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Teachers' Views on the Application of Educational Technologies in the Classroom: A Case of Selected Tshwane West Secondary Schools in Gauteng

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ABSTRACT
The teaching profession is moving toward the use of educational technologies (ET) in the form of tablets, laptops, and reliable internet in the classroom to improve the quality of teaching and learning in schools. The use of these tools in the Fourth Industrial Revolution (4IR) is believed to positively impact how teachers deliver the curriculum. Teachers' views on the application of educational technologies in the classroom are examined in this paper. The opinions of the teachers are crucial since they could influence whether or not the technologies are accepted. This study used a qualitative approach through semi-structured interviews with 12 teachers from one district in Gauteng province. A purposive sampling method was used to select these teachers on the basis that Gauteng is the leading province in ICT integration in schools. Data were analysed thematically from teachers' responses. The Activity Theory framework was used to underpin the study. According to the findings, teachers voiced their dissatisfaction with the use of these technologies and other issues they face, such as poor technical support, a lack of equipment for maintaining educational technologies, inferior educational technology infrastructure, and unreliable Internet connectivity. Additionally, teachers called on the Department of Basic Education to provide professional development in technology integration and to equip schools with infrastructure as well as Wi-Fi.

KEYWORDS
Educational technology; fourth industrial revolution; information and communication technology; resources.

INTRODUCTION

Educational institutions throughout the world are being pressured to integrate educational technologies (ET) such as tablets and computers and to provide Internet access to improve the quality of teaching and learning. According to San-Martin et al. (2020), gaining knowledge on what encourages teachers to consciously implement ET in the classroom is a solid starting point for moving and modernizing education into the future world. However, teachers' issues around the adoption of ET in the education system have motivated this study. According to San-Martin et al. (2020), several elements may influence teachers' decision-making process when it comes to implementing ET in the classroom. To begin with, many teachers believe that they must first master the necessary ET skills for them to be able to adopt them. Teachers believe that they must not only be able to utilize these technologies, but also be confident in their use to enhance teaching and learning (Meskhi et al., 2019). With the rapid change in both the industry and the schooling system, the Fourth Industrial Revolution (4IR) is gradually demanding change in many sectors. In a study by Mhlongo et al (2023), the 4IR has necessitated the teaching activities to change to prepare learners for the world of work. Strong demands are placed on teachers who continue to drive the learning experience and they are compelled to adopt ET in their classrooms. There seem to be varying views among teachers on the adoption of these ET skills and this study unearths such views.

Gauteng province is one of the richest provinces in South Africa where most of the economic hubs are situated. This has seen the revamping and refurbishment of its schools into so-called state-of-the-art schools, depending on the areas where they are situated in terms of crime in the province. The Department of Basic Education (DBE) in South Africa has embarked on the integration of Educational Technologies (ETs) in all Gauteng Secondary Schools, which are meant to be used by both teachers and learners (Department of Basic Education, 2014). This has seen learners receiving tablets and schools being provided with computers for the establishment of computer rooms for learners and teachers to be able to learn and teach through technology. Even though many consider this a good initiative, some are critical and regard this as putting the cart before the horse because many teachers do not seem to be keen nor proficient at utilising these ETs (Chigona & Chigona, 2013). A study by Garrone-Shufran (2021) indicated that teachers can only offer explicit instruction in the teaching of academic English if they are trained to do so. This applies to any academic discipline that teachers offer. This means that for any teacher to excel in what they do in class, they ought to be experts and manage to adapt to the changing situation that continues to engulf the teaching and learning situation. On the other hand, Garcia (2021) says that for teachers to succeed in the learning and teaching experience, they need to apply pedagogical instructions and practices that are beneficial for the learners, because teachers are the main drivers of the teaching experience and as such, they need to ensure that correct instructional practices are employed. These instructional practices need to be in line with the current trends that have taken over the learning experience in the form of new technologies and an education system that is engulfed

in new devices and innovations. Therefore, this study aimed to obtain the teachers' views on the issues related to the application of ET in their classrooms in the Tshwane West secondary schools in Gauteng province to determine how far the teachers have progressed in implementing ET since Gauteng province is at the forefront of such innovations.

