

INVESTIGATING THE INTEGRATION OF DIGITAL TECHNOLOGIES IN THE SENIOR PHASE IN SOUTH AFRICAN TECHNICAL SCHOOLS

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Abstract: Throughout the history of teaching and learning, changes such as the use of calculators and computers have been recorded to be opposed before most teachers could be comfortable with such change. The Department of Basic Education has drafted a policy for implementing current technologies in schools as part of the Technology Learning Area (TLA). This study seeks to explore the extent to which schools have adopted and integrated current technologies in the Senior Phase. The study is guided by the technology acceptance model (TAM) to assist in investigating the extent of integrating current technologies in technical schools. TAM enabled the researchers to identify the factors influencing the acceptance and use of these technologies in schools. A qualitative study was conducted to derive what the literature and school educators are saying about the phenomenon under inquiry. Data was gathered through interviews with the educators and classroom observations. Content analysis was employed to analyse the qualitative data. The results have revealed that the extent to which teachers implement new technologies in the classroom teaching and learning context is dependent on the availability of resources and skills. The participants indicated the use of overhead projectors as a prominent technology they use for teaching and learning. Furthermore, the participants stated that the Department of Basic Education does not provide in-service training regularly to upskill educators in relevant software and applications relevant to their subjects. It could therefore be concluded that educators need ongoing in-service training to keep up with the evolving technologies. The Department of Basic Education may partner with the institutions of higher education to assist with ongoing training for educators on new technologies.

Keywords: teaching and learning, digital technologies, technology acceptance model, technology learning area

Introduction

The evolving technologies through the centuries did not exclude the education setup. Although the initial developments in technologies aim at economic enhancement, teaching and learning in schools eventually

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become the focus for adapting to changes in the business world. Howard and Mozejko (2015) explained that the three pre-digital technologies which were introduced in schools were film, radio, and television, which were not adopted as expected in schools, as their design was based more on responding to the needs of the whole family. Hence, these technologies were more commonly found in homes than in schools. Transformation into computer-based instruction, simulations, and online resources enhanced the learning experiences, particularly in medicine and engineering (Kozma, 2003; Voogt & Robin, 2012). Technical education, which initially focused on practical hand skills, was also influenced and transformed by evolving industrial demands and computerised machinery (Kearns, 2018). Technology, as a school subject in the Senior Phase in South Africa, seeks to equip learners with basic skills and knowledge in electrical, mechanical, civil, and engineering graphics using digital tools and information technology and communication platforms (Blose & Ndlovu, 2023).

Adopting new and digital technologies in the teaching and learning space at the school level and the tertiary level has become increasingly crucial in the 21st century to imparting learners with relevant and up-to-date skills and knowledge. Lohr et al. (2024) argue that, for learners to acquire relevant skills and knowledge, the digital technologies used in the classroom must help learners achieve specific subject outcomes. Therefore, the researchers agree that the integration of digital technologies should be inclined towards the subject area to achieve subject-related positive impact. Thus, both the teacher and learners should be hands-on in the use of these digital technologies during teaching and learning sessions. The correct or encouraged manner of adopting digital technologies in secondary schools is essential for enhancing teachers' pedagogical practices and effective classroom time management (Phunyal, 2023). However, Lohr et al. (2024) found that most teachers use passive digital learning activities, leading learners to absorb only the information relayed to them and not actually gain digital knowledge and skills. DBE (2018), in the Professional Development Framework for Digital Learning, defines digital learning as the use of "appropriate digital tools and resources to strengthen a teacher's teaching and learner's learning experience resulting in more effective achievement of curriculum learning objectives." Thus, the framework acknowledges that the encouraged integration of digital technologies includes the acquisition of subject-specific technological skills by both the teacher and the learner.

The Department of Basic Education (DBE) began training departmental officials to advance the integration of digital technologies by implementing coding and robotics as a core subject in addition to the Technology curriculum in the Senior Phase in South African schools. According to the DBE (2024), coding and robotics, as a multidisciplinary subject, consists of various components, including Technology, Engineering, Arts, and Mathematics (STEAM). However, coding and robotics, as core subjects, are directly related to

mechanical engineering, electrical engineering, computer science, and the arts. Technology education within the technical school environment consists of various technical subjects, such as mechanical technology, electrical technology, civil technology, and engineering graphics, excluding computer science. Therefore, the inclusion of coding and robotics was a great idea for advancing the integration of digital technologies within technical education.

