SAJELM 3 (1)

Using (or not using) technology to enhance teaching and learning in historically disadvantaged school communities in South Africa.

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Abstract
In this article we report on a study that investigated the use of technology in primary schools to enhance the quality of teaching and learning in the subjects Mathematics, Science and Technology (MST). The sudden outbreak of Covid-19 in 2020 brought with it many changes in teaching and learning in the Sedibeng West district, South Africa. A major change was the sudden forced use of technology in schools, which highlighted the inequality in South African society. For instance, the skewed provision of resources in the past dispensation became evident when schools in suburban areas had the necessary resources to adopt alternative modes of teaching while township schools were unable to cope with the demand of relying on technological equipment, where the use of technology for teaching purposes was experienced as a distinct challenge. In an attempt to understand teachers' use of technology, we conducted a qualitative study, underpinned by critical theory. Data was generated through semi-structured interviews with 10 purposively selected primary school teachers, supported by observation, audio recordings and field notes. Our thematic analysis of the data revealed that teachers' tendency not to sufficiently use technology in their teaching can be linked to neglect of school infrastructure, poor management and limited maintenance, among other factors. In addition, the participants seemed to lack the necessary skills to use technology for teaching in their classrooms, which points to limitations in terms of teacher training on the use of technology to enhance the quality of teaching and learning.

Keywords: Covid-19 pandemic, information and communications technology, programme delivery, quality teaching, school infrastructure, teacher training programmes, teaching and learning.

Introduction
The value of using technology in the 21st century in primary schools cannot be underestimated. Throughout the history of education, there has been one driving force behind rapid and constant change, namely technology. The concept technology-enhanced learning (TEL) is preferred to explain the application of information and communication technologies (ICT) to teaching and learning. However, the plethora of content knowledge in every subject that is available on the internet requires skilful and competent teachers to know what to access in order to enhance the quality of their teaching practice. Although many studies have been undertaken worldwide on the use of technology, limited research has been conducted on the skills and the willingness of primary school teachers to use technology in their teaching. It is against this background that we undertook a study on the availability of technology in primary schools, taking into account

that technology is often either not effectively used or not used at all in primary schools in South Africa.

Pletka and Torlakson (2014) assert that the evolution of technology has broken down barriers and opened up a completely new world, with an overabundance of information right at everyone's fingertips. This implies that sufficient information is available to teachers to freely access and incorporate this when teaching, including in the subjects Mathematics, Science and Technology. Despite this availability, implementation and incorporation of technology for teaching and learning in primary schools remains a challenging and complex process for teachers. In undertaking our study, we aimed to contribute at a practical level, by making recommendations for policymakers which could help to address this challenge. Despite the fact that during the Covid-19 pandemic, teachers were forced to adapt their usual teaching style to online modes, which are dependent on internet connectivity and technology, many teachers quickly reverted to their old ways of programme delivery in the post-Covid-19 classroom. The question is why these teachers reverted to their old approach instead of continuing with online teaching and using available technology.

In this regard, we argue that teachers consider the available technology ineffective for enhancing the quality of teaching and learning, particularly in the subjects Mathematics, Science and Technology. Hyndman (2018) posits that the impact of the lack of technology use in primary schools in an education system will be enormous, due to learners being deprived of access to a much wider and more content-rich environment. Cox and Cox (2009, p. 4) point out that it puts these learners at a disadvantage in an age of innovation, where technology is prominent in most activities and is an integral part of everyday life. Hardman (2005) contends that the ideological thrust behind effective use of technology in the classroom is located in the South African Schools Act (1996) and can be summarised as follows:

- Commitment to providing quality education for all
- Developing democratic citizens, equipped with the essential skills required to participate in the knowledge economy of the 21st century
- Redress past inequities by providing for new learning/teaching strategies to enable the flexible delivery of services across diverse learning contexts by providing access to and equitable distribution of technological resources
- A focus on learner-centred, outcomes- based approaches to education. (p. 258)

Against the background of this discussion, our study sought to determine the reasons teachers tend to avoid using technology when it is readily available in most schools, for the sake of enhancing the quality of teaching and learning experiences in their classrooms.