LITERATURE REVİEW

Teachers continue to believe that there are barriers to using educational technologies in the classroom, such as a lack of time, insufficient computer facilities, a lack of administration support, teachers' limited computer skills, and teachers' perceptions of adequate training (Wu, 2019). Echoing similar sentiments, in their research in South African secondary schools, Moila et al. (2019) contend that pedagogical issues also impede the advancement of educational technology integration in teaching. To this end, it was fundamental for the researchers to review related literature to understand the teachers' views on the application of educational technologies in the classroom at the Tshwane West secondary schools in Gauteng. In this regard, the subsequent section of this study presents literature in the following categories: ET teacher professional development; ET resources; infrastructure; and access to the Internet.

ET teacher professional development

As new perspectives emerge, the use of ET in the delivery of teaching has produced a variety of results. According to Luo's (2020) study, teachers consider the use of these tools in carrying out teaching activities as stimulating their excitement, enhancing teacher-learner interaction, and cultivating independent learning ability in secondary school teachers and learners. However, some of the teachers in the Tshwane West secondary schools seem to be cynical about this and do not seem to have an interest in adopting and utilizing these ETs. Maryuningsih et al. (2020) noted that teachers require ET skills to be competent in using ET in their teaching and learning environments. Other authors (Cooper et al., 2020) also agree that teachers must be prepared to integrate ET into their teaching as well as be prepared to satisfy the needs of their learners. They also stated that teachers who cannot integrate ET into education will be unable to provide enough support to their learners because the learners who are currently in our schooling system are regarded as the generation Y group who are known as kids that are born with and within technology. This then calls for an education system that is encouraged by instructional practices that are digitally inclined because this generation tends to own one or more devices.

Proper training is required for most teachers to improve their skills in using ET since learners are better positioned to harness the potential of these tools for learning purposes with teachers serving as facilitators during this process (Hampel, 2019). It is crucial to improve teachers' capacity to deliver the curriculum through relevant teacher-professional development (TPD) initiatives. Access to ET knowledge and skills is essential for integrating these tools into teaching and learning in the classroom. Teacher Professional Development is crucial because it enables teachers to acquire the abilities they require for professional understanding in a technological society (Moiseienko et al., 2019). Additionally, a study by Du Toit (2015) found

that inadequate TPD could result in poor or incorrect usage of ET and poor educational outcomes. The incorrect use of ET-assisted instruction takes time that may be spent on more important learning challenges if teachers are not provided with TPD. Since ET resources must be used effectively, high-quality TPD with specifically effective teacher preparation and appropriate links to ET utilization is essential to produce sound education. Different acquisition strategies are required for various types of learning. Teachers who want to include ET in their curricula should receive relevant support to equip them to do so. This study presents the views of teachers in Tshwane West secondary schools on the application of ET in their classrooms. The teachers' views shed some light on how far the government has progressed in its initiative toward a digital society where learners would receive education wherever they are and whenever they want to (Department of Basic Education, 2014).

Access to ET resources

The lack of ET resources, for example, hardware such as laptops, notebooks, computers, scanners, cameras, and projectors, and a lack of internet access is an often-reported barrier in the literature (Fenty & McKendry Anderson, 2014). Without adequate ET resources, there is little opportunity for teachers to integrate these tools into their work practices. However, Gauteng as a province was the first to roll out tablets for its learners to utilise, particularly in secondary schools. Even though the initiative was met with criticism, it was a good initiative considering the type of learners that we have in our generation. Some of the criticism was that the learners received tablets while teachers were not trained on how to use them and that caused a public outcry among citizens Doering, et al. (2014). According to Carrasco and Torrecilla (2012), there are also contrasting views on the significance of teachers and learners having educational facilities at their fingertips that provide them with access to ET tools, and tools that are integrated into their teaching and learning practices. However, merely equipping schools with technological resources may not necessarily lead to superior learning or influence the level of learners' performance (Carrasco & Torrecilla, 2012). On the other hand, limited access to ET equipment was the resource challenge most frequently mentioned by teachers (Doering, 2014). Faced with budget measures and restrictions in funding, many educational institutions need cost-effective open access to educational resources (Davies & West, 2014). However, the maintenance of such devices needs to be put in place to sustain the lifespan of ET resources. In some cases, reliance on limited school resources prevents teachers from introducing new ideas and methods into the classroom, especially technology-driven methods (Doering, Beach & O'Brien, 2014). These researchers further highlighted that resources enable teachers to engage with technology integration whilst strengthening their skills. For teachers and their learners, the lack of adequate resources such as modern computers, peripherals, networking, and other resources within an increasingly diverse range of technologies, adversely impacts their intended educational outcomes.

