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Research Article

Strategies adopted by South African teachers to overcome challenges associated with technology integration in rural schools

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ABSTRACT

Teachers in different contexts continue to integrate technology into their classrooms to enhance their instructional practices. However, teachers in rural villages encounter several challenges when incorporating technology in their classrooms. Therefore, this qualitative study explores the strategies adopted by teachers in schools in rural villages to overcome the challenges associated with technology integration. This study is located within the interpretive paradigm and a case study research design was adopted. The diffusion of innovation theory was employed as the theoretical lens of this study, while interviews were used to collect the data. Twelve grade 9 teachers from the secondary schools in Bojanala District in the North-West Province were selected purposefully. Thematic analysis was used to analyze the data. The study revealed that teachers devised different strategies to overcome challenges they encounter when integrating technology into their classrooms. From this, the study concluded that teachers have accepted technology and that it adds value to their classroom instruction, hence they devise strategies to overcome the challenges associated with technology integration. Based on this, the study recommends that the government should intervene and eliminate the infrastructural challenges that teachers encounter when integrating technology into their classrooms. The study also suggests that schools should adopt peer mentoring in order to entrench technology integration among the teachers.

Keywords: challenges, instructional practices, strategies, teachers, technology integration

INTRODUCTION

The integration of technology in teaching and learning continues to gain traction in both urban and rural-based schools. This has resulted in technological integration in education being a need rather than a choice for many teachers (Onyema, 2020). Consequently, many teachers make strides to integrate technology into their classrooms to enhance their instructional practices. Policymakers also encourage teachers to integrate technology in their classrooms to enhance their pedagogical practices. They regard technology integration as a strategy to access educational resources and ensure quality of education (Herodotou, 2018). In other words, policymakers believe that technology integration plays a role in ensuring access to quality education for all learners. This is because technology offers different resources including application programs for teaching and learning (Zamir & Ali, 2023), which make it easy for teachers to access educational resources that they can integrate into their classrooms.

Furthermore, as Souheyla (2019) observes, technology integration is acclaimed for supporting the constructivist approach to teaching–where the teacher creates a learning environment that promotes learner

participation in learning activities. Nkengbeza et al. (2022) stress that technology integration enables learners to take control of their own learning by engaging with the content via technological tools. This view suggests that technology integration encourages learners to take charge of their learning and to be at the center of learning activities. This is because technology integration creates opportunities for learners to access content, even outside the classroom (Chisango & Marongwe, 2021). As Gcabashe (2023) explains, accessing the content outside of the classroom through technological tools helps learners to come to class prepared for more learner-centered learning activities such as classroom discussions, debates and problem-solving. Learners' active involvement in learning activities helps to free up teachers' time in the classroom and it enables them to pay attention to learners' individual needs (Mhlongo et al., 2023).

Despite the role of technology integration in enhancing learners' learning experiences, the Department of Basic Education has noted that technology integration in South African schools is generally weak (Department of Basic Education, 2015). Graham et al. (2020), Mhlongo et al. (2023), and Munje and Jita (2020) have attributed the weak state of technology integration to a mixture of ongoing challenges that teachers encounter when integrating technology into their classrooms. Tawfik et al. (2021) categorize these challenges as first-order and second-order challenges. The first-order challenges comprise external factors such as a lack of access to technology, time constraints, and lack of support and professional development. Second-order challenges, on the other hand, constitute internal factors such as teachers' confidence regarding technology integration and their beliefs on the usefulness of technology integration in teaching and learning. In spite of the challenges teachers face when integrating technology, some teachers are able to devise strategies to overcome the obstacles. This study explores the strategies devised and adopted by teachers to overcome the challenges associated with technology integration in selected secondary schools located in rural villages in South Africa. To guide this study, two research questions were formulated:

1. What challenges do teachers encounter when integrating technology?
2. What strategies do teachers devise to overcome the challenges they encounter when integrating technology into their classrooms?

LITERATURE REVIEW

Challenges Associated With Technology Integration in Teaching and Learning

The existing literature outlines several challenges that teachers encounter when integrating technology into their classrooms. Inadequate technology integration skills (Dinc, 2019) and a lack of technological infrastructure (Chisango et al., 2020) are among the key challenges that hinder teachers from integrating technology effectively. The two challenges are discussed in detail below.

