

*Attitudinal Predispositions of First Year Preservice Teachers to
Technology Integration in Pedagogy*

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Abstract

There is growing cognizance of the potential of technology integration in pedagogy for enhanced educational experiences, though for sub-Saharan Africa, there is evident opacity of the concept due to the region's unique challenges slowing down bridging of the technological gap between developing and developed regions. However, improved technology integrated pedagogical practices heavily rely on the beliefs and attitudes of educators. It is imperative for teacher educators to understand these attitudes for teacher preparation. This paper informed by the unified theory of acceptance and use of technology (UTAUT) is the first cycle of three studies. This first cycle investigates the attitudinal predispositions of first-year preservice teachers towards the integration of technology in pedagogical practices as a case study of one university in South Africa. 400 first year students enrolled in the Bed program were purposively sampled to respond to questionnaires and a subsample of 20 responded to focus group interviews. Through descriptive statistics and thematic analysis, findings indicated that, although students acknowledged the importance of technology in education, educational backgrounds, cultural contexts, personal experiences and institutional support influenced their attitudes towards use of technology in pedagogy. The study provides insights for the development of dedicated strategies for teacher training programs such as professional development innovations to foster positive attitudes towards technology in pedagogy.

Keywords: Attitude, Predispositions, Technology Integration, Technology Gaps

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Introduction

In recent years, there has been a growing recognition of the potential of technology integration in pedagogy to enhance educational experiences. Nevertheless, its effective use at grassroots levels in the classrooms has challenged teachers in the sub-Saharan African region (Kao et al., 2020). Technology offers countless possibilities for transformative teaching and learning (Dursun, 2019), together with enhanced opportunities for interactive, active engagements and personalized pedagogical experiences (Marbán & Sintema, 2021). However, in sub-Saharan Africa, realizing these benefits is hindered by unique challenges, triggering the evident opacity around the concept at the same time slowing down concerted efforts by various governments to bridge the technological gap existent between developing and developed regions (Mammen et al., 2023). Although it is glaringly evident that technology integration for the classroom has positive results and that it provides for 21st century skills acquisition for students (Sungur-Gül & Ateş, 2021), which has created interest in educators, policymakers and teachers (Dong & Xu, 2021), actual implementation has dodged practitioners in the region.

For technology mediated pedagogical practices to be successful, the attitudes and beliefs of educators are critical in the implementation process (Sungur-Gül & Ateş, 2021). Pre-service teachers are of particular interest because they represent the next generation of educators (Marbán & Sintema, 2021), therefore, are integral to the shaping and mapping of the future of education. Consequently, teacher educators must understand the attitudinal predispositions of pre-service teachers towards technology integration for effective teacher preparation and wherever possible, re-shaping them to suit 21st century educational demands (Saleh et al., 2023). We argue that effective integration of technology in educational practice is dependent not only on availability of resources but to a large extent, on how practitioners conceive their use and what prospects the same educators have about the learning outcomes they can produce. In this sense, the purpose of study is to explore how first-year pre-service teachers perceive integration of technology in teaching and learning and that which influences their attitudes towards technology use for practice.

Review of Related Literature

Global Perspectives on Technology Integration in Teacher Education

Technology integration in teacher education has developed into a global phenomenon, influenced by a variety of factors that include economic conditions, policy initiatives and cultural attitudes towards education (Chigona et al., 2024). In most developed nations, such as Canada, the United States, and some parts of Europe, emphasis is on incorporating digital technologies into the curriculum. Such a focus is driven by national as well as regional policies advocating for modernized educational practices aimed at better preparation of students for a technology driven 21st century world (Anderson, 2016; Roumell & Salajan, 2016). For instance, the United States' National Education Technology Plan puts emphasis on the need for preservice teacher preparation programs that equip them with skills necessary for effective technology integration into their pedagogical practices (Torchia, 2024; US Department of Education, 2024). Similarly, the European Commission launched initiatives such as the Digital Education Action Plan as a way of fostering digital competencies among educators and students (Anderson, 2016; Zhan, 2022).