Access to ET Infrastructure and the Internet

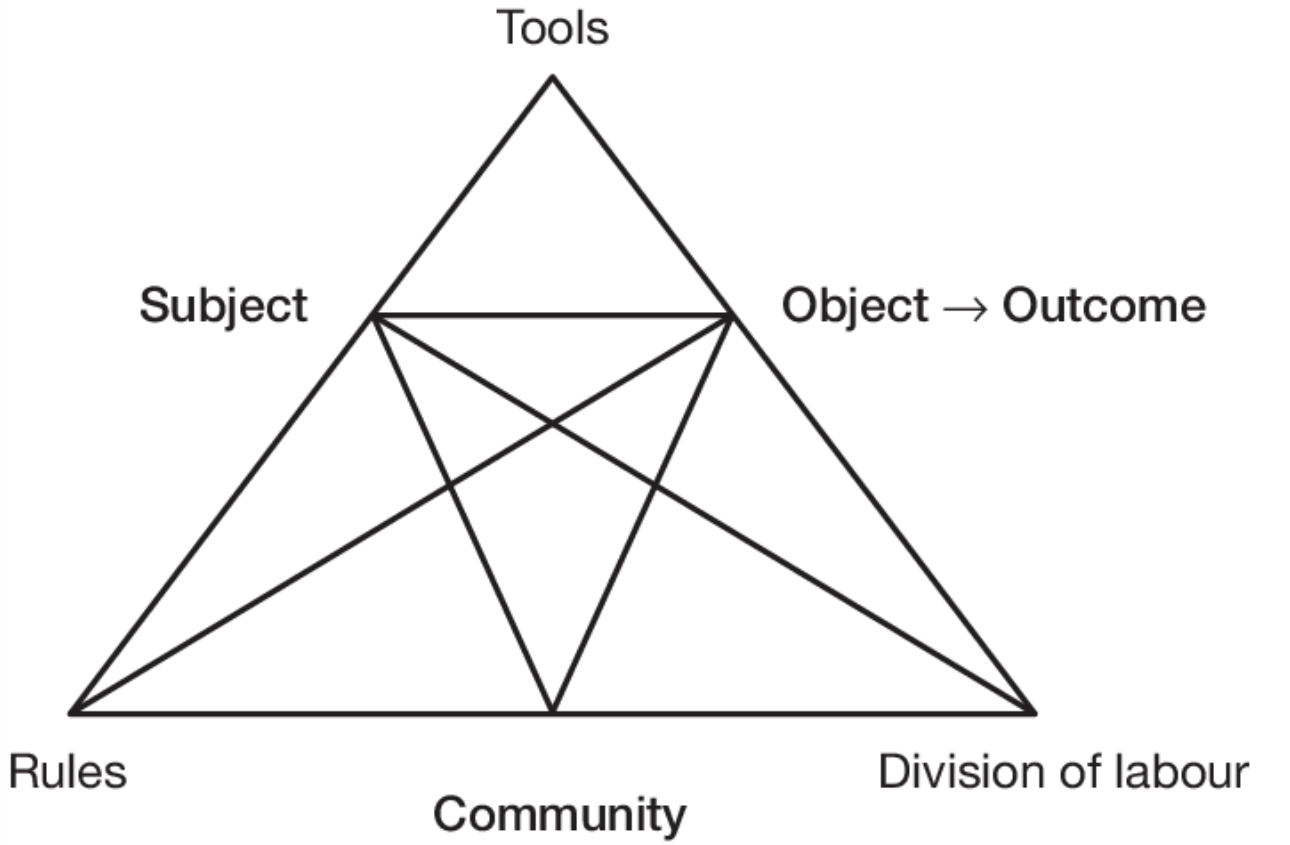
Apart from the lack of teachers' appropriate skills to use ET tools in their practices, poor infrastructure remains a major obstacle in many developing countries, including South Africa (Howie, Muller & Paterson, 2016). In addition, De Freitas & Spangenberg (2019) assert that insufficient internet access and frequent computer problems are to blame for teachers' failure to use ET at other schools, therefore technical support is essential. Farrell & Isaacs (2009) argue that because of prohibitive Internet costs in South Africa, of the estimated 6 000 schools that have access to digital technologies, only an estimated 2 500 have Internet access, but even a lesser number of schools can use the Internet because the government has been slow in implementing the e-rate policy. The Department of Basic Education (2003) also indicated that disparities reflected in South African society, particularly vandalism of ET infrastructure, also find negative expression in ET integration into education. Being that as it may, with connectivity and infrastructure challenges that have been alluded to, many educators and learners own devices in the form of a laptop or a smartphone that could be utilized to learn. This would be a yardstick to indicate how teachers view the issue of ETs in classrooms regarding more effective facilitation of tasks. A device today can help on numerous levels because of the period we live in. A device can allow one to access sites such as the internet, do banking, allow one to travel, and many more. And as such, one would say that the adoption of ET should be embraced by many. This study presents the secondary teachers' views on the application of ETs in the Tshwane West classrooms in Gauteng province.