Inadequate technology integration skills

Technology integration skills are important for teachers to integrate technology effectively in their instructional practices. Dinc (2019) underscored the importance of such skills by asserting that having technological tools in the classroom is not enough; teachers need to possess technology integration skills in order for them to integrate technology effectively. Studies conducted in different African countries reported that the lack of technology integration skills among teachers still persists. A study by Joseph (2021) revealed that the lack of technology integration skills among secondary school teachers in Tanzania was a major challenge and that it hindered teachers from integrating technology. Furthermore, a study that was conducted by Onyema (2020) reported that Nigerian teachers still lack technology integration skills, and this constrains them from integrating technology to support their instructional practices. Similar findings also transpired from the study by Chisango et al. (2020) in South Africa and they recommended that teachers be taken through professional development to improve their technology integration skills. A study of the similar nature was conducted by Sharambe and Simuja (2024) in South Africa and it found that teachers showed varying levels of TPACK. They attributed this to the lack of formal training on technology integration in many South African schools and they recommended teacher training programs that encompass TPACK's nuanced, contextual, and evolving aspects.

Based on the studies reviewed in the preceding paragraph, it can be deduced that teachers still lack technology integration skills. This is a serious challenge because if teachers do not have the required skills, they will not be able to use technological tools provided to them by the government. This view is reiterated by Atabek (2020) by asserting that having access to technology alone is not sufficient; teachers need skills to integrate technology in their instructional practices. It further manifested from the literature that possessing basic technological skills is not enough for teachers' meaningful integration of technology (Ismail et al., 2020). They need skills that would enable them to integrate technology for the purpose of enhancing teaching and learning. This simply means that teachers need to possess technological knowledge, as suggested by Mishra and Koehler (2006), for them to integrate technology effectively. Mishra and Koehler (2006) add that technological knowledge enables teachers to choose technological tools that are suitable for the content taught. This helps them to enhance their pedagogical practices, hence the need for teachers to be equipped with technology integration skills that would enable them to integrate technology effectively.

Lack of technology infrastructure

Technology infrastructure is key in supporting technology integration by teachers to enhance their instructional practices and, as Dinc (2019) underscores, for teaching and learning to occur smoothly. In other words, technology infrastructure is at the heart of technology integration. Yet, there are schools in South Africa that still lack technology infrastructure to support technology integration. This is evident in the existing studies that were conducted in South Africa. A study that was conducted by Chisango et al. (2020) revealed that some schools do not have technology infrastructure such as electricity, computer laboratories and computers. Similarly, a study that was carried by Mnisi et al. (2024) in South Africa revealed that insufficient internet coverage in classrooms made it impossible for most teachers to appreciate the benefits that come with using technological tools such as laptops, whiteboards, and online videos. Lack of technology infrastructure have implications for teaching, especially among those teachers who teach subjects such as computer application technology. Furthermore, Duma et al. (2021) conducted a conceptual study that focused on digital inequalities that the South African rural schools continue to face. It emerged from the study that inadequate technology infrastructure such as internet connectivity hinders teachers from integrating technology in their classrooms.

Based on the literature presented in the preceding paragraph, it is clear that the absence of proper infrastructure negatively affects technology integration by teachers. Munje and Jita (2020) added that it could also lead to underutilization of available technological tools. For example, if computers are available in schools while the internet connectivity is poor, teachers choose to integrate the available resources on a smaller scale than if the computers had proper internet connectivity. Munje and Jita (2020) further noted that some technology integration challenges in South African schools are context specific, which suggests that some of the challenges depend on the context in which the school is located. For example, poor internet connectivity is common in schools that are in rural villages (Duma et al., 2021) which makes it difficult for teachers to integrate technology effectively into their classrooms.

The literature reviewed in this section outlined several challenges encountered by teachers when integrating technology in their classrooms. It also emerged from the literature that some of the challenges are context-specific and call for context-friendly solutions. However, the existing literature fell short in outlining solutions that teachers can adopt to overcome the challenges associated with technology integration. Hence, this study explored the solutions adopted by teachers to overcome challenges that they face when integrating technology into their schools. The study reports on practical and context-friendly solutions that teachers can adopt in their classrooms to overcome challenges associated with technology integration. This research makes a notable contribution to the body of knowledge on technology integration, especially in schools located in rural villages.