Research shows that incorporating coding and robotics into the school curriculum offers various advantages for learners, including enhancing problem-solving skills, creativity, teamwork, critical thinking, logical reasoning, and innovative abilities (Vigdor, 2018; Resnick, 2017; Yardi, 2017). Furthermore, Kolodner (2007) suggests that coding and robotics curriculum in schools be linked to real-world applications to enhance computational thinking and problem-solving skills (DBE, 2019; Brennan, 2015). Therefore, against this background, this study explores the extent of digital technologies integration in some technical secondary schools in South Africa. Alam (2018) argues that the current educational system fails to develop learners into becoming global citizens in the current digital world. Thus, pre-service teachers must also be prepared to embrace the present and future digital technologies related to the subjects they specialise in. This will enable them to create interactive, technology-infused learning environments in classrooms when they start their teaching careers. Scherer and Brito (2020) also contend that the integration of digital technologies must include a continuous process that involves educator development and the adoption of various software and applications that contribute to the attainment of subject and curriculum objectives. Therefore, the department, schools, educators, and learners must be active participants in the process of digital technologies integration.

The role of the teacher

Integration of current digital technologies in the classroom begins with lesson preparation aligned with stipulated subject outcomes. The teacher's digital competencies should not be basic like those of general community members, but rather more embedded in the subject they teach (Lohr et al., 2024). This way, the teacher will also be able to choose the relevant application or software that would ignite learners' interest and their interaction with the technology in relation to the subject content. The teacher must have a sound knowledge of the subject and be pedagogically competent to deliver the subject content. The DBE (2018) identifies three key competencies that teachers should obtain regarding digital teaching and learning. They are professional growth and knowledge, curriculum focus, and leadership. Professional growth and knowledge refer to teachers' ability to research digital technologies relevant to the subjects and topics in their subjects. The teachers must be lifelong learners who reflect on their roles and students' roles during the lessons that integrate digital technologies to attain subject-specific objectives (Lohr et al., 2024;

DBE,2018). Curriculum focus refers to the adoption of digital technologies to enhance learners' understanding and content-based application of digital tools. Leadership competency talks to running with the departmental and school digital vision and initiating collaborations and workplace learning with peers (Alam, 2018).

Teachers' experiences

Phunyal (2023) interviews with teachers showed that appropriate integration of digital technologies in the classroom promotes learner participation and enhances the achievement of subject outcomes.

Benefits of integrating digital technologies in the classroom

Alam (2018) states that digital technologies stimulate engaged and active participation of learners. Therefore, enhancing knowledge acquisition and construction among learners, promoting explorative and inquisitive behaviours, as well as increasing profitable digital application towards learning. Sharlovykh et al. (2023) further add that the current digital technologies develop creative abilities, intellectual enhancement, and professional competencies among the students. Furthermore, Majdoub et al. (2024) agree that the integration of digital technologies in the teaching and learning space must promote socio-affective engagement, referring to enjoyment, value, and positive relationships out of collaborations. Also, the integration of digital technologies must become a psychological investment that develops learning and learner cognitive abilities (Majdoub, 2024).

Challenges towards integrating digital technologies in the classroom

Scherer and Brito (2020) contend that the main challenge in integrating digital technologies into the classroom begins with policymakers who do not adapt curriculum objectives that include skills and knowledge in digital technologies in the subject outcomes. Majdoub et al. (2024) add that the current integration of digital technologies in the classroom is teacher-centred and not learner-centred. Therefore, this could not be regarded as bearing the aspired methods of digital technologies integration that promote learner participation in acquiring subject-related digital technologies skills and knowledge.

Theoretical framework

A popular theoretical paradigm for explaining how people accept and adopt technology is the technology acceptance model (TAM) (Davis, 1989). Perceived usefulness (PU) and perceived ease of use (PEU) are two important variables that affect technological acceptance, according to TAM (Davis, 1989; Natasia et

al., 2022). Users are more likely to embrace and adopt technology when they believe it to be helpful and simple to use (Marikyan & Papagiannidis, 2024; Venkatesh & Davis, 2000)

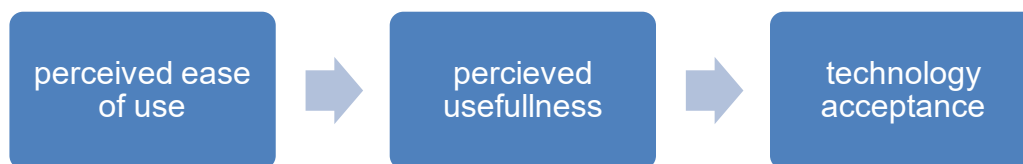


Figure 1: Technology Acceptance Model from (Davis, 1989)