Theoretical framework

In exploring the teachers' views on the use of digital technology in Gauteng Tshwane West public schools, the Activity Theory (AT) Framework was employed. The AT is not just a theory employed in teaching and learning, but it is also deemed as the theory that is best suited for qualitative analysis which suits the study. The AT sees the integration of technology as a tool that mediates social action. These tools or artefacts include instruments, signs, language, machines, and computers (Carroll, 2003; Roth & Lee, 2007). Engestrom (1987) and Leont'ev (1981) explain that AT is a conceptual framework that is suitable for research, and it involves human behaviour. Below is the diagrammatic representation of the AT as espoused by Engestrom (1987):

Figure 1

The Activity Theory (Engestrom, 1987)



The relation between the individual and their environment is considered by the components of the community. The relationship between subject and community is mediated by rules and the relationship between object and community is mediated by the division of labour (Hettinga, 1998; Carroll, 2003). Since the tools which have been incorporated into the social system have been created and transformed by humans during the development of the activity itself, they will carry with them the remnants of the cultural and historical evolution. Mediation through tools and technology is therefore not a neutral process, as the tools will influence the interaction between the subject and the object. Leont'ev (1981) refers to this phenomenon as Ringstruktur, or "ring structure", a combination of three codes determining the elements-subject, activity, and the object-where the subject is not primary, and where the object completes the circle by influencing the subject. Technology-mediated suggests that technology is the method used to connect individuals and transmit information. When technology is used in a class, both the program and the equipment mediate the full set of interactions (Bower, 2019). The relevance of the AT in this study is that it provided a holistic operational view of the phenomena at hand. It is through the Activity Theory that an overview perspective into the factors affecting DT integration into the processes of teaching and learning

in the Tshwane West district is understood. The framework helped to clarify the context of the research, the mediators as well as the activities.

Research question

The main research question of this study was phrased as follows:

- What are the secondary school teachers' views on the application of ETs in their classrooms?

RESEARCH METHODOLOGY

The study followed the following methods to obtain the views of teachers on the application of ETs:

Research Approach

A qualitative method was used in this study. This method was preferred based on the type and size of the targeted population and sample. According to Hlatshwayo et al. (2022), investigative inquiries often make knowledge claims based primarily on constructivist perspectives (i.e., the multiple meanings of individual experiences, meanings socially and historically constructed, with the intent of developing a theory or pattern) or advocacy /participatory perspectives (i.e., political, issue related, collaborative or chance oriented), both qualitative approaches. A qualitative approach was deemed appropriate since it would enable the researcher to find time to understand the context and participants through interviews/observations, and or documents. By having time to study and understand the phenomenon, the researcher found it easier to make conclusive judgments on the issue under study.

Research Design

This study utilised a case study research design. According to Creswell (2014), research design refers to the plan or proposal in which the research will be conducted. Therefore, it involves the intersection of philosophy, strategies of inquiry, and specific methods. Furthermore, a case study research design was selected for this study to explore and gain an in-depth understanding of participants' perceptions. A case study is an in-depth examination of a single unit to comprehend a broader group of units (Gerring, 2004). The schools that took part in the study were known for their economic and historical background where issues like ETs were not emphasized. This was done so that we could ascertain how well the schools were doing in the adoption of ETs considering the advancements that the schools in Gauteng have experienced. These schools had the same background, hence the adoption of the case study design.