Theoretical Framework

The diffusion of innovation (DOI) theory was deemed suitable to serve as the theoretical lens of this study. This theory was proposed by Rogers (2003), and its proponents believe that innovations (technology) are communicated through certain channels within a social system over time. In the context of this study, the integration of technology in teaching and learning has been communicated to teachers via different

platforms. For example, channels such as mass media and social media, as well as scientific research continue to communicate the role that is played by technology in education to enhance teaching and learning. According to the DOI theory, individuals go through five stages as they accept the new innovation (Arkorful et al., 2021). The first stage, the knowledge stage implies that individuals should have knowledge or an idea about how the innovation works (Seemann, 2003). This suggests that teachers should have knowledge and an idea of how technology can be integrated to enhance their pedagogical practices. The second stage of the theory is persuasion; where an individual can have a positive or a negative perception of an innovation or technology (Hajara & Bukari, 2017). In other words, after obtaining knowledge or coming up with an idea about technology, teachers can develop positive or negative perceptions towards it.

Decision-making is the third stage that individuals undergo as they embrace new innovations. During this stage, individuals decide to adopt or reject the innovation or technology based on the social perspective (Rogers, 2003). This means teachers adopt technology if they recognize its value towards their pedagogical practices–and reject it if it adds no value towards their pedagogical practices. The fourth stage is the implementation stage, where individuals put the new innovation into use (Arkorful et al., 2021). This stage occurs when teachers integrate technological tools in their classrooms to enhance their pedagogical practices. Finally, individuals engage in evaluating their decisions to adopt a particular innovation (Sherry, 2011). The evaluation of this decision includes determining the benefits and disadvantages of implementing the new innovation and it results in the individuals rejecting or maintaining the innovation going forward.

The teachers who participated in this study have already adopted technology in their pedagogical practices. In other words, they have evaluated their decision to adopt the new innovation (technology), and they perceive its value in their pedagogical practices. That is why they devise strategies to overcome the challenges associated with technology integration in their schools. The DOI theory was identified as an ideal theory to underpin this study because it helps in investigating the adoption of technology in education environments (Medlin, 2001). Adopting this theory also helped the researchers to understand and interpret the findings of the study better.

METHODOLOGY

The research methodology and design comprise the procedure used to collect, analyze and interpret data, and to write the results of the inquiry or a structural framework used by the researchers to respond to the research problem (Babbie & Mouton, 2012; Bertram & Christiansen, 2020). The point of departure was to describe the research approach, the population and sampling technique to be utilized, the data collection instruments and collection techniques, and how the data would be analyzed and then end up being interpreted (McMillan & Schumacher, 2014). The researchers in this study embarked on the process by clearly sharing with the readers the following: qualitative research methodology and design pursued in this study, how data was collected, and what was used to draw data to answer the research questions.

The Research Philosophy of This Study

Knowledge generation involves a systematic procedure carried out to answer the research questions (Babbie & Mouton, 2012; McMillan & Schumacher, 2014). Epistemologically this study sought to understand the participants' context in which they overcame the challenges related to technology integration in schools.

In this study, the researchers adopted the "research onion" proposed by Saunders et al. (2023) to present the research design and methodology. Saunders et al. (2023) view the research design and methodology as a process linked to the shedding of an onion in layers–from the outer layer to the inner layer, when the research questions have been answered. **Figure 1** illustrates the research onion used in this study and permission was granted by authors to use in this study (Saunders et al., 2023).

