UNIVERSITY OF ZULULAND

INFLUENCE OF THE 21ST CENTURY TECHNOLOGY IN LEARNER ACADEMIC PERFORMANCE IN KING CETSHWAYO DISTRICT SECONDARY SCHOOLS

by

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DECLARATION

- I hereby declare that the research project titled **"INFLUENCE OF THE 21ST CENTURY TECHNOLOGY IN LEARNER ACADEMIC PERFORMANCE IN KING CETSHWAYO DISTRICT SECONDARY SCHOOLS",** which has been presented to the University of Zululand for the Master of Education, is my original work.
- I also declare that all sources that appear in this study were consulted both in the text and references.
- I also declare that part of this work has been published. The citation is thus: J.P Seme, B.T. Gamede, C. Uleanya (2021). Influence of 21st century on Learners` Academic Performance: Adaptable Strategies on Control of Online Gadgets*. Universal Journal of Education Research, 9* (5), 1096-1103. DOI: 10, 13189/jujer.2021. 090523

DEDICATION

This study is dedicated to all those who made this research a success through their inputs and unwavering support: my family, friends, colleagues, schools and teachers who participated as respondents, the Department of Education of King Cetshwayo District, KZN Provincial DoE and God, the provider.

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Abstract

In the 21st Century, technology has been known to play an important role in stimulating teaching and learning. Conversely, technology is also seen as a tool which tends to distract learners and hamper their academic performances. This study investigates strategies that can be adapted for the control of online gadgets in order to enhance learners' academic performance in the 21st Century. Quantitative methods were adopted for the study. Rural and urban-based secondary schools were purposively selected, while 180 educators were randomly selected across the schools. The selected schools comprised of ten (10) rural and ten(10) urban secondary schools in King Cetshwayo District, KwaZulu-Natal Province, South Africa. Data were collected through the use of questionnaires which were administered to the 180 randomly selected educators. The collected data were analyzed using SPSS. The findings of the study showed, inter alia, that there is a need for the use of online technological gadgets in schools to be legalized by the Department of Basic Education (DBE) under strict terms and conditions. Also, there is need for parents according to DBE to keep the gadgets during school hours and return them after school and week-ends. The study recommends that a strong alliance regarding the control of learners' use of online gadgets be formed amongst DBE, parents and educators.

Keywords – Adaptable Strategies, Department of Basic Education (DBE), Online Gadgets, Teaching and Learning, 21st Century Technology

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CHAPTER 1

1.1 INTRODUCTION

The purpose of this study is to find out the influence that 21st century technology has in learner academic performance, specifically in the King Cetshwayo District. Learners in this case will mean school-going Secondary persons with the main focus on Grade 12. One of the main characteristics of the 21st century is the emergence of advanced technological devices like Television, computers, cell phones and recently smart phones which are internet-connected.

These advanced technological devices are good for the current era, especially because they enhance socialization and in schools, they enable teachers and learners to acquire information quicker through internet networking. The researcher is of the view that if those technological devices are abused, they may not bring the intended results in the form of positive learner academic performance in school. The researcher concedes that the 21st century technology (which is the key focus of this study) may result in negative influences on learner academic performance if these devices are abused. On the other side of the coin, if the devices are well used and their content constantly monitored, they may produce the envisaged positive learner academic performance.

Additionally, the evolution of technology has changed the society and the lives of adolescents for the better, Sivalingam and Subbaiyan (2018). Learners get used from an early age to the digital world, Hatch (2011). This is very true, having observed that young children have cell phones which are used for a variety of activities such as games, but more importantly, knowledge acquisition including socializing. Through these gadgets, learners socialize with known and unknown associates. This study intends looking into the influence that modern technology has on learners' academic performance, specifically at Grade 12 level. The 21st century technology in this study means technological devices such as cell phones, smart phones, laptops, computers and not leaving out iPads, WhatsApp, Instagram and many other socializing techniques.

According to Madden *et al*. (2013), a survey conducted by Pew Internet and American Life Project in 2012, found out that 78% of teens have cell phones, 23% have tablet computers and 95% use internet. These statistics show that in America almost every child has a certain gadget to use. However, in South Africa, it has since been discovered that the majority of teachers have not been well introduced into the digital space, Nkula and Krauss (2014); Padayachee (2016).