Population

Maree (2012) describes a population as all the elements that meet certain characteristics for inclusion in a study. The target population for this study was 1 227 teachers from 37 full ICT secondary schools in Tshwane West District in the Gauteng province. These teachers were targeted because the Gauteng Department of Education had made digital technologies such as tablets, laptops, interactive whiteboards, and interactive smart boards available to secondary schools in the province. For this reason, secondary school teachers were expected to use digital

technology in their classrooms for teaching and learning. Participants in the study were secondary school teachers in the Tshwane West district of Gauteng province.

Sampling

The sample is a subject of the population that is selected from the targeted population to participate in a study (Bless et al., 2013). The nonprobability sampling technique was used to select the participants as it allows the researcher to obtain essential data regarding the study. In this regard, convenience sampling was used to select a sample of 12 teachers from four schools. The researcher selected purposive sampling because it is a technique that allows researchers to select a sample from a research population exclusively following the researcher's judgment (Babbie, 2010). Purposive sampling is most appropriate when the researcher has a clear idea of the participants' characteristics (Mlitwa, 2011). The sampled schools were chosen because of their historical and economic background. A total of four schools were selected, two schools from a poor rural background while the other two schools were from urban townships. All the sampled schools had access to DTs. Three teachers from each of the four secondary schools were involved in this study at the Tshwane West District, resulting in a total of 12 teachers. Teachers were given pseudonyms of T1, T2, etc. to protect and respect their identities. Schools were also termed S1, S2, etc.

Data collection techniques

Semi-structured interviews were used to explore teachers' views on ET use for teaching and learning in the classroom. For this study, 12 participants were interviewed. All participants gave their informed consent, and the Institutional Review Board of the university approved the study as ethical. The transcripts were carefully examined to ensure that they were accurate and complete. To ensure that the final transcripts accurately represented the participants' statements, the researcher repeatedly and attentively listened to the audio recordings. Thematic analysis was used to examine the interviews. This strategy supports the argument made by Braun and Clarke (2006). The researcher went over the interview transcripts several times, created the preliminary codes from the information, and gathered four prospective interview themes. Themes based on related data gathered from various schools were used to present and discuss the findings from the semi-structured interviews. The interviews with the teachers were face-to-face and were conducted at the teachers' convenience and at selected times to suit their availability. The interview items were drafted using the discussed literature and concepts of the AT. Table 1 below shows the biography of teachers who took part in the study.

Table 1

Biographical Data of the Participants

Participant	Gender	Teaching experience	Teacher development
T1	Male	5	Yes
T2	Male	25	No
T3	Male	15	No
T4	Female	32	No
T5	Male	27	Yes
T6	Male	19	No
T7	Female	9	No
T8	Male	10	No
T9	Female	24	No
T10	Male	9	No
T11	Female	5	No
T12	Female	7	No

The above table shows that 4 participants were somewhat experienced in the teaching field while the majority had more than 11 years of teaching experience. Only two of the teachers received the TPD with 10 teachers who said that they had not received TPD. The participants were dominated by male teachers (7) with only 5 female teachers.

FINDINGS

The study explored the teachers' views on the use of ET for teaching and learning in secondary schools of the Tshwane West district in Gauteng province. Face-to-face interviews with the 12 teachers were conducted using the aforesaid literature review with the items supported by the AT framework by Engestrom. It should be noted that the collection of data was complicated by the fact that the country was amid the COVID-19 pandemic where access to people was limited due to restrictions on movement that were put in place by the country's lockdown rules. Four themes emerged from the teachers' responses as shown in Table 2 below.

Table 2

Themes that Emerged from the Teachers' Views on the Application of ETS in Classrooms.

Theme	**Sub-theme**
Access to educational technology teacher professional development	Lack of professional development
Access to educational technology resources	Lack of digital teaching resources
Availability of educational technology infrastructure	Poor infrastructure
Access to the internet	Lack of connectivity

The above themes emerged from the face-to-face interviews with secondary school teachers on their views on the adoption of ET in their classrooms. When asked about the challenges that they faced when integrating technology while teaching, various responses were given which produced Theme 1. In the teachers' responses, the complaints centred around the lack of TPD which teachers required.