The Research Methodological Choices

The research methodological choices adopted in this study was a qualitative case study. A qualitative research methodology choice is best suited to this study as the researchers attempted to discover and understand the participants' experiences, perspectives, and thoughts on real-life situations within their natural environment (Creswell, 2014; McMillan & Schumacher, 2014; Saunders et al., 2023). The starting point

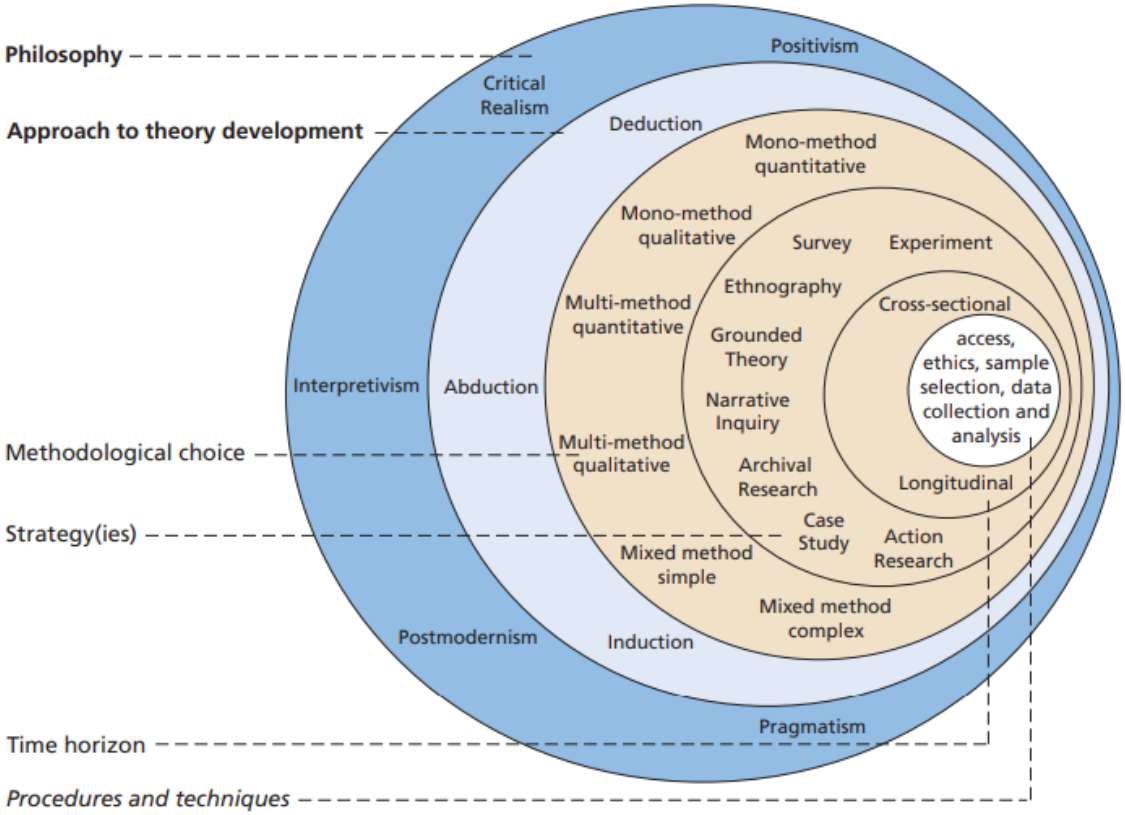

Figure 1. The research paradigm used in this study (Source: Saunders et al., 2023, p. 131. The research onion is ©2022 Mark NK Saunders and is reproduced with his written permission)

was the identification of a problem which relates to the title of the study; it was followed by the choice of sampling, then the data collection strategies, and proceeded to the data analysis and interpretation (Babbie & Mouton, 2012; Bertram & Christiansen, 2020; Creswell, 2014; Saunders et al., 2023). The methodological choice for this study follows below.

Population and Sampling

The research population refers to individuals who can fit into a group that has the same characteristics, from which a sample can be drawn (Bertram & Christiansen, 2020; McMillan & Schumacher, 2014). The target population for this study consisted of teachers who managed to overcome the challenges associated with technological integration in teaching and learning. All grade 9 teachers from the six secondary schools represented a population group within the Dinaledi cluster located in Bojanala District, North-West Province.

Sampling is the process of selecting from a subset of a population, participants who would provide information relevant to the study without having to collect data from the entirety (Bertram & Christiansen, 2020; McMillan & Schumacher, 2014). The technique employed was purposeful sampling. Twelve grade 9 teachers were requested to participate in the study with the premise that they adopted strategies that could be used to overcome the challenges associated with technology integration.