Asian countries have a diverse landscape of technology integration in preservice teacher training (Hong & Songan, 2011; Zhan, 2022). Nations like Singapore and South Korea are vanguards in ICT in education, incorporating advanced technologies in the form of robotics and artificial intelligence into their educational systems (Chitturu et al., 2017; Roy, 2018; UN.ESCAP, 2018). South Korea is committed to technology in education as evidenced by its “Smart Education” initiative that seeks a transformation from traditional pedagogical methods to technology enhanced learning environments (Seo, 2013; Roy, 2018; Lim & Kye, 2019; So et al., 2023). Singapore on the other hand focuses on developing “future-ready” students through comprehensive teacher training in the use of ICT as a way of fostering innovative teaching methods (Almazroa & Alotaibi, 2023). Conversely, countries like India are still trying to scale their technological infrastructure to ensure equitable access to digital tools and closing gaps across urban and rural areas (Bandyopadhyay et al., 2021; Balli & Singla, 2024). Nonetheless, India is making significant strides through programs such as the National Mission on Education through ICT that is aimed at providing quality educational content using digital platforms (Balli & Singla, 2024).

Latin America is making progress in the integration of technology into teacher education, albeit at a wide-ranging pace (Gómez-Galán, 2021). Countries such as Chile and Brazil have evolved national policies to promote use of digital technologies for the classrooms. ProInfo program is Brazil’s one such initiative whose purpose is the enhancement of digital literacy among students and teachers by providing access to the internet and computers in public schools (de Souza Borges, 2021). Similarly, Chile’s Enlaces program was intended for enabling the integration of digital technologies into the education system, providing necessary training for teachers and resources in schools to effectively incorporate technology in their pedagogical practices (Fowler & Vegas, 2021).

In contrast, developing countries face unique opportunities and challenges vis-à-vis technology integration in preservice teacher training (Ifinedo & Kankaanranta, 2021). Countries in sub-Saharan Africa, for instance, often wrestle with limited resources and access to technological infrastructure (Chigona et al., 2024). However, innovative approaches are emerging in different nation states to address gaps and barriers. For example, mobile technologies are being leveraged in countries where there is limited traditional computer access. There are initiatives like the "Teacher Laptop Initiative" in Kenya where teachers are provided with laptops and training enhancing their digital literacy as well as pedagogical skills (Omito, 2021). Additionally, organizations like UNESCO and others are working to support developing nations globally through programs premised on improving information and communication technology (ICT) competencies for educators (Wambugu et al., 2017).

Technology integration has emerged as perhaps the most complex and challenging aspect of designing and mapping educational systems of instruction (Almazroa & Alotaibi, 2023). The international landscape of technology use in teacher training is characterized by a variety of approaches and experiences. Developed nations are leading with advanced comprehensive policies and infrastructure (Anderson, 2016), while on the other hand, developing countries are trying to find innovative solutions towards overcoming resource constraints (Chigona et al., 2024). Regardless of context, a common thread running across all countries is the appreciation of the crucial role technology plays in the preparation of future educators who would meet 21st century demands of an emergent digital world.

Global Trends and Best Practices

Current global trends in technology integrated teacher training underscore a significant shift in favor of interactive and immersive learning environments (Trevisan & De Rossi, 2023). One of the most outstanding trends is the embracing of blended learning models, combining traditional face-to-face instruction with online digital learning components (Saleh et al., 2023). The approach provides preservice teachers with experiential first-hand challenges and benefits of integrating ICT for their future practice. For example, higher education and teacher training programs globally have increasingly reverted to Learning Management Systems (LMS) such as Moodle, blackboard and Canvas for course content delivery, student assessment and to facilitate discussions (Balli & Singla, 2024). This does not only acquaint preservice teachers with the digital tools likely to be encountered in their professional lives but also makes provision for a personalized and flexible learning experience catering to various learning needs.