Background and problem statement

Education is of paramount importance for development, as it shapes the future of a nation, by empowering individuals and groups with capabilities, opinions, understanding and principles to live by and to function in a sustainable manner (Pushpanadham, 2020). It is for this reason that one would expect that teacher training institutions would train pre-service teachers holistically. Such a holistic approach would imply inclusion of training of pre-service teachers on how to incorporate technology for teaching and learning in schools in the previously disadvantaged communities which are, according to Myers, Louw and Fakier (2008), black African and Coloured communities. In this regard, Pushpanadham (2020) argues that it is the responsibility of higher education institutions (HEIs) to develop human resources right from

their inception, and to provide prospective professionals to all sectors of the economy. Therefore, it seems clear that HEIs can be expected to include the use of information and communications technology (ICT) in initial teacher training, thereby aligning 21st-century teacher training efforts with the Fourth Industrial Revolution (4IR). Davis (as cited in Mhlanga & Moloi, 2020) explains the 4IR as "the advent of cyber-physical systems involving entirely new capabilities for people and machines". Therefore, the 4IR signifies a completely new system, in which technology is embraced in communities, and also in schools. This study acknowledges that the use of electronic devices to engage in teaching and learning across multiple settings via connections to media, teachers, peers, experts and the larger world is a new academic undertaking. This new undertaking may be referred to as technology-enhanced learning (TEL). Use of TEL is explained by Mohamad et al. (2021, p. 1) as "breaking the barrier in all education innovations by accelerating the learning transfer from a teacher to students".

However, the key to successful integration of technology in learning is competence of both the teacher and the students in adopting relevant technology to facilitate and optimise learning. If not attended to, a lack of, or limited, technological skills by teachers may lead to ineffective teaching and learning, even in schools where technological infrastructure has been provided. This is especially so considering that "children eight years old and younger spend, on average, 2.3 hours a day using digital technologies", and that "the percentage of that time on mobile devices has tripled since 2011, from 15 to 48 [minutes] a day" (Bernacki et al., 2020, p. 1). Adu et al. (2022) assert that most of the technological infrastructure available in schools in South Africa was not utilised before, during or after the Covid-19 pandemic. This means that the available resources are not adequately utilised in these schools. As mentioned before, this trend can be attributed to teachers not feeling sufficiently equipped to use technology for teaching and learning.

The world's education systems must move away from the conservative face-to-face mode of programme delivery and adopt virtual and online learning, irrespective of whether there is a pandemic (Maphosa, 2021). Virtual and online learning enables learners to actively participate in lessons, it provides flexibility, and it allows learners autonomy. Ali (2020) contends that digital technologies have made learning easier, through animation and YouTube videos that support interactive learning environments. Nuskiya (2018) opines that technology significantly improves teachers' performance, and that it increases their satisfaction and motivation. Koh (2015) argues that teachers can become more productive by using technology effectively, by, for example, supporting processes of checking, trialling and alteration, enhancing the variety and the appeal of classroom activities, fostering learner autonomy and peer support, and building confidence. As mentioned before, Hyndman (2018) opines that limited use of technology in schools can deprive learners from gaining access to a much wider and more content-rich environment. Schmidt and Ralph (2016) report on the way a school with severe budget constraints successfully incorporated the flipped classroom method by using technology. They explain that "the learners watch […] videos, practice problems, and take quizzes. The teacher has access to the results instantly on the website. This provides the teacher with information on what the students have mastered and what information needs further instruction" (Schmidt & Ralph, 2016, p. 5). Cox and Cox (2009) point out that limited incorporation of technology in teaching and learning will put learners at a disadvantage in the

current age of innovation, where technology is prominent in most academic activities and forms

a vital part of the everyday lives of both teachers and learners. Wilson-Strydom et al. (2005), in their study of ICT integration in South African schools, found that in many schools that had access to such technology, the focus was often on learning about this technology, rather than on learning with or using this technology during learning activities.

Research design and methodology

We implemented a qualitative phenomenological research design, and critical theory underpinned the study. This research design allowed us to generate data with participants who have experienced the phenomenon under study, in attempting to understand their experiences and perceptions (Creswell, 2014). Critical theory of technology perceives technology as socially constructed, symbolizing historically specific social biases and values, thus it is considered impossible to assess the use of technology in a social vacuum. According to this theory, "it is particularly important to examine the underlying power relations that shape how technology is designed and used." (Schmid, 2006, p. 51)

In qualitative research, the main objective is to "learn the meaning that the participants hold about an issue" (Creswell, 2014, p. 186), which is why qualitative research methods were deemed suitable for this study. According to Campbell et al. (2020), purposive sampling enhances the thoroughness and accuracy of a study, as well as the credibility and trustworthiness of the data and the results, by better matching the sample to the aims and objectives of the research. Therefore, for us to collect rich data from the research participants, a non-probability purposive sampling technique was utilised. The sample for our study consisted of 10 teachers from five different schools in the Sedibeng West district, South Africa. One novice teacher (participants1 to 5) and one experienced teacher (participants 6-10) were chosen from each school. Teachers were selected based on the availability of technology infrastructure in their schools and with a potential of providing rich data on their perceptions of their use (or non-use) of technology.