The initial technology acceptance model had two main constructs or variables, perceived usefulness and perceived ease of use, that would lead to acceptance or rejection, and later, extra variables were added, namely attitude towards use and system usage (actual use) (Julianto et al., 2018). Perceived usefulness is defined as the teachers' judgement of the employability of technology in teaching and learning as important or not really necessary (Bothma & Mostert, 2023). Perceived ease of use is teachers' observation of the user-friendliness of technology for work-related tasks, which is hassle-free and minimises work demands or speeds up the task completion (Bothma & Mostert, 2023). The attitude towards use of technology is said to be influenced by teachers' behavioural intentions, including subjective norm, image, job relevance, output quality, result demonstrability, voluntariness, facilitating conditions, and self-efficacy (Schorr, 2023).

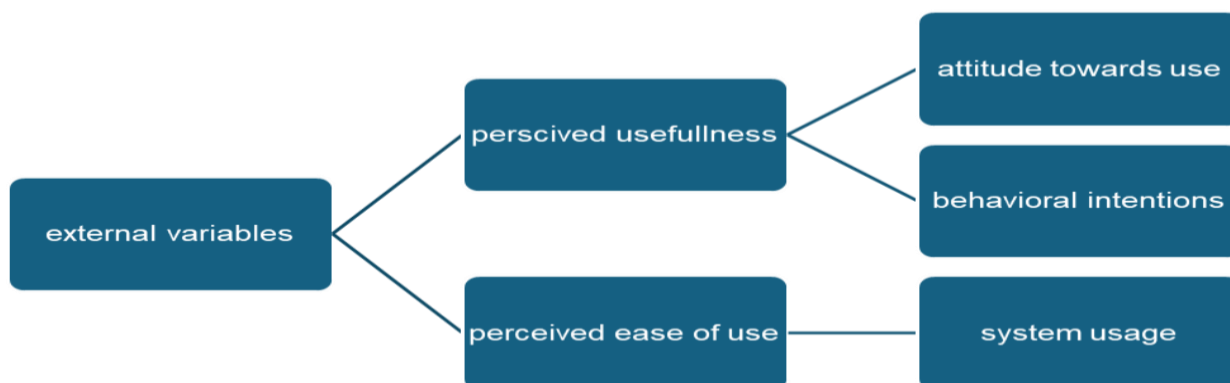


Figure 2: Extended TAM Flow Chart adapted from (Davis, Bagozzi & Warshaw 1989)

Problem statement

Adopting current technologies into the South African school system is a great idea. However, research shows a lack of infrastructure to cater for the integration of new technologies in South African schools due

to inadequate resources and connectivity (Kozma, 2003). The schools that may suffer exclusion in this process are the Quintile 1 to 3 schools because they depend wholly on the government's funding. And the majority of these schools are found in previously disadvantaged communities and rural areas where technology-based infrastructure is close to non-existent. The effective implementation of digital technologies, including coding and robotics curriculum, would require adequate development programmes for educators to acquire the necessary pedagogical skills and knowledge for the subject (Mashile, 2016).

The research questions

What types of digital technologies do teachers use in Technology Learning Area classrooms?

How do teachers employ these digital technologies to achieve lesson and subject objectives?

The aim

The study aims to assess the current adoption of digital technologies in some technical schools around the Mangaung Municipality Education District. The focus will be on the Senior Phase (Grades 8 and 9) Technology teachers to determine the feasibility of rolling out coding and robotics in the Senior Phase at technical schools.

Materials and methods

Methodology could be regarded as a set of research approaches, designs, methods of collecting data, and the relevant tools (Alharahsheh & Pius, 2020).

Research paradigm

The research methodology was guided by the interpretivist paradigm to enable the researchers to understand and make meaning of TLA teachers' integration of digital technologies in their classrooms (Fodouop Kouam, 2024). The researchers believe that the TLA teachers have in-depth knowledge and understanding of their schools' contexts and, therefore, an accurate meaning could be drawn from the teachers' responses and views (Alharahsheh & Pius, 2020; Pervin & Mokhtar, 2022).