Data Collection Procedures and Techniques

The procedure and technique that was used to collect qualitative data was semi-structured interviews. The aim of using qualitative semi-structured interviews was to experience the phenomenon through the eyes of the participants–they are regarded as valuable sources of information (Nieuwenhuis, 2020). The participants were interviewed at their respective schools within a place of comfort, to be free to express themselves and to share their experiences about the phenomenon under scrutiny. Probing was also done when the need arose–for clarity-seeking purposes. The duration of the interviews was ±60 minutes and it depended on the

discussion between the participants and the researchers. Data collected was recorded to ensure that no important data was missed; a journal was also used to take notes during fieldwork.

Trustworthiness in the Study

Trustworthiness is a concept used by Guba and Lincoln (1985) for interpretive research which could be found in the neutrality of its findings. In addition, Babbie and Mouton (2012) view the basic issue of trustworthiness as the researcher persuading the reader that the inquiry's findings are worth paying attention to. Ideally, the findings should be a true reflection of the life experiences of the participants. In this study, trustworthiness was maintained through credibility.

Credibility

Credibility refers to the compatibility between data reflecting the reality and lived experiences of participants in a research study (Bertram & Christiansen, 2020; Babbie & Mouton, 2012). In this study, the researchers pursued credibility using prolonged engagement, persistent observation, referential adequacy, and peer briefing.

1. **Prolonged engagement:** McMillan and Schumacher (2014) attest that prolonged engagement allows more delving into verifying what transpired in the context of the participants. The researchers in this study made prolonged engagement a priority by visiting the participants at the schools to get to know them, build trust, and at the same time gain the appropriate full representation of their voices. The engagement between the researchers and the participants enabled the researchers to understand the context that can produce trustworthy research.
2. **Persistent observation:** Regarding persistent observation, as the researchers continuously visited the schools, they kept on recording what transpired during their visits with a focus on answering the research questions. In Babbie and Mouton's (2012) view, the process of continual observation provides a different scenario that augments the gathering of rich data.
3. **Referential adequacy:** Referential adequacy in research relates to the use of digital devices for capturing data and documentation (Babbie & Mouton, 2012; McMillan & Schumacher, 2014). The researchers in this study recorded data using cell phones and at the same time a journal to write reflections of what happened in fieldwork. The handwritten data was then typed using Microsoft Word and was securely saved within the system for future reference.
4. **Peer briefing:** Peer briefing involves requesting an outsider to the research study to review the researcher's study (Barbie & Morton, 2014; McMillan & Schumacher, 2014). Ideally, an outsider should be knowledgeable about what pertains to the inquiry and should have the same status as the researcher. The researchers presented this study as it was unfolding, at several conferences to allow peer examination. The questions and comments that surfaced at different conferences assisted in improving the study and contributed to the trustworthiness of the research.

Ethical Considerations

Ethical considerations are the guiding principles for the researchers on how to conduct research. Qualitative researchers tend to experience more ethical dilemmas than quantitative researchers as a result of the intensive interaction with the participants (McMillan & Schumacher, 2014). Simelane-Mnisi (2018) attests that scholarly research involves human participants as ethical approval from the institutional ethical review committee should be obtained before engagement with the participants. Researchers should ensure the protection of research participants from physical and mental harm (Maree, 2020). In this study, the researchers obtained ethical clearance certificate from the College of Education Research Ethics Committee at the University of South Africa and research ethics certificate reference number 2020/09/09/90173651/05/AM was issued.

The researchers had to take cognizance of informed consent, voluntary participation, confidentiality, and anonymity. Anonymity and confidentiality in this study were maintained by not disclosing the names of the research participants. The participants were named teacher 1 to teacher 12 throughout the research reporting process. Furthermore, the participants were requested–and not coerced–to participate in the study.

The researchers advised the participants on the purpose of the study and their roles in the study so that they could make informed decisions. Furthermore, the participants were made aware that they had the right to withdraw at any stage as the research unfolded–and not continue to be participants.

PRESENTATION OF RESULTS

Two main themes emerged during the data analysis: *challenges faced by teachers when integrating technology* and *coping strategies devised by the teachers to overcome challenges associated with technology integration.* The themes were used to report the findings of the study.