The other emerging trend in teacher education globally is the use of virtual reality (VR) and augmented reality (AR) (Samala et al., 2023). These are simulated classroom environments offered to preservice teachers through technology where they can practice their teaching skills as well as classroom management without the need for the high risks of a real classroom. VR and AR applications are able to create realistic scenarios quite challenging to preservice teachers to exercise critical thinking and adaptation to diverse teaching situations (Al-Ansi et al., 2023; Alalwan et al., 2020). For instance, platforms like TeachLivE afford a mixed-reality environment in which preservice teachers are able to interact with virtual students where immediate feedback is received towards improving their instructional techniques (Ersozlu et al., 2021). Such innovative approaches help to bridge the theory and practice gap at the same time allowing future teachers to gain practical experiences in controlled and supportive environments.

Collaborative learning by way of a variety of digital platforms is gaining traction as best practices in preservice teacher training (de Souza et al., 2022). With the emerging global connectivity, preservice teacher training programs are exploiting tools such as Microsoft teams, Google Workspace, and Zoom for ease of peer learning and joint projects across differing geographical locations (Bandyopadhyay et al., 2021; Samala et al., 2023). These platforms allow preservice teachers to collaborate on shared resources, lesson planning, and be involved in professional learning communities (PLCs) outside physical distance. This collaboration tends to improve their communication and digital literacy skills at the same time exposing them to a multiplicity of educational perspectives and practices (Kao et al., 2020; Trevisan & De Rossi, 2023). As they participate in such global learning networks, they tend to develop broader appreciation of educational challenges and solutions, creating more effective and culturally sensitive future educators.

Focus on digital inclusion and equity is increasingly becoming important in technology integration for teacher education (Bailey & Nyabola, 2021; Katz et al., 2023; So et al., 2023). Recognizing that access to digital resources and technology is unevenly distributed especially in the sub-Saharan Africa region, many teacher education programs are now prioritizing strategies that ensure all preservice teachers, with their divergent socio-economic backgrounds, have equal access to technological tools and training (Deganis et al., 2021; Jules, 2023; Chigona et al., 2024). Initiatives such as ensuring robust internet access, providing affordable devices and comprehensive training on inclusive pedagogical practices have become essential components towards transformational educational practices (Deganis

et al., 2021). Programs premised on digital equity tend to prepare preservice teachers in spearheading the mitigation of the digital divide when they join the world of work promoting the global goal of inclusivity, equality and equity in learning environments that benefit all students from technology-enhanced education for a just educational landscape.

Attitude and Technology Adoption for Pedagogy

Preservice teachers' attitudes have a significant impact and influence on the adoption of technology in teaching and learning, creating entrenched perspectives for the educational experiences of future educators. Positive experiences with technology in the course of training and exposure to a variety of tools and their uses brings with it efficacy and positive attitudes for intended use (Dursun, 2019; Marbán & Sintema, 2021), a greater willingness to integrate is realized. Such openness to technology is critical in modern classrooms, as digital literacy is increasingly becoming a fundamental skill for survival in the 21st century information driven economy (Kao et al., 2020). When preservice teachers become cognizant of the potential of ICT in the enhancement of learning and students engagement, more often than not, would experiment with and become innovative adopters of trending technology supported teaching methods. This proactive approach is the basis for setting precedence for professional development, where continuous technological adaptation is the norm (Sungur-Gül & Ateş, 2021).

Preservice teachers' attitudinal dispositions towards technology Overallly get shaped by the training programs they undergo as undergraduates and also the type of support they received during that critical period (Saleh, et al., 2023). While it is important that teacher preparation programs should provide hands-on experience with digital tools to significantly influence preservice teachers' attitudes, for sub-Saharan Africa, though the will might be there, challenges involving educators' efficacy and student access to tools may mitigate these anticipated outcomes (Dilling & Vogler, 2023). Attitude change through extensive experiential learning is among the practical ways of scaling the digital divide as attitude would drive technology initiatives wherever these future educators would find themselves deployed where traditional methods are still prevalent. With access to resources and surrounded by supportive mentors in the form of educators at entry point into university, attitudes are most likely to be skewed towards positivity which increases hope for the region to actively participate in the global village.