Research approach

Therefore, this qualitative study seeks to comprehend the technology learning area (TLA) teachers' perspectives regarding the integration of current digital technologies in their classrooms (Mack et al., 2005).

Thus, the researchers expect to obtain rich contextual experiences that would assist them in providing accurate textual descriptions of the teachers' experiences (Yin, 2016). The researchers found the use of a qualitative research approach with the technology acceptance model as a methodological gap due to most studies being underpinned by TAM being quantitative in nature (Schorr, 2023).

Research design

The study employed a multiple case study design because data were collected in two different contexts in the form of technical schools. The researchers are of the view that the two schools represent exclusive contexts, and the views and perceptions of the educators would be based on their respective school contexts (Brink, 2018; Halkias et al., 2023). The researchers interviewed four participants from two technical schools. The two technical schools fall under the quintiles 1 to 3 category. Quintiles 1-3 fall under the nonfee-paying schools, meaning they are financially dependent on the government subsidy. In most cases, schools within this category appear to be under-resourced in various instances.

Sampling

The participants were purposefully selected as Technology educators in the Senior Phase (Grades 8 to 9). The participants' teaching experience varied from two to ten years. Three of the participants were male, and one was female. Moreover, the research sites were also purposefully selected as technical schools. The understanding was that technical schools were expected to be more advanced in the teaching and learning of subjects like the technology learning area.

Procedure

The researchers wrote letters to the schools' principals to ask for access and explained the purpose of the study. The researchers explained the characteristics of the participants they would like to have interviews with, and the principals appointed the participants. The participants were given consent letters stipulating the purpose of the research for the requirements of the B.Ed. Honours degree. After consenting to the interviews, the appointments were set with the participants at their convenience.

Analysis

The study employed thematic analysis due to its flexibility and ease of application (Braun & Clarke, 2006). Furthermore, it builds the analyst's capacity to learn more sophisticated analytical techniques as a foundational approach for novice researchers in qualitative studies (Lochmiller, 2021). Thematic analysis

involves identifying patterns of interest in responding to the research questions (Maguire & Delahunt, 2017).

Ethical considerations

The Department of Postgraduate Studies Education at our university applied for permission to access the public schools in the Mangaung Metropolitan Education District, in the Free State Department of Education. After the Department of Education has granted permission. We drafted letters to the principals and consent letters for prospective participants of technical schools in the district that would be conveniently accessible to the student.

Results and discussion

From raw data, five themes were developed as follows.

Table 1: Themes

1. THEME 1-Teacher experience on integrating digital technologies in the classroom.
2. THEME 2- Adoption of digital technologies relevant for a lesson
3. THEME 3 -The successes of integrating digital technologies in the classroom
4. THEME 4- In-service training for professional development
5. THEME5- Selection of digital tools during lesson planning.

THEME 1-Teacher experience on integrating digital technologies in the classroom.

Digital technology integration in senior phase technology education refers to the thoughtful and purposeful use of technology to enhance learners' learning and engagement (Timotheou et al., 2023). It involves incorporating various digital tools and software, such as robotics, coding, CAD, and Recur Dyn, to name a few, and resources into the curriculum. Digital technology has become an integral part of modern education, transforming how learners learn and how teachers teach (Timotheou et al., 2023).

The participants were asked to broadly explain their experiences regarding the integration of digital technologies in their classrooms, and their responses were as follows:

Table 2: Theme 1 data set

Researcher: What is your experience with integrating digital technology in the classroom?	
T1	“The integration of technology in the classroom has made it easier for learners to learn, and it's very helpful for the visual or spatial learners because of projectors; they can actually see what is being taught through videos.”
T2	“It has been a beautiful experience since the world is moving, and technology is also changing. Our learners from a very young age need to be exposed to a lot of things, especially technology, so now we have robotic electrical technology, mechanical technology. They can acquire certain skills at a very young age, so it has been a beautiful experience.”
T3	“My experience, I find it so challenging because of resources, but as for curriculum, everything is okay, the only challenges are the resources; we don't have enough resources to accommodate all the learners.”
T4	“Though sometimes we have very limited technology integration in the school, it does help because it caters to different learners' needs.”