Theme 1: Access to educational technology teacher professional development

Teachers were requested to indicate if they had received any professional development in the use of educational technology. In this regard, the following are some of the responses from the interviews:

T1 said: *'I was never trained to use the ET in the classroom, hence I'm still using the old method'.* This was echoed by his other colleague T4 who added: *'I think teachers need to be trained more because I don't think they were trained to a standard that is expected of them, more workshops and training needed. To add on that T8 said: 'Not all teachers received training. Efforts are not made for us to receive training'.* T11 on the other hand said: *'I'm not familiar with using ETs I was not trained that is why I'm still lagging behind'.*

In the case of access to educational technology teacher professional development, the results revealed that not all teachers received training. The results further showed that the training which was offered was inadequate. Based on these findings, a conclusion may be drawn that teachers would not be efficient in the use of technologies available in their schools.

Theme 2: Access to educational technology resources

Teachers were asked to provide information on their access to educational technology resources. Some of the teachers' views are presented below:

T3 said: *'I'm not familiar with using ETs I was not trained that is why I'm still lagging behind'.* On the other hand, T4 commented and said*: 'We have all the necessary resources to conduct our practice, but the challenge is resources are not maintained'.* Their frustrations were supported by T5 who said: *'What can you do with a broken smartboard…. They are not being replaced and then they expect you to make a miracle.* The other challenge that T7 said was: *'My challenge is the resources are there, but they don't cater to us as the language e-books are not inserted in the smartboard'.* T10 added: *'We have irrelevant e-books so these technologies don't assist us'.*

The findings suggest that teachers had access to educational technology, however, some of the technologies were either broken or lacked the required materials needed in other subjects, and smartboards contained materials that were not useful to teachers.

Theme 3: Availability of educational technology infrastructure

The teachers were requested to indicate the availability of educational technology infrastructure. In this regard, the following are some of the responses from the interviews:

T1 said: *'The challenge is when there is no electricity or load shedding, they are not functional at all and sometimes they are stolen, and teaching and learning won't be effective that day unless you resort to the old method of learning'.* On the other hand, T4 said: *"The*

challenges are when there is no electricity you can teach effectively". T6 added: *'For me, the challenge is that at times I wish to share something with my learners while at home, but I can't because I'm disadvantaged by lack of proper infrastructure'.* T10 said: *'I can't say much as you can see most of our ET facilities are here but not used as some were broken and some not functional at all'.* T12 added: *'It's tough here as you can see that the facilities are here, but they are often locked away as proof that no one was interested in using them, we struggle like this because no service is done to these gadgets.*

The study found that teachers were encountering challenges in terms of educational technology infrastructure. The most common challenges were lack of electricity in schools, non-functioning smartboards, damaged and broken technological devices, and crime related to stolen devices. However, it was found that in some instances schools chose to lock away the devices as teachers in some of the schools did not show interest in using them. These challenges led to teachers using the teacher-centred method. The overall response of the teachers was that there was concern about dilapidated infrastructure and the ailing electricity grid in the country which continues to affect teaching and learning activities.

Theme 4: Access to the Internet

The teachers were requested to explain whether the school had access to the Internet. In this regard, the following are some of the responses captured from the interviews with the concerned teachers:

T2 said: *'I think if they can provide proper connectivity like for example when I am teaching, the smartboard must be linked to the learner's tablets so that learners can access the saved lesson from it. And even if I am not at work teaching and learning can take place.* On the other hand, T3 said: *'When we don't have Wi-Fi it becomes a problem and when there is no electricity it means we must go back to the chalkboards.* T5 commented: *'The challenge could be that learners cannot access the internet while at their home, so connectivity is a challenge for them'.* Still, on that, T7 said: *'It's discouraging to be a fully functioning ICT school that lacks connectivity all the time'.* T9 said: *'Wi-Fi connectivity is the main challenge as Telkom (network provider) assisted the school with network connectivity, so without it no use of the gadget is possible'.* T12 said: *'Internet connectivity impacts negatively our progress as a school, and I believe that something must be done.'*

In terms of access to the Internet, teachers in the Tshwane district complained of a lack of connectivity between teachers' devices and learners' tablets. In most instances, teachers resorted to chalkboard teaching due to the lack of Internet connectivity. Furthermore, learners did not have access to Internet connectivity when at home.

DISCUSSION

The results illustrated above were acquired from the teachers answers to the questions,which represented a range of viewpoints. The consensus was that although teachers were eager to use RT in their classes, they were constrained by a number of challenges relating to resource shortages, a lack of training, and poor or nonexistent connectivity in their respective schools.