Research Questions

1. What are first-year preservice teachers' attitudes and beliefs towards integration of technology?
2. What are the first-year preservice teachers' views and experiences on the integration of technology for their own teaching?

Theoretical Framework

This study is premised on the Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT was evolved as a comprehensive model to address the inconsistencies and limitations of existing earlier models (Riaz & Adnan, 2016, Vankatesh et al., 2003). It predicts and explains behaviors of users towards technology adoption and usage (Momani, 2020). Propounded by Venkatesh, Morris, Davis, and Davis in 2003, UTAUT is a blending of eight elements from other models of technology acceptance, among them Technology

Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Social Cognitive Theory (SCT) (Venkatesh et al., 2003). The UTAUT framework also presents four basic determinants of intentions and practice behavior, namely, Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions (Alblooshi et al., 2021), together with four moderating factors given as gender, experience, age and voluntariness of use as influencers of the impact of the determinants on technology adoption (Momani, 2020).

In the context of studying the attitudinal predispositions of first-year preservice teachers' technology use in pedagogy in a developing country university, UTAUT is highly relevant. The framework provides multiple dimensions into factors influencing preservice teachers' willingness to embrace and integrate technology in their teaching practices, for intentional interventions (Momani, 2020). For developing countries, where common challenges are limited access, inadequate infrastructure, and prevalence of low levels of technology literacy, knowledge of these determinants is critical. The theory's emphasis on performance expectancy assists in identifying extent of preservice teachers' beliefs in technology use for teaching effectiveness and outcomes. Effort expectancy enlighten on perceived ease of use, an essential aspect in contexts where it is common for teachers to face barriers to technological skills acquisition (Venkatesh et al., 2021). Peer and institutional support in attitudes shaping towards technology is examined through the social influence construct, while facilitating conditions deals with the resource availability and support mechanisms requisite for effective integration (Alblooshi & Hamid, 2021).

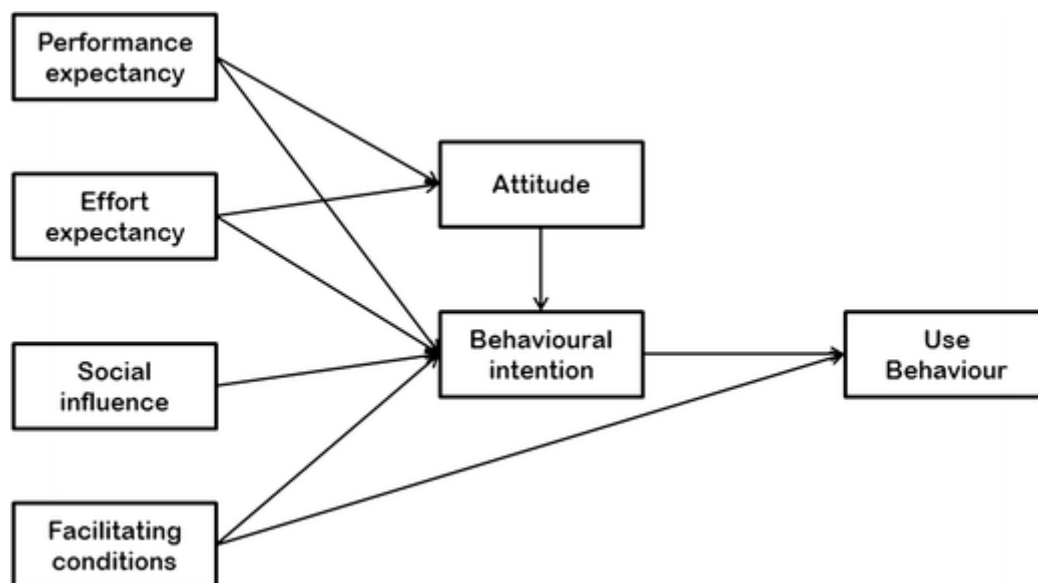


Figure 1: Proposed theoretical framework (Source: Adapted from Venkatesh et al. 2003)