The teachers' views on their experiences regarding the integration of digital technologies in their classrooms reveal mixed reactions. However, the four participants highlighted that the integration of digital technologies in classrooms has some benefits for learners. Participant T1 emphasises that the use of digital resources such as projectors to show video clips explaining technical concepts has facilitated learning through technology integration, especially for visual learners. Participant T2 further confirms that inclusion of current digital technologies within the curriculum bears a favourable experience for learners, as they will grow up comfortable working with new technologies to entice their inquisitive and explorative minds to acquire relevant skills and knowledge as the 21st century learners. Participants T3 and T4 highlight the challenges of a lack of resources to serve all students.

THEME 2- Adoption of digital technologies relevant for a lesson

The evolution of technology in learning has transformed education, shifting from traditional hands-on training in trades and crafts to incorporating computer-based instruction, simulations, and online resources (Kozma, 2003). This change has enhanced the learning experiences, particularly in medicine and engineering (Voogt & Roblin, 2012). Initially, technical education focused on practical skills, but the Industrial Revolution spurred the development of technical schools and vocational training to meet industry demands. Today, technology continues to shape education, providing new opportunities for learners to develop essential skills (Kearns, 2018).

The four participants (T1, T2, T3, and T4) give an account of their present technology utilisation in the classroom. Although students aren't permitted to handle machinery directly for safety reasons, T1 employs projectors in classrooms to show students images and videos and carries out hands-on projects in workshops where students identify and learn about tools. To accommodate both aural and visual learners, T2 uses a projector to play videos for visual learning, integrates a smart board for presentations, and saves lessons for later use. T3 highlights that technology is simple to use when presentation slides are ready, enabling video playback and simulations. T4 talks about how students can visualise subjects by using technology as a virtual aid for tasks.

Table 3: Theme 2 data set

Participant	How do you currently use technology in your teaching practice
T1	” We have projectors in classrooms to project pictures and videos for learners, and we have workshops to do practical projects, called PAT. The learners are not yet allowed to work with the machine in the workshop for their own safety, but need to be able to identify and give the functions of the tools in the workshop. Most technology we have in schools is the tools in the workshops.”
T2	“I use technology, for example, I have a projector right there, it helps me when I teach my learners, because I believe we have different learners in the classroom, we have auditory learners and visual learners, so those that are visual, they can learn from seeing something. So, I can play those videos using my laptop; they can see the internet, the laptop, and the projector is working. The speaker is involved at times, and this caters to the auditory

	learners. I do use a smart board. Also, when presenting a lesson, you can save it, and you can retrieve it for revision. Those are the technological resources I have been using.”
T3	“It becomes easy if you are prepared with a slide for presentation, using technology becomes easy because sometimes you can do simulations, virtually, sometimes you can play videos of what you are talking about.”
T 4	” I have used it for a virtual aid to the project for the learners, maybe for that topic, and for them to see what we are talking about.”

In the table above, the participants' use of projectors, smart boards, laptops, and videos demonstrates how technology is incorporated into their teaching methods. This supports research indicating that by accommodating various learning styles and streamlining the delivery of lessons, technology can improve educational experiences (Mayer, 2009). For example, participants T1, T2, and T4 encourage visual learning by using projectors to showcase visuals. This is in line with research showing how effective multimedia instruction is at increasing student engagement and comprehension (Mayer, 2009). The literature on how technology can enhance teaching and learning, especially in terms of easing resource access and encouraging student-centred learning, is also reflected in T2's usage of smart boards for presentations and lesson storage for later revision (Puentedura, 2006). Additionally, T3's focus on how simple it is to use technology for presentations that include slides, simulations, and video playback highlights how technology can improve student learning outcomes and the efficacy of instruction (Koehler & Mishra, 2009). Overall, the rising corpus of research demonstrating the advantages of technology in education is reflected in the participants' approaches to technology integration.

THEME 3 – The successes of integrating digital technologies in the classroom

According to studies, effective use of technology can increase learner (TLA) engagement, improve learning outcomes, and provide better access to learning resources. According to Gyawali and Mehndroo (2024), the emergence of these technologies has created several opportunities, including enhanced access to educational resources, the creation of individualised learning environments, increased student engagement through augmentation, and the cultivation of digital literacy skills. A study by Dinar (2024) shows that technologists' AI-based adaptive technologies significantly increase student engagement and academic achievement, with the potential to reduce social inequality.

The participants emphasise how technology might improve learning results for students. T1 places a strong emphasis on extending learning outside of the conventional classroom setting by using resources like

YouTube for additional explanations and WhatsApp groups to distribute homework. In contrast to theory sessions, T2 emphasises the value of hands-on activities that allow students to learn by doing, which boosts engagement and comprehension. Although today's students are tech-savvy, T3 points out that in order to guarantee that students can cope without depending on AI, technology use must be balanced with regulated learning. According to T4, learners can better relate to projects by viewing and engaging with content through the use of technology such as virtual displays and WhatsApp groups.