According to the study, teachers were not properly trained and did not receive enough training in the area of professional development. The statements mentioned by teachers were in contradiction with what Maryuningsih et al., (2020) said, that teachers must have ET skills to be competent in using ET in their teaching and learning environments. This is also against what Cooper et al, (2020) said, that teachers must be prepared to integrate ET into their teaching as well as be prepared to satisfy the needs of their learners. If teachers continue to be ill-prepared for issues of ICT integration in their classroom, the dream of Gauteng province being the number one in technology integration teaching would not be realized.

On the other hand, teachers lamented the difficulties they frequently encounter while attempting to access ET tools. T4 commented and said*: 'We have all the necessary resources to conduct our practice, but the challenge is resources are not maintained'.* Their frustrations were echoed by T5 who said: *'What can you do with a broken smartboard…. They are not being replaced and then they expect you to make a miracle'.* The above frustrations could be the reason why ET is not implemented as much as it should be. It is said that merely equipping schools with technological resources may not necessarily lead to superior learning or influence the level of learners' performance (Carrasco & Torrecilla, 2012). On the other hand, limited access to ET equipment was the resource challenge most frequently mentioned by teachers (Doering et al., 2014). These then seemed to be the reasons why teachers were not applying ET. This was also lamented by T10 who said: *'I can't say much as you can see most of our ET facilities are here but not used, as some were broken and some not functional at all'.* According to Cooper et al., (2020), teachers must be ready to meet the requirements of their students as well as to incorporate ET into their lessons. They added that teachers who are unable to incorporate ET into the classroom will be unable to give their students enough help.

The results also revealed a dearth of ET resources, which are cited in studies as a hindrance to the efficient use of these technologies for teaching and learning (Fenty & Anderson, 2014). The level of student performance will suffer because of inadequate ET resources (Carrasco & Torrecilla, 2012). In this instance, the reliance on constrained ET resources limits teachers from implementing novel concepts and instructional strategies in the classroom, particularly those that are technology-driven (Doering et al., 2014). The findings also revealed that the top barriers to adopting ET in the classroom were a shortage of electricity, student misuse of technology, theft, and a lack of Wi-Fi in some institutions. De Freitas and Spangenberg (2019) contend that limited internet access and frequent computer malfunctions are to blame for teachers' failure to utilize the digital tools available in schools and that this is why technical support is so important.

The need for 21st century skills is evident from a cursory glance on any 'Wnted ads' online or in newspaper. However, studies have indicated that teachers are still not skilled to teach using ET tools in classrooms. The reason being is that they either have never started, or they do not understand the implication behind ET tools or they were not trained enough. This study refected these results in that many teachers do not have prior experience in using ET

themselves. Some of them stated that they haven't the experience, therefore they were going into the classroom with limited knowledge of how to teach using ET tools. The results further tells us that teachers are not skilled enough at taking on the challenges to teach ET skills, however connections need to be made in terms of how they can incorporate these skills into the existing curriculum. They require guidance, resources and understanding of how to use the resources to give them the confidence to be able to teach these skills.

CONCLUSION

The findings indicated that there was a lack of adequate professional development in the use of education technologies available in schools. The findings further revealed a lack of Internet connectivity in schools. According to the study, there was a lack of electrical supply in schools, faulty smartboards, broken and damaged technology, and crime that presented difficulties for teachers. The study also discovered that teachers turned to the chalkboard method of instruction as a result of frustrations with inadequate technological resources.

Recommendations

The study suggests that to be relevant and suit the demands of both teachers and learners as well as the South African environment, educational technology teacher professional development is urgently required. The DBE and all relevant stakeholders should attend to the challenges that hinder effective teaching and learning with ET tools. It is within this stance that the study calls for the utilization of the AT as a gauge to have ETs adopted in secondary schools in Gauteng province, particularly Tshwane West secondary schools. The six-legged theory by Engestrom (1987) needs to apply. This can be done as follows: The *Division of labour* needs to be prioritised by the DoE for schools to have technology as a main resource that drives teaching and learning. This would see a *Community* (schools) being established in the form of a hub, where ETs are adopted across the schools. The Curriculum and Assessment Policy Statement (CAPS) policy document can be used as a *Rule* that ET needs to be adopted by all teachers. This should then be followed by the *Subject* being the teachers that ought to be encouraged to be trained in new technologies. *Tools* need to be sought in the form of devices, computers, and connectivity to ensure success. If all of the above could be implemented, the *Output (Object)* would be positive, as espoused by Engestrom (1987).

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