Data generation and documentation

Data was generated through in-depth semi-structured face-to-face interviews (Creswell, 2014) conducted at the schools where the participants were working at the time of our research. The interviews lasted approximately one hour each. Participants' permission to record the interviews was sought prior to commencing with the interviews. Field notes were taken, and observations of unusual circumstances were noted.

Data analysis

After transcribing the recorded interviews verbatim, the generated data was analysed thematically (Creswell, 2014). We followed the steps for data analysis proposed by Braun and Clarke (2021). Accordingly, we repeatedly read the interview transcripts and our field notes, as well as the observational notes we had compiled during the interviews. Next, we searched for themes, we reviewed and defined them, we named the different themes that had been identified, and, finally, we compiled a research report.

Ethics and rigour

We applied for ethics clearance from the Research Ethics Committee of the Faculty of Education of the institution where the research was undertaken, namely North-West University (reference number NWU-00283-23-S2), and we then obtained permission from the Gauteng Department of Education to conduct research in schools. Next, written informed consent was obtained from the participants after their safety, anonymity, protection from harm, and confidentiality and safekeeping of the generated data were discussed (Creswell, 2014). The transcribed data was typed as text and saved as a data file. The data file and a hard copy were then saved on a password-protected online cloud database with limited access. The data file and hard copy were filed under anonymous names to ensure the confidentiality of the study. The recorded data is managed solely by the researchers. They saved both audio files and text files on the password-protected online cloud database with encryptions. The recorded non-verbal notes were then scanned onto the password-protected online cloud database with encryptions, for the purpose of effective record keeping. We strived to ensure trustworthiness of the study by attending to the criteria for rigour in qualitative research, as proposed by Lincoln and Guba (1985).

Presentation and discussion of the findings

The majority of the participants agreed that integration of emerging technologies in teaching and learning processes can bring inspiration and modernisation to education, enhance inclusivity, and promote achievement of teaching and learning objectives. This finding is confirmed by Onyema (2019), who asserts that teachers no longer have a choice but to integrate technology in education, as the learning landscape is changing, there is a call for flexibility in teaching methodology, and there is a need for innovation and creativity in learning. The critical theory that underpins this study suggests that each piece of technology is created by the interface between its design and how it is adopted by its users. Nonetheless, the findings of our study indicate that integration of ICT in teaching and learning processes may be constrained by a number of challenges, as discussed below.

Insufficient skills and lack of support

When the participants were probed to provide reasons for teachers being reluctant to use technology in teaching and learning, they mentioned lack of support and age as two prominent reasons. Regarding lack of support, it was evident that there was a specific common reason that made it difficult for teachers to embrace technology in their classrooms. More specifically, the participating teachers indicated that their school management team encourages the use of technology in the school but does not provide any practical support for them to use technology. All the teachers in Schools B and C, for example, have to use their own laptops if they want to use an overhead projector. When asked to what extent they have been empowered by their school management team to become skilled in the use of technology, the participants said the following: *"No, that just came basically, naturally. I mean I have not been trained to, but I do know how to use it from experience"* (Participant 5); and *"Mostly I taught myself, but for some pages or searching for videos and that, we learnt at university"* (Participant 6).