Methodology

The primary purpose of this study is to understand the attitudes that preservice teachers have towards technology integration in pedagogy at their point of entry into university. A mixed methods design (Creswell, 2014) was used in tandem with the principles of the pragmatic paradigm (Thorne, 2014). This paradigm is appropriate as it seeks understanding of both subjective meanings and experiences individuals assign to their interactions with technology and also describe the attitudes in relation to educational settings. The underlying principle of this methodology is to unearth the perceptions and beliefs that have shaped the attitudes preservice teachers have towards technology in pedagogical practices. This approach was

chosen with a view to gathering data to inform the research questions and lens provision for the interpretation of participants' viewpoints (Creswell, 2014).

Sample

The research assumed a sequential explanatory design in two phases. Random and Purposive as well as convenience sampling were employed to select 400 participants who provided rich, relevant data on the topic. Phase one of the study involved random sampling for questionnaire responses. Specifically, the study targeted 400 first-year students enrolled in an education program at one selected university in South Africa. Phase two was purposive sampling for participants who had direct experiences with the integration of technology in their initial teacher education courses, while convenience sampling facilitated recruitment of participants who were readily accessible to the researcher and willing to participate in the study in the focus group discussions. Out of the 400, a sub-set of 20 took part in focus group discussions as part of phase two. The methodology provided contextualized understanding of the preservice teachers' attitudes towards technology and the factors which influenced them for data based professional development programs. Data analysis for phase one of the study used descriptive and inferential statistics as it was quantitative data while in phase two of the study, a thematic approach was used for qualitative data from focus group discussions.

The aim of the research was explained to the participating preservice teachers that it was voluntary in nature and they were free to withdraw from the study without explanation at any stage of the research. The researchers explained issues of confidentiality, consent and anonymity. For phase one of the data collection, a five-point Likert scale for the questionnaire was used where 1 represented strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree. All the students (400) 100% responded to the questionnaire, of which 32% were males, 66% females and 2% indicated as other. Participant ages were 60% under 20, 34% for 21-25 age group, 4% for the 26-30 and 6% were above 31 years old. Phase two was focus groups discussions. There were 4 groups each comprising 5 participants.

Variables of the Study

The variables for the study were grouped under five main headings according to the UTAUT model for data collection for the questionnaire in phase one as indicated in Table 1.

Variables of the research model Construct	Measure item
Performance Expectancy	<ul style="list-style-type: none"> i. Learning with technology enhances student engagement and motivation ii. Technology facilitates supportive environments and collaboration iii. Technology improves my confidence to teach with technology in my future classroom
Effort expectancy	<ul style="list-style-type: none"> i. I prefer learning with technologies than without ii I feel confident in my ability to learn new technologies iii. I feel confident in my ability to use technology in my future classroom
Social Influence	<ul style="list-style-type: none"> i. Technology is the needed 21st century skill for teaches. ii. My peers and lecturers think that I should use technology in my teaching iii. It is expected for teachers to use technology in their pedagogical practices.

Facilitating Condition	<ul style="list-style-type: none"> i. My teacher training program is adequately preparing me to integrate technology ii. I am aware of technological tools that assist in teaching my subject matter iii. The university is providing training to increase confidence and competence
Behavioral Intention	<ul style="list-style-type: none"> i. I intend to work hard at promoting technology use ii. I intend to learn as much as I can about technology integration in my area iii. I will use technology for learning in my future classroom

Table 1. Variables of the Study

Phase Two

Focus Group Discussion

1. What is your opinion of the integration of technology in education?
2. What can you say about the way you are being prepared by the university to teach using technology when you begin your profession?
3. Do you have suggestions for improving teacher training programs to better prepare you for technology integration?
4. Is there anything else you would like to share regarding your future technology integration intentions?

