity (Baker, 2018). Effective implementation of digital tools involves addressing both technical and pedagogical challenges. This includes designing platforms that are user-friendly and offer multilingual support, as well as providing adequate training for educators. By adopting a comprehensive approach, educational institutions can maximise the benefits of digital tools while mitigating potential drawbacks.

In line with the Technology Acceptance Model (TAM), the study's findings suggest that perceived ease of use and perceived usefulness are critical factors influencing the acceptance of digital tools in multilingual education (Davis, 1989). Students and educators are more likely to embrace technology if they perceive it as beneficial and easy to use. Therefore, designing digital platforms that are intuitive and offer clear value can enhance their adoption and effectiveness in multilingual contexts.

The study also highlighted the role of social constructivist theory in understanding the interaction between technology and learning (Vygotsky, 1978). According to this theory, learning is a social process that is shaped by interactions with others and the environment. Digital tools should therefore be integrated in a way that supports collaborative learning and allows for meaningful interaction among students. By aligning technology use with the principles of social constructivism, educational practices can better support students' learning processes.

Additionally, the study's findings underscore the need for continuous evaluation and improvement of digital tools in education. As technology evolves, so too should the strategies for integrating it into teaching and learning. Regular feedback from students and educators is essential for refining digital platforms and ensuring they meet the evolving needs of users (Czerniewicz & Brown, 2019). Ongoing assessment and adaptation can help maintain the relevance and effectiveness of digital tools in multilingual education.

This study provides valuable insights into the challenges and opportunities of integrating digital tools into multilingual education. By addressing issues related to access, language barriers, educator training, and equity, educational institutions can enhance the effectiveness of digital learning environments. The findings also suggest that emerging technologies, when used thoughtfully and in conjunction with strong pedagogical frameworks, have the potential to significantly improve multilingual education. Future research should continue to explore these themes and evaluate the impact of new technologies on educational outcomes.

**Implications of the Study and Recommendations**

The study's findings underscore several critical implications for enhancing digital inclusion in multilingual education. One major implication is the urgent need to address the disparities in access to digital resources. The research highlighted that students in economically disadvantaged areas often lack the necessary technology and internet connectivity to fully engage with online learning platforms (Beukes, 2020). To bridge this gap, it is essential for policymakers and educational institutions to invest in infrastructure improvements, such as expanding internet access and providing affordable digital devices. This investment can help ensure that all students, regardless of their socio-economic background, have the opportunity to benefit from digital learning.

Another key implication is the necessity of incorporating multilingual support into digital platforms. The study found that language barriers significantly hindered students' ability to navigate and utilise online resources effectively (McKay, 2020). Therefore, educational technology developers should prioritise designing platforms with built-in multilingual support and user-friendly interfaces. Providing resources in multiple languages and offering translation tools can help accommodate diverse linguistic needs and improve accessibility for all students.

The findings also point to the critical role of educator training in the successful integration of digital tools. The study revealed that many teachers lack the skills and confidence to use technology effectively in multilingual settings (Schoeman, 2019). To address this, it is recommended that institutions implement comprehensive professional development programmes. These programmes should focus on equipping educators with both technical skills and pedagogical strategies for using digital tools in diverse classrooms. Enhanced training can empower teachers to leverage technology to support their students' learning more effectively.

Equity in digital education is another significant concern highlighted by the study. The research showed that students from disadvantaged backgrounds face additional challenges in accessing and benefiting from digital resources (Naidoo, 2021). To promote equity, it is essential to develop targeted interventions such as subsidised technology and tailored support programmes. These initiatives can help ensure that all students have equal opportunities to engage with digital education, regardless of their socio-economic status.

The potential of emerging technologies, such as AI-driven tools and adaptive learning platforms, was also a prominent finding. These technologies offer promising solutions for personalising learning experiences and overcoming language barriers (Schneider et al., 2022). However, it is important to use these technologies thoughtfully and in conjunction with effective pedagogical practices. Educational institutions should evaluate the effectiveness of these tools regularly and ensure they are implemented in a way that enhances learning outcomes without introducing new challenges.

A holistic approach to digital inclusion, which considers both technical and pedagogical aspects, emerged as a key recommendation. The study emphasised that integrating technology into multilingual education requires more than just providing digital tools; it also involves creating a supportive learning environment that addresses linguistic diversity (Baker, 2018). Educational institutions should adopt a comprehensive approach that includes designing user-friendly platforms, providing adequate training for educators, and ensuring equitable access to resources.

The study's findings also suggest the need for continuous evaluation and adaptation of digital tools. As technology evolves, so too should the strategies for integrating it into education. Regular feedback from students and educators is crucial for refining digital platforms and ensuring they remain relevant and effective (Czerniewicz & Brown, 2019). Ongoing assessment can help identify areas for improvement and ensure that digital tools continue to meet the needs of diverse learners.

In conclusion, the study provides valuable insights into enhancing digital inclusion through multilingual education. Addressing issues related to access, language barriers, and educator training can significantly improve the effectiveness of digital learning environments. By implementing targeted strategies and embracing emerging technologies, educational institutions can promote equity and enhance learning outcomes for all students. Future research should continue to explore these areas and evaluate the impact of new digital tools on educational practices.

**Conclusions**

In conclusion, this study has highlighted the critical need for enhancing digital inclusion in multilingual education, particularly within the context of developing countries like South Africa. The findings underscore that while digital platforms hold significant potential for improving educational access and outcomes, several challenges remain, such as disparities in technology access, language barriers, and the need for comprehensive educator training. To address these issues, it is crucial for policymakers, educational institutions, and

technology developers to work collaboratively to implement practical solutions. This includes investing in infrastructure, integrating multilingual support into digital tools, and providing targeted professional development for educators. By addressing these challenges and embracing emerging technologies, the future of multilingual education can be significantly improved, ensuring that all students have equitable access to high-quality digital learning opportunities.

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