However, when exploring the participants' experiences at School A, which engages with technology in a positive way, it was evident that these teachers are supported in various ways. They are, for example, provided with laptops by the school and sent on training courses to

improve their own knowledge and become more adept at using technology. Participant 2 said the following regarding the support they have received from their school: *"Yes, we had smart board training at the beginning of the year somewhere, where we were taught to use the smart boards and applications and all of that"*. Another participant expressed similar sentiments:

> *"We were trained to use tablets, because the Grade 7s work with tablets. We've been trained with the IBM program that we use on the interactive whiteboards. We have had a couple of trainings on that, but practical training on the board itself. And also with SA-SAMS, we utilise it in our classes as well, because we are connected with the server in our classes. And we also have a new Karri app, where parents are able to pay school fees and extracurricular activities and stuff like that, where we can actually upload it in our computers, and we can see who has paid, who hasn't paid. It will keep record like that. We use the computers for discipline systems as well, so we have had training on that. Cell phones, tablets, laptops: we have had training on it all."* (Participant 1)

It seems that support by school management can play a role in how teachers perceive and implement the use of technology in their classrooms. This finding is consistent with Ghavifekr and Rosdy (2015), who contend that school management teams (SMTs) should encourage teachers to incorporate ICT in teaching and learning. These authors believe that SMTs have the responsibility to convince teachers that ICT can benefit both teaching and learning processes, and that they should encourage teachers to integrate ICT in their classroom teaching. The training of teachers to effectively use technology can be a determining factor in how they view use of this resource in the classroom and how motivated they are to use it. Gilakjani et al. (2013) argue that if teachers are appropriately taught how to use technology before they enter a real classroom, their computer self-efficacy will increase, and their likeliness to use technology in the classroom will improve. Studies have shown that when pre-service teachers attend educational technology courses that emphasize technology use skills as part of the curriculum, the pre-service teachers' computer self-efficacy improves (p. 54).
This will be more of a possibility in cases where SMTs empower their teachers by, for example, enrolling them for training courses or seminars. Ghavifekr and Rosdy (2015) opine that it is important for SMTs to find ways of providing adequate technical support and training as well as continuous professional development (CPD) for teachers, in order to ensure successful incorporation of ICT in teaching.

Teachers at Schools B and C indicated the opposite, namely that their use of technology was a result of their own initiative. At these two schools, the teachers use their personal laptops to stream videos. After one of the interviews, a participant indicated that a learner had accidentally knocked her laptop off her desk, resulting in a broken screen, and that the onus was on the teacher to fix her laptop. In this case, the school did not cover any loss or damage to personal property of the teachers. Participant 4 confirmed this: *"We don't have it readily available, unless you can fund it yourself and bring it to school, which is a risk"*. This was also confirmed by Participant 6:

"I think personally the school needs to provide technology for the teachers, because I don't think it is fair if we use our own laptops or own technology in our classrooms. The school doesn't have things set in place for if it is getting stolen."

These seemingly opposing findings highlight the importance of having various role players in teachers' use of technology in teaching and learning. Therefore, although the support of SMTs is important, teachers themselves can drive the process of integrating technology in their own teaching and learning process. Both these factors can support implementation of this resource by teachers in the classroom.

The participants linked willingness, or in some cases lack of willingness, of teachers to use technology to the age of the teacher, remarking that age plays a definite role in how teachers view technology and use thereof. Participants said the following, which indicate reasons for the apparent resistance of older teachers to using technology:
"There will be your teachers that won't want to use it and want to stay with the older way of doing things, especially older teachers. But the younger teachers will really enjoy the technology and using different ways of connecting with the kids." (Participant 2)
"The older teachers do not want to use technology for their teaching. Most of them always say that they are about to leave their profession, and thus they see no need for attending workshops that will teach them how to incorporate technology in the classrooms. Personally, I don't think they use technology. They will be more trapped in the type of textbook methods or go get more worksheets or things in textbooks to explain to the children more, while the internet is freely available to make the work easier. That's my opinion." (Participant 6)
"Old age. When we started with the interactive whiteboards and it became accessible for the whole school, a lot of the old generation kept against it, because it is a lot of new training. It is a lot of new stuff to get their grip around. We still have some of the younger generation to help the older ones understand working on Word or changing fonts with their activities on the board. And it is a lot of training you have to go through, and it is practice over and over. And I think the patience that they have after been teaching for 25, 30 years, having to start something new and adapt their curriculum to the new internet program on the board, it makes it difficult for them." (Participant 1)
"And then, of course, we have the old teachers. They are not interested. They write their mark sheets in pen, by hand." (Participant 4)

This finding indicating a difference between younger generations and older generations of teachers when it comes to using technology in the classroom is in line with Ellis and Allaire (1999), who found that older-generation teachers feel less comfortable using technology for teaching purposes, and less confident in their ability to successfully use ICT. Gilakjani et al. (2013) explain this as follows:

> [T]he millennial generation, generally defined as students born after 1982, differs from previous generations in specific characteristics. These new students gravitate toward group activity and are fascinated by new technologies. They are actively engaged on the Internet playing videogames and chatting, actions which do not coincide with the traditional lecture style practiced by older generations of teachers in most classrooms. The learning styles of new generation lean toward […] use of technology. (p. 55)

This shows that teachers who are used to doing things a particular way with which they are familiar will tend to resist change, even when opportunities are available to them. In the context of the study that we report on, this implies that older-generation teachers are accustomed to using non-technological methods, based on their training and teaching practices over the years.