All things considered, the participants saw technology as a tool to improve learning by raising accessibility, engagement, and comprehension of the material through real-world application and additional resources.

Table 4: Theme data set

Participant	What role do you think technology plays in enhancing student learning outcomes?
T1	” Let's start with the phone, I formed a WhatsApp group with them, remember, teaching and learning happen for 45 minutes, the time is not enough, now through technology we can send them homework through the WhatsApp group. Another thing when you project something we have YouTube, we have wi-fi, if you see that have been explain, and the learners are having difficulties understanding, you can play a video so they can hear it from another person, for example a video of how welding or how to operate this machine, so they can watch and pause it now and then to explain ”
T2	“You know, for the fact that they have a practical assessment task, this is the part where they are learning by doing something, so the engagement of them doing something is very important. It increases their level of understanding in the subject, unlike when it's a theory class the whole year, it means now they can touch, search, and connect a circuit, which I think is very important for them, and it really enhances their skills and level of understanding the subject content. ”
T3	“Because you know, it's a fact this generation of children is cleverer than us, especially with this thing called AI, so if we prevent them from using it eventually, they will use it, then we will not be able to find out if they did use it. Rather, we let them use it controllably and manage it; they cannot rely on AI. Yes, here and there you will have to use it to show how they can use it also, so that their learning can be interesting.”

THEME 4 -In-service training for professional development

A recurring theme in literature is the need for adequate teacher training and ongoing support to effectively implement and utilise technology in the classroom. According to (Heyman, 2007), a high percentage (91,7%) of the respondents indicated that educator development was important during the introduction of the new curriculum in schools and were convinced that formal training for Technology Education is necessary.

Different degrees of professional development possibilities pertaining to technology integration were indicated by the participants. Future training for SA vehicles, with an emphasis on gas and arc welding artisan certifications that will be registered and accepted under educational qualifications, was suggested by T1. T2 emphasised participating in yearly 5-day seminars hosted by the DBE in Paris and Bloemfontein, which include hands-on instruction and skill development funded by the Sasol Foundation. According to T3, they participate in a lot of workshops, PAT mediation training, skills training, and content training. T4, on the other hand, reported that they had not yet received any professional development on technology integration.

Table 5: Theme 4 data set

Participant	What professional development opportunities have you had related to technology integration?
T1	“We will be taken for SA trucks for training, we are going to train there, and we are going to receive gas and arc welding artisan certificates. We will be registered and recognised because we are doing it under the qualifications of education.”
T2	“The DBE organising 5 days workshops in Paris, Bloemfontein every year, it is an annual event, we go there to do some practical and also the Sasol foundation has supported us in terms of practical teachings skills trainings, so their annual event we go there for 5 days to enhance our skills in terms of learners’ PAT, we attend year in year out, sometimes its virtual training during the year. ”
T 3	“We attend workshops, skills training workshops, content training and PAT mediation training. We do attend them a lot.”

T4	“I have yet to attend training, but for now, I have not attended any professional development workshops.”
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THEME 5: Selection of digital tools during lesson planning

Table 6: Theme 5 data set

Participant	How do you select digital tools and resources for your lessons?
T1	“To be honest, I do not use any digital tool in my classroom. Only people with digital tools are the ones in electrical technology, digital electronics, and power systems. I only work with manual and power drive tools and machines.”
T2	“It depends on the topic that I am going to teach, for example, let me say we are going to do grade 8 electronic components, this is a topic where learners need to understand what a circuit is, and what it is built of. We have different types of components: passive, which consist of a cell, and active, which consist of an LED. This is where I check the lesson, make sure I bring a resistor to class, and make sure I can play some of the videos. I also make sure I bring a breadboard and multimeters. So, it depends on what I am going to teach and check on my resource and how best I can integrate them in my lesson, for learners to be able to see & experience them.”
T3	“It depends on what I am about to teach, it depends on the topic that will be presented, because now you cannot use the microcontroller equipment where else you are going to teach digital sequential devices.”
T4	“Because we don’t have much technology, what I will be talking about mostly will be the projector, so I have only been using the projector to display so that those virtual learners can be catered to during the lesson. It depends on the lesson I will be teaching.”