Results and Discussions

Students' attitudinal dispositions were explored using the UTAUT constructs. 77% of the students had high performance expectancy. Students agreed that their present exposure to technology integration was a motivating factor which improved engagement during learning. Ersozlu et al., (2021) concur that technology integration with pedagogy enhances student engagement and is a significant motivator in the classroom. Ease of use is a strong motivator in the adoption of technology especially in education (Sao, 2013) and the generality of students (82%), agreed under effort expectancy that learning is made easier with technology than without. This is in line with findings by Almazroa & Alotaibi (2023) that 21st century requisite skills for teachers should integrate technology in their pedagogical practice to match global everyday life practices. With regards to facilitation conditions which considerably influence adoption, 73.6% concurred that the way they were being trained as teachers was adequately preparing them to integrate technology when they join the teaching profession. This corresponds with findings by Herro (2021) that teacher educators whose technology proficiency rate was high tend to have positive beliefs, attitudes and practices about technology integration which they were most likely to pass on to their students.

Due to this high exposure to technology integrated lessons, students indicated a high awareness of technological tools and applications that can assist in teaching and learning at 65.96%. 79.71% agreed that the training offered by the university in technology integration in pedagogy was improving their confidence and competences in the use of technology in the classroom. Findings by Panakaje et al. (2024), concur with these results when they indicated that high support from institutions contribute significantly to improved teacher performance as well as students' engagements through integration of technology. In relation to future intentions in incorporating ICTs in their future classroom practices, participants indicated a high intention of 81.3%. This is consistent with Eksail and Afari, (2019) who posit that

exposure to technology use during training enhances students' intentions to adopt the same for their future classrooms.

Findings from the focus group discussions were in tandem with the findings in phase one from the questionnaire survey. Performance expectancy had students indicating highly positive attitudes towards technology use in teaching and learning. This was in line with Lim & Kye (2019) whose findings showed that the way teacher educators would use technology in their interface with the students impacts the same students' future technology adoption significantly. According to Alalwan et al. (2020), ease of use is a huge motivator for classroom practitioners in adopting certain types of technology reflecting on their attitudes towards its effectiveness in concepts transmission.

When asked for suggestions towards improving teacher training programs, the generality of students indicated that they would be better prepared if the university would provide a variety of gadgets that included tablets instead of those computers only found in computer labs so that they can learn as much as possible to increase their efficacy and confidence. Eksail & Afari, (2020) found out that the more confident and skilled the teacher is, the more they would integrate the technology in their own practice. Behavioral intentions were all positive from the students. Despite the fact that many students from the rural campus indicated lack of prior experience in technology use, they were positive that they would integrate it in their future teaching because of the training they were receiving as preservice teachers, which is an indicator of positive attitudes.

Conclusion

The study clarifies the critical role of fostering the right attitudes among preservice teachers to bridge digital gaps in schools. Pertinent to the findings were the need for an adequately trained educator to model and professionally develop preservice teachers for technology integration in their own practices. The UTAUT provided this study with a worthwhile framework for understanding the attitudinal dispositions of first-year preservice teachers towards technology integration in pedagogy. The study results showed that even though a significant number of preservice teachers had none to limited prior knowledge of computers, they were however, positive towards technology integration in the provision of relevant education. The generality of preservice teachers gave their intention to learn as much as they could of technology integration preparatory for their teaching careers, indicating a positive attitude towards technology integration with pedagogy.

Findings provided insights for professional development when participants indicated that the consistent and relevant use of technology in teacher training improve students' attitudes towards technology use in pedagogy for their own practices. This study further demonstrated how training environments influence attitudinal dispositions in first-year preservice teachers which would in turn influence their intentions for use for their future classrooms. The results indicated the need to develop dedicated strategies for teacher training programs such as professional development innovations to foster positive attitudes towards technology in pedagogy.

This study recommended focused use of technology for pedagogy by teacher educators for modelling purposes. There is also need for the provision of adequate infrastructure to support technology use in teacher training programs. Further recommendations included suggestions that teacher educators be adequately equipped to mentor preservice teachers from

backgrounds with technology gaps to provide equal opportunities to learn. This is more relevant considering that most students from under resourced backgrounds like rural and township schools enter university without prior knowledge of ICTs.

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