SMTs should therefore remain aware of this and act appropriately to change the status quo of the older-generation teachers and empower all teachers under their supervision. Gilakjani et al. (2013, p. 56) opine that "if teachers perceive technology as a threat to their traditional teacher-centered methodology in which they have received years of training, they may resist the use of technology". As confirmed by the research we completed, older teachers are used to methods that do not implement technology, as these methods represent what the teachers have been trained to use and what they have applied for many years.
For this reason, Ungar and Baruch (2016) claim that teacher training institutions have an essential role to fulfil in training teachers not only to teach, but also to serve as role models for ICT-based teaching. When teachers believe that technology is valuable, they are more likely to incorporate it into their teaching practices, as explained by Ottenbreit-Leftwich et al. (2010). However, it remains unclear "what interventions can be developed to decrease the amount of time it takes students to become functional in the online environment" (Wisneski et al., 2017, p. 8).

Availability and accessibility issues
In most schools included in the study, the participants mentioned that they do have computers and projectors available in the classroom. They also indicated availability of technological resources in their schools, and that they use these resources in their classrooms. The participants responded as follows:
"We've got smart boards that we use. We use basically PowerPoint with the projectors." (Participant 2)
"I do make use of YouTube when we cover a new subject or a topic, and I use the whiteboard with a projector that projects onto the white screen. We don't have interactive boards, but we do have our laptops that we do use." (Participant 3)
"I use my cell phone during my classes as well. I google information. I teach English and Life Orientation, so YouTube videos, Google pictures, articles: I live on that. And I have a projector in my classroom. Laptop absolutely necessary." (Participant 4)
The responses of the participants confirm Mhlanga and Moloi's (2020) assertion that "South Africa generally has some pockets of excellence to drive the education sector into the 4IR, which has the potential to increase education access". The authors recommend that the South African government "propose mechanisms of fiscal expansion to try to provide funding for moving of some aspects of education online and promoting the adoption of the 4IR" (Mhlanga & Moloi, 2020).

Although all the participants indicated availability of technological gadgets in their schools, the teachers at Schools B and C reported that they only use their personal laptops and projector screens. School A seemed to be technologically advanced in comparison with the other schools. In this school, all the teachers have smart boards, from Grade 1 to Grade 7. In addition, it was reported that the school provides all teachers with laptops. Although these laptops remain the property of the school, teachers can freely use the equipment as they see fit. The two participants who were interviewed from School A indicated that they both have interactive

whiteboards in their classroom: *"Yes, we do. We use interactive whiteboards in our classes, as well as internet. We use YouTube videos. We have got full internet access in our classes, so we use interactive whiteboard with the internet"* (Participant 1). Our observations confirm that School A has a technologically oriented culture, and that the teachers are not just supported to use technological tools, but are encouraged to use them.

Poor maintenance and vandalism of technology infrastructure

We observed in the schools that have computer laboratories that this infrastructure was often either damaged or vandalised, resulting in these facilities not being in working condition. When asked about the technology infrastructure of their schools, the participants responded as follows:

"We are devastated by what happened to our computer lab. The building was donated by a company called IBM many years ago. The computers that were donated by this company were all stolen after numerous break-ins." (Participant 7)
"As you can see, sir, it shows that this building is now a white elephant. Nobody is taking care of it. But, er, there are a few computers available in there, although all of them are no longer working." (Participant 9)

Another participant, however, explained that some learners are provided with tablets loaded with study materials, from textbooks to worksheets. According to the participants, some of these learners delete the resources from the gadgets and upload other material, such as music videos, that is not helpful for their academic work. This, in our view, points to a serious form of vandalism. In the words of one of the participants:

> *"Our students proved that they didn't want to use technology for teaching, but for some nefarious reasons. They removed whatever that was in the tablets and put their own stuff in there. Some learners reported that their elder siblings took the tablets and sold them. Others claim that they were mugged by tsotsis in the streets. It is so hectic, hey!"* (Participant 7)

Teachers who are willing to use technology to enhance the quality of their teaching are seemingly prevented from doing so, due to erratic power supply. Load-shedding and cable theft were reported as rife in some school communities, resulting in inconsistency in the use of technology. One of the participants explained this as follows:

> *"There is continuous theft of the electrical cable that supplies this school community with electricity, and vandalisation of our backup generator. Now we are unable to use the technology equipment that uses electricity. The transformer burnt down to ashes in the previous months, and the school was without electricity for more than six months, until the students marched to Eskom to demand a replacement transformer. We were told that the new transformer will also burst, because of all the illegal connections, that overloads it."* (Participant 8)

This finding is consistent with Chisango and Marongwe (2021), who found that the condition of the available ICT infrastructure in South African schools could deter teachers from using technology in their classrooms. Chisango and Marongwe (2021) assert that this is compounded by a lack of internet access and teachers not being able to afford data, which is costly. As a result, teachers can become frustrated and demotivated, to the extent that they will not even

consider incorporating ICT in their teaching. Theft and vandalism were also reported as having a huge impact on access to ICT for learning.

Based on the foregoing discussion, it is evident that there is a need to reskill teachers for them to be competent in ICT usage for teaching and learning. Furthermore, all the existing ICT laboratories in schools need to be overhauled, in order for them to serve the purpose they were designed for. It is the responsibility of the Department of Basic Education to ensure that schools are provided with ICT materials to enhance the quality of teaching and learning. In addition, the Department of Higher Education and Training must ensure that all institutions of higher learning provide tuition in ICT incorporation as a compulsory programme during initial teacher training.

Conclusion

While integration of technology in the classroom seems to be following an upward trajectory, the technological tools that are used must be managed well in order to maximise their value in teaching and learning processes. The study we reported on in this article revealed that many teachers still find it difficult to incorporate technology in their classrooms, due to various factors. The findings also suggest that positive attitudes and beliefs regarding the use of technological tools remain the foundation for successful integration of ICT in the classroom. Based on the findings of our study, we can conclude that all teachers at all levels of education will benefit from regularly upgrading their knowledge and skills on how best to integrate emerging technologies in teaching and learning processes. This may provide student teachers in initial teacher training, teachers and students with the necessary tools to be able to thrive in 21st-century pedagogy.

Recommendations

Based on the objectives of the study, the researchers propose the following recommendations:

1. Teachers who are not computer literate must be reskilled to enable them to integrate ICT in their daily pedagogic encounters with their learners.
2. The Department of Basic Education, in collaboration with the Department of Higher Education and Training, must provide in-service training for teachers, so that they can keep abreast of the latest trends in education.
3. More technological devices must be provided to every school in the country, and learners must be encouraged to use cell phones for teaching and learning.
4. School security must be improved to ensure that school facilities are safe and secure; and
5. Parents should be given a crash course in the use of technology, so that they can assist their children with their homework.

References

Adu, K. O., Badaru, K. A., Duku, N., & Adu, E. O. (2022). Innovation and technology: A panacea to teaching and learning challenges during the Covid-19 lockdown in South Africa. *Research in Social Sciences and Technology*, *7*(1), 69–89. https://doi.org/10.46303/ressat.2022.5

Ali, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher Education Studies*, *10*(3), 16–25. https://doi.org/10.5539/hes.v10n3p16

Bernacki, M. L., Greene, J. A., & Crompton, H. (2020). Mobile technology, learning, and achievement: Advances in understanding and measuring the role of mobile technology in education. *Contemporary Educational Psychology*, *60*, Article 101827

Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*, *18*(3), 328–352. https://doi.org/10.1080/14780887.2020.1769238

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: Complex or simple? Research case examples. *Journal of Research in Nursing*, *25*(8), 652–661. https://doi.org/10.1177/1744987120927206

Chisango, G., & Marongwe, N. (2021). The digital divide at three disadvantaged secondary schools in Gauteng, South Africa. *Journal of Education*, *82*, 149–165. https://dx.doi.org/10.17159/2520-9868/i82a09

Cox, J., & Cox, K. (2009). *Constructivism and integrating technology in the classroom*. Boise State University. http://edtech2.boisestate.edu/coxk/eportfolio/EdTech%20504%20Final%20Synthesis%20K&J.docx.pdf

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE.