According to the teachers' comments, there are differences in how they choose digital resources and technologies for their classes. In order to educate in electrical technology, T1 focuses on using manual and power-driven tools and machines rather than digital tools. T2, on the other hand, chooses digital resources according to the subject being taught, employing tools such as resistors, multi-meters, breadboards, and

films to help students understand electronic components. T3 also selects tools according to the lesson plan and learners' needs.

T4 "The projector, firstly coz it helps so much in terms of you going to display something virtually, something that a learner can relate to, so that they know what you are talking about, because they can see it, sometimes even using the phones, the WhatsApp groups where we share the information, question papers and communicating with the students."

Discussion

Under this section, from the research findings, the researchers will address the posed research questions employing the technology acceptance model lens and the themes that were generated from the data. The themes were further coded to identify phrases responding to the technology acceptance model variables.

What types of digital technologies do teachers use in Technology Learning Area classrooms?

The participants' use of projectors, smart boards, laptops, and films demonstrates how technology is incorporated into their teaching methods. The participants have explicitly shown the usefulness of these technologies towards reaching learners with various learning styles (Bekeke & Menchaca, 2008). Mayer (2009) also attests that technology can improve educational experiences by streamlining the lesson delivery to accommodate learners' different learning styles. For example, participants T1, T2, and T4 encourage visual learning by using projectors to showcase visuals from YouTube videos and PowerPoint presentations. However, Lohr et al. (2024) regard these technologies as passive, not really stimulating learners' active participation during teaching and learning sessions.

"The integration of technology in the classroom has made it **easier** for learners to learn. It's very **helpful** for the visual or spatial learners. It does **help** because it caters to different learners' needs. I have used it as a **visual aid** for the learners."

The above sentiments indicate that the teachers view the integration of digital technology in the teaching and learning of TLA in the Senior Phase as useful in limiting challenges that hinder students' learning. According to Davis (1985), perceived usefulness is an important variable in technology usage; therefore, teachers may decide to continue or abandon integrating digital technologies in their classrooms (Bothma & Mostert, 2023) based on the usefulness in the teaching and learning context. Research further describes multimedia as an effective instructional tool that enhances students' engagement, participation, and

comprehension (Mayer, 2009). Furthermore, Bekeke and Menchaca (2008) in their study on internet-supported learning (ISL), found encouraging results that support digital technologies' positive contribution towards learners' comprehension and academic achievement.

The teachers portrayed a positive attitude for integrating digital technologies in their Technology Learning Area classroom based on their perceptions of the usefulness of its integration for teaching and learning.

“It has been a **beautiful experience**. They (learners) can **acquire certain skills** at a very young age. Rather, we **let them use it** under control and manage it; they cannot rely on AI.”

In his study, Davis (1989) found there is a relationship between the perceived usefulness of technology and actual use. Thus, teachers' positive experiences of integrating digital technologies in their classrooms are a confirmation of the actual use of these technologies. The teachers enjoy using these digital technologies based on their observations towards achieving learning outcomes and improving learners' classroom participation.

Furthermore, integration of digital technologies can enhance teaching and learning by accessing relevant subject content online that encourages student-centred learning, like the use of smart boards for teaching presentations and lesson storage for later revision (Puentedura, 2006). Therefore, the participants observe integration of digital technologies as useful in the teaching and learning context.

How do teachers employ these digital technologies to achieve lesson and subject objectives?

The research participants (T1, T2, T3, and T4) believe that technology can improve students' learning results and teaching competency. Koehler and Mishra (2009) add that enabling interactive and hands-on learning opportunities, technology integration can improve student engagement and comprehension (Koehler & Mishra, 2009). Digital technology can offer additional learning materials, improving accessibility and flexibility, as participants use YouTube and WhatsApp to expand learning outside the classroom (Means et al., 2010).

“I do **use a smart board**. Also, when presenting a lesson, you **can save** it and **retrieve** it for revision. It becomes **easy** if you are prepared with a slide for a presentation. Technology becomes **easy** because sometimes you can do simulations, virtually, and sometimes you can **watch** videos.”