Challenges Faced by Teachers When Integrating Technology

During the interviews, teachers mentioned different challenges they face when integrating technology in their classrooms. The challenges range from a lack of technology infrastructure to inadequate training in technology integration. Teachers' commentaries are elucidated in the sub-themes below.

Lack of technology infrastructure and resources

Some teachers experience a lack of technology infrastructure that would enable them to meaningfully integrate technology in their classrooms. It emerged that some classrooms in some schools do not have electricity, which hinders teachers from integrating technology seamlessly. Teacher 6 said:

> So, in the school where we are, like in terms of resources I can say that we are only using a projector right. So sometimes I do apply the projector inside, though in our classroom we are having a problem in terms of electricity, the plugs, like if you want to like show learners in using projector.

From the commentary of teacher 6, it can be inferred that some teachers are willing to integrate technology in their classrooms; however, the basic infrastructure such as electricity is lacking in some grade 9 classrooms. The lack of infrastructure such as electricity in the classrooms may negatively affect teachers' technology integration.

A similar challenge of lack of electricity in some grade 9 classrooms is prevalent in teacher 2's school; however, she overcomes it by moving learners to the classes that have electricity. She stated:

> Some classes do not have electricity, so we have to rotate learners, so if electricity can be supplied to all classes and all the resources get installed in all the classes and that would be better because you will not have to be rotating learners from one class to another. They will stay in their class and then they learn from their classes to save time as well.

From teacher 2's comments, it can be deduced that if she wants to integrate technology in her lesson, she has to exchange classes with another teacher. Thus, because her classroom does not have electricity, for her to connect technological devices, she needs to move the learners to the classroom that is fitted with electricity.

Furthermore, it transpired from the interviews that some schools have limited technological tools that grade 9 teachers can integrate to enhance their lessons. Teachers reported that technological tools such as data projectors and laptops are limited. Nevertheless, they try their best to integrate the available resources. Teacher 7 stated:

> And then there is a shortage of laptops, we only have five laptops, so they are used departmentally.

Due to an insufficient supply of technological tools, in teacher 7's school, the tools are allocated according to departments, and they are shared among teachers within the departments. Teacher 7 indicated that as a department, they find it difficult to share the limited technological tools. She opined:

> We've got one, we've got only one overhead projector, we really manage hard, it is managed hard, sometimes we are given the soft documents by out subject advisor to use when teaching, but it is difficult to use it at the time when we need it.

Teacher 7's comment suggests that sharing technological tools makes it difficult for individual teachers to access the educational resources they need to support their lessons. This is because curriculum specialists (formerly known as subject advisors) share learning materials for their subjects electronically. Teachers therefore need technological tools such as data projectors and laptops to display the information to learners to supplement the information from the official learning materials.

Inadequate training and lack of support

Another challenge that is faced by grade 9 teachers when integrating technology is the lack of skills due to inadequate training. In addition, these teachers do not receive much support from the school management. During interviews, some teachers reported that the training they received on technology integration was not adequate. Teacher 1 and teacher 10 had this to say:

> There was no adequate training. The only thing they called us to attend a short training and they left … it was for a very short time; it was for only three days (teacher 1).

> Eish, I did not receive any training, I just learned how to use these by myself, but for the interactive whiteboard, we had this, there was a three-year program from those people who donated the interactive whiteboard in our school, so we normally go maybe three days, three to five days, two times a year (teacher 10).

Teachers' comments above suggest that they received incoherent and unsystematic training from the providers of the technological tools. This resulted in them not developing adequate skills to integrate technology in their classrooms. Teacher 10's decision to voluntarily learn to use other technological tools on his own might be due to the training he received on using IWB which might have encouraged him to learn more about technology integration.

Another challenge to integrating technology that emerged during the interviews is the lack of support from school management, as teacher 8 and teacher 6 indicated. Teacher 8 said:

> We don't get support it is just that after they provided us with the laptops, they gave us but there is no more support that we get.

From teacher 8's commentary, it appears that the school management only allocated technological gadgets to teachers; no further support was provided.

According to teacher 6, the school management should have taken steps to ensure that the technological gadgets provided to teachers are used optimally. She felt that the school management should have provided Wi-Fi to enable teachers to access different educational resources from the internet. She stipulated:

> There is poor support in our school, because even now we cannot access the internet and the Wi-Fi and that is where we can get more information, but we don't have such things.