Ellis, D., & Allaire, J. C. (1999). Modeling computer interest in older adults: The role of age, education, computer knowledge, and computer anxiety. *Human Factors*, *41*(3), 345–355.

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science*, *1*(2), 175–191.

Gilakjani, A. P., Leong, L.-M., & Ismail, H. N. (2013). Teachers' use of technology and constructivism. *I.J. Modern Education and Computer Science*, *4*, 49–63.

Hardman, J. (2005). Activity theory as a framework for understanding teachers' perceptions of computer usage at a primary school level in South Africa. *South African Journal of Education*, *25*(4), 258–265.

Hyndman, B. (2018, August 13). Ten reasons teachers can struggle to use technology in the classroom. *The Conversation*. https://theconversation.com/ten-reasons-teachers-can-struggle-to-use-technology-in-the-classroom-101114

Koh, C. (Ed.). (2015). *Motivation, leadership and curriculum design: Engaging the net generation and 21st century learners*. Springer.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE.

Maphosa, V. (2021). Teachers' perspectives on remote-based teaching and learning in the COVID-19 era: Rethinking technology availability and suitability in Zimbabwe.

European Journal of Interactive Multimedia and Education, *2*(1), Article e02105. https://doi.org/10.30935/ejimed/9684

Myers, B., Louw, J. & Fakier, N. (2008). Alcohol and drug abuse: removing structural barriers to treatment for historically disadvantaged communities in Cape Town. *International Journal of Social Welfare*,17, 156–165

Mhlanga, D., & Moloi, T. (2020). COVID-19 and the digital transformation of education: What are we learning on 4IR in South Africa? *Education Sciences*, *10*(7), Article 180.

Mohamad Yusuf, N., Abd Rahman, N., & Ghazali, N. (2021). The effect of a technology-enhanced learning (TEL) module on the achievement of Form Four students in the topic of waves and sound. *Jurnal Pendidikan Sains Dan Matematik Malaysia*, *11*, 81–93. https://doi.org/10.37134/jpsmm.vol11.sp.8.2021

Nuskiya, A. F. (2018). The effect of information technology on employees' performance in the banking industry in Sri Lanka. Empirical study based on the banks in Ampara District. *European Journal of Business and Management*, *10*(16), 47–52.

Onyema, E. M. (2019). Integration of emerging technologies in teaching and learning process in Nigeria: The challenges. *Central Asian Journal of Mathematical Theory and Computer Sciences*, *1*(1), 34–39.

Ottenbreit-Leftwich, A. T., Glazewski, K. D., Newby, T. J., & Ertmer, P. A. (2010). Teacher value beliefs associated with using technology: Addressing professional and student needs. *Computers & Education*, *144*(3), 1321–1335.

Pletka, R., & Torlakson, T. (2014, August 27). Torlakson and Pletka: Technology in the classroom is the pen and paper of our time. *The Orange County Register*. https://www.ocregister.com/2014/08/27/torlakson-and-pletka-technology-in-the-classroom-is-the-pen-and-paper-of-our-time/

Pushpanadham, K. (2020). The academic accountability in higher education; rhetoric or real. *Interwoven: An Interdisciplinary Journal of Navrachana University*, *2*(1), 1–13.

Schmid, E.C. (2006). Investigating the use of interactive whiteboard technology in the English language classroom through the lens of a critical theory of technology. *Computer Assisted Language Learning*, 19(1), 47-62

Schmidt, S. M. P., & Ralph, D. L. (2016). The flipped classroom: A twist on teaching. *Contemporary Issues in Education Research*, *9*(1), 1–6.

Ungar, O. A., & Baruch, A. F. (2016). Perceptions of teacher educators regarding ICT implementation. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, *12*, 279–296.

Wilson-Strydom, M., Thomson, J., & Hodgkinson-Williams, C. (2005). Understanding ICT integration in South African classrooms. *Perspectives in Education*, *23*(4), 71–85.

Wisneski, J. E., Ozogul, G., & Bichelmeyer, B. A. (2017). Investigating the impact of learning environments on undergraduate students' academic performance in a prerequisite and post-requisite course sequence. *The Internet and Higher Education*, *32*(1), 1–10.