The comments from the teachers reveal different methods for choosing digital resources and technologies for their classes. The topic being taught, the availability of technology, and the requirement to accommodate both in-person and remote learners all have an impact on the choice. In line with research indicating that

successful technology integration in education is context-dependent and should support particular learning objectives, teachers T2 and T3 place a strong emphasis on matching the choice of digital tools with the subject of instruction (Mishra & Koehler, 2006). T4's experience with inadequate technology supports research showing that classroom technology integration can be impacted by resource limitations (Hew & Brush, 2007). T4's utilisation of projectors to accommodate online learners is an example of their efforts to guarantee accessibility and diversity. The idea that technology can improve learning experiences by making knowledge more accessible is supported by literature (Means et al., 2010). The disparity in how teachers adapt technology is in line with studies showing that teachers' perspectives, abilities, and environment are important factors in deciding how to integrate technology (Ertmer & Ottenbreit-Leftwich, 2010). In addition, Musood and Kaur (2025), in their digital competence research revealed that digital competence can predict mindful attention of teachers. In this study, the teachers have shown enjoyment of using digital technologies at hand with the anticipation of adapting more sophisticated applications should they be made available to them.

The behavioural intentions variables, such as subjective norms, job relevance, output quality, voluntariness, facilitation conditions, and self-efficacy, were also included in the participants' responses.

The teachers have also displayed subjective norms, such as meeting the learners' learning needs to improve their comprehension of the taught content. Furthermore, to improve learners' participation during the lessons.

“We have **auditory** learners and **visual** learners. I can play those videos using my laptop.”

Lazebna and Prykhodko (2021) support the notion that the use of computers and information and communication technologies (ICT) in the teaching and learning context enhances subject content comprehension and improves the quality of teaching and learning.

Alam (2018) argues that putting computers in schools does not necessarily entice learners' interest in using digital technologies. However, the job relevance of these technologies is essential. Subject-relevant and related digital technologies improve learners' active participation and knowledge construction as they explore deeper use of these technologies (Alam, 2018).

“We have projectors in classrooms to project pictures and videos for learners.”

Sarkar (2023) contends that the integration of digital technologies enhances learning output quality by means of preserving teaching materials and enhancing their clarity. Thus, learning materials become readily available and accessible to the teachers and learners.

“I do use a smart board. Also, when presenting a lesson, you can **save** it and **retrieve** it for revision.”

Facilitation conditions in South African public schools falling within quintiles 1 to 3 reflect a gap in the adoption of digital technologies; this indicates a lag in digital skills among teachers in these schools (McCoy & Siedschlag, 2025). According to Sarkar (2023), digital technologies such as WhatsApp applications facilitate quick communication to transmit important and urgent information to learners; therefore, sharing information is much easier even off the school premises.

“**I have a projector** right there, which helps me when I teach my learners. We can send them homework through the **WhatsApp** group. I can project something on **YouTube**, because **we have wi-fi**. We have WhatsApp groups where we share the information.”

Despite the challenging circumstances of limited resources at public schools, teachers make an effort to integrate digital technologies in their classrooms. Lohr et al. (2024) argue that inadequate backing in technical and technology infrastructure hampers the proper adoption of relevant digital technologies in teaching and learning. Although the integration of digital has been highlighted as profitable toward teaching and learning, a study done in Ireland also indicates a similar challenge, a lack of vision that responds to evolving digital technologies in education (McCoy & Siedschlag, 2025).

“I find it so **challenging** because of the resources. We have very **limited** technology integration in the school.”

The teachers also stated their frustrations regarding the lack of financial resources at their schools to provide infrastructure for more advanced digital applications that are more relevant to their subjects' objectives and outcomes (Phunyal, 2023).

Self-efficacy is displayed by teacher's who are effectively using the technologies at their disposal; the teachers are showing confidence and are adamant about using and learning more about technology in teaching and learning. Their determination to work with the limited resources they have shown self-efficacy.

Conclusion

Digital technologies and their usage in educational settings are increasing rapidly and also getting more advanced with the arrival of artificial intelligence tools that are influencing new methods of teaching and learning. The findings of this study revealed that teachers are doing their best to integrate digital technologies in their teaching and learning contexts despite challenges of a lack of infrastructure and

connectivity in their schools. The study further showed that teachers are willing to learn and access more advanced digital technologies that are not general but more subject-related. However, there is no in-service training arranged by the Department of Education or the schools' management teams on current digital technologies for teaching and learning. We recommend that the Department of Education and the schools build partnerships with network companies for enhancing connectivity at the quintiles 1 to 3 schools. Then, assist in a form of in-service training to enable digital literacy among the teachers, including training on the ethical use of these technologies.

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The authors declare that they have no conflicts of interest.

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