From the teachers' commentaries above, it is clear that they feel that the school management do not support them in their attempts to integrate technology. Nevertheless, the teachers were not discouraged from integrating technology into their classrooms. Rather than relying on government and the school management to eliminate the challenges that are associated with technology integration, they devised some strategies to cope with these challenges.

Strategies to Overcome Challenges Associated With Technology Integration

This theme reports on the strategies adopted by grade 9 teachers to overcome the challenges associated with technology integration. During interviews, the teachers recounted a few strategies they adopt in their classrooms to overcome challenges associated with technology integration. For example, teacher 4 indicated that she downloads educational videos to share with the learners while at home–to overcome the lack of connectivity in the village where her school is located. She articulated:

> So, I download video lessons and then send them when I am at home. I send them to their phones while they are at home, they use them when they are at home, but when at school, it is not going to materialize.

Teacher 2 devised the same strategy to overcome the challenge of poor connectivity in his school.

> In most cases you find that if I had to present a lesson using a video lesson, I can't do it online since we don't have a signal at my school. It means that I have to download everything and prepare everything as it is in another village, because at school, it is impossible to access online videos since the village that I am working at, there is no signal.

Based on the comments made by teacher 4 and teacher 2, it can be concluded that they have opted to access content from the internet when they are away from their schools–due to lack of connectivity. Although this coping strategy is commendable considering the context in which their schools are located, it also means they cannot access educational videos from the internet while teaching to support their instructional practices. Grade 9 teachers who teach subjects such as English, mathematics, natural sciences and economic and management sciences may need to quickly access educational videos online while teaching, in order to enhance their instructional practices. In this context, it means such teachers are not able to do so, which puts them and the learners at the backfoot compared to their counterparts who have access to the internet during teaching and learning.

Furthermore, teachers indicated that they sometimes seek help from their colleagues who have skills to integrate technology. Teacher 7 reported:

> We usually encourage each other to use those technological stuff and those who do not understand how to use them we help them we help each other, like especially on, ja, [sic] downloading videos, simpler things like downloading videos and then I remember there are those teachers born before technology.

Hence, the teachers did not wait for individuals from outside to guide them on technology integration; they decided to seek help from their knowledgeable colleagues from within their schools. This finding is encouraging because it shows that some teachers do not rely heavily on government initiatives regarding technology integration skills; instead, they take initiative to equip their colleagues with those skills. In addition, teacher 2 and teacher 4 indicated that they seek guidance on technology integration from the neighboring schools. Teacher 2 said:

> You know, [as] a teacher one needs to improvise in anyway [sic] and the teachers should be flexible as possible, so if whenever I come up with challenges, I outsource some of the information from other schools, from colleagues, so that at the end of the day, I am able to use them in my school, for example we have subject meetings with other teachers, within the area, that is where we interact and we get information, in one way or the other. That on its own assists a lot in terms of using technology.

> In terms of problems, normally there is a guy which we call, one of our neighboring schools, like he is good in terms of technology. Like he is an assistant teacher, so we normally call him to come and assist us at school (teacher 4).

This finding is encouraging because it strengthens the corporation between schools and among teachers. Furthermore, having teachers from different schools working together to integrate technology may help to advance technology integration among the schools in the area. Grade 9 teachers may also share technological resources such as content slides, digital tools, and ideas on technology integration in different subjects. Teacher 10 indicated that he also seeks help from the IDTC, which seems to be a unit within the education district that deals with technology-related issues in schools. He stated:

> Normally I will be having my own internet for me to use and then also to share with the learners, and then again if there is a problem with the laptop or whatever, I go to IDTC at Whatlalerve, it is a place whereby we get help in terms of our laptops, they put in things such as antivirus.

From teacher 10's commentary, it can be deduced that he seeks help from a third party with technology integration. Although this strategy is good because he receives assistance from individuals who are qualified to help, it was not clear how often this happens and how far the IDTC is from his school. This is because, if it is far, he might compromise time for teaching and learning.

DISCUSSION OF FINDINGS

This study investigated the strategies adopted by grade 9 teachers to overcome challenges that are associated with technology integration in their classrooms. The study revealed that teachers face a plethora of contextual as well as general challenges when attempting to integrate technology in teaching and learning. For example, it transpired from this study that some schools lack basic technology infrastructure such as electricity in the classrooms. Similarly, with regard to the South African context Chisango et al. (2020) found that some schools are not equipped with technology infrastructure such as electricity, computer laboratories or computers. In the current study, it emerged that the lack of electricity in some of the classrooms resulted in teachers rotating learners to classes that have electricity connectivity in order to integrate technology. This may be time consuming for teachers, especially in South African schools where teachers are encouraged to ensure that teaching and learning time is used optimally. Furthermore, spending more time on preparations for integrating technology may discourage teachers from integrating technology in their classrooms. However, this was not the case in the schools where the study was conducted–possibly because teachers are at an advanced level of technology acceptance. Rather than focusing on challenges of integrating technology, they devised strategies to overcome those challenges–such as rotating the learners to classes with electricity.

It further transpired from the study that some teachers do not have the skills to integrate technology in their classrooms. This finding corresponds with that of a study that was conducted by Joseph (2021)–that found that the lack of technology integration skills among secondary school teachers in Tanzania was a major challenge and it hindered teachers from integrating technology. Interestingly, although some teachers indicated that they lack the skills to integrate technology in their classrooms, it emerged from this study that they sought guidance on technology integration from their colleagues who are knowledgeable with regard to integrating technology in teaching and learning. This finding suggests that some grade 9 teachers did not see their lack of their technology integration skills as an invincible challenge; they found a strategy to overcome this obstacle by seeking assistance from their colleagues. Some teachers even approached teachers from nearby schools to help them. Based on the above, it can be argued that the teachers were proactive in their approach because they did not sit back and wait for the interventions from government to equip them with the necessary skills. The proactive approach that was adopted by the teachers to seek assistance from their colleagues from both within and outside their schools might be attributed to their advanced level of technological acceptance, as advocated by Roger's (2003) DOI theory. The proponents of the DOI theory argue that teachers who have fully embraced technology in their practices reach an advanced level where they see the value of the innovation (technology) in their teaching. Due to their level of embracing the innovation, this study argues that it became difficult for grade 9 teachers to stop using technology, hence they devised strategies that would help them to enhance their use of technology.

Finally, this study revealed that the location of the schools generally affected teachers' integration of technology. In the villages where the schools are located, network connectivity is poor. To overcome this challenge, teachers opted to download educational videos and other learning materials accessible from the internet in the villages where they reside because there is connectivity. This finding is against that of the study by Duma et al. (2021)–that revealed that poor connectivity prevented teachers from integrating technology in their classrooms. In the current study, teachers downloaded educational materials and shared them with the learners, whereas some were saved on their gadgets in order to use them offline during their lessons.

CONCLUSIONS AND RECOMMENDATIONS

This study concluded that the grade 9 teachers who participated in this research face several contextual challenges when integrating technology into their classrooms; however, they are able to develop different strategies to overcome the obstacles. This might be attributed to the level of technology acceptance and the value of technology in their pedagogical practices. It emerged from the study that teachers face challenges such as a lack of basic technology infrastructure, lack of connectivity and lack of technology integration skills. To overcome these difficulties, teachers engage in rotating learners to classrooms with electricity connectivity and seek guidance from their colleagues who are knowledgeable about technology integration. Through this, the teachers demonstrate that they believe in the role of technology integration in their classroom practices. Based on these findings, this study recommends that schools should be provided with proper technology infrastructure to support teachers' endeavors to integrate technology into their classrooms. The study further recommends that schools should adopt and sustain technology peer mentoring among teachers–where teachers who have knowledge and skills on technology integration serve as mentors to their colleagues who need to acquire the relevant knowledge and skills.

For future research, the study recommends that studies of the same nature include learners as participants. This will help to capture learners' voices on challenges that are associated with technology integration in teaching and learning. Furthermore, a quantitative study on the same topic should be conducted in order to include more teachers so that the findings can be generalized in other contexts.

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Data availability: Data generated or analyzed during this study are available from the authors on request.

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