Some ICT tools which are indispensable in integrating educational technology in the classroom are cited in the following: word processors, data projectors, PowerPoint spreadsheets, search engines, interactive whiteboards, mobile technologies and smart phones. This shows the gap that still exists between South

Africa and other countries. The fact of the matter is despite the gap, South Africa is also on the track of adopting these trending devices.

Learners communicate using Facebook, WhatsApp and other media gadgets. Jensen (2013) in his writing about Modern Technology posits that traditional media materials such as books are converging with digital media for social communication. According to Simuforosa (2013a), adolescents use social media gadgets like cell phones, which are internet connected and by virtue of them being adolescents, they interact with the devices frequently.

The researcher agrees with this notion because possessing a cell phone is no longer a luxury but a need to the adolescents, their environment and their lives. Also, gadgets have positives and negatives as Page (2013) points out: it is imperative that ICT specialists who are in contact with learners be well informed as to the good and detriments of the devices, so that they always perform the tasks they were intended for: in this study that is positive learner academic performance.

This implies that whilst modern technology comes with new innovations which are the positives - using internet to search for information is good for learners - it has its own hazards when learners are socializing with strangers who may mislead them. Hence, the reason for this study, which seeks to explore online communication access, its affordability and challenges towards enhancing learning, using Grade 12 learners from selected secondary schools in King Cetshwayo district.

Various researchers have argued strongly in support of the use of 21st century gadgets to enhance teaching and learning; this study purports to look at how abuse of these gadgets may yield unintended results in terms of negative learner performance. This study is also influenced by the sudden emergence of the unprecedented Covid 19 which recently (2020) took the world by storm and has forced teaching and learning to proceed through the use of these 21st modern technologies which have seen Zoom and virtual meetings playing centre stage to avoid mass gatherings. Adolescents especially have been obsessed with modern technology which has the potential to yield either a positive or a negative impact as will be seen in this study. The impact of digital technology on adolescents has been acknowledged by (Dienlin & Johannes, 2020).

1.2 BACKGROUND TO THE STUDY

The 21st century is characterized by advanced technological devices such as cell phones and smart phones, which may be disastrous in learner performance if not used with caution. Technology in communication has made life very comfortable for many people because of its convenience (Ye & Huang, 2011).

The abundance and also to a certain degree the abuse of these modern 21st century technological devices by learners have grossly compromised writing skills that are supposed to be acquired by learners at schools. According to Sundus (2018), there is a need for parents and children to converse about how to make good use of these gadgets to alleviate delayed development of some basic cognitive skills.

The researcher is concerned with abuse of these gadgets because have negative effects on learner academic performance which is the main concern of this study. Among recommendations made by Sundus (2018), parents can prevent their children being gadget slaves by encouraging them to have good sleep. Schools have adopted a more technologically aligned approach to teaching and currently the e-learning approach is at its early stages of adoption; Gauteng Province is an example. The use of advanced technology was initially thought of as belonging to people of a certain class, and predominantly in urban areas. This is no longer the case as it has become a basic need, even in the deepest rural areas; in addition, even low-class people use these modern 21st century devices.

These technological devices are self-assisting in that learners acquire more information on their own without the assistance of a teacher or parents. The technological advancements are sources of information such as for assignments and homework. Valk, Rashid, and Elder (2010) opine that technological devices enhance easy access to educational outcomes; hence learners have all the information at their disposal if they can access the internet. The good of modern technology does not come without negative influence; Arıcak (2009) maintains that modern technologies have exposed learners to content that is at times inappropriate and harmful, and that teachers and parents should randomly access the content that their children are exposed to when using these gadgets. There may be deliberate fabrication of information that is circulated through those media gadgets.

According to the International Journal of Evaluation and Research in Education (IJERE) (2020), there is great influence of social media on students` academic performance, this is what this study intends to explore in details.

This study purports to come to a solution between learner success and internet use. Owusu, Monney, Appiah, and Wilmot (2010) came to the conclusion from findings of their research that there is a trend for learners who were taught through traditional methods to perform better than those who had received their teaching through modern technology. As this study unfolds, the researcher will reveal the significant role played by 21st century devices in either improved learner academic performance or the contrary outcome.

This project intends to investigate just that, although there will be no comparison made between traditional instruction and modern instruction; the focus is on the influence that modern devices have on learner academic performance, especially Grade 12 learners of King Cetshwayo district. Cavanaugh, Dawson, and Ritzhaupt (2011) also undertook a comparative study on learner performance involving those who used modern devices, and those who did not. Their findings showed that even though the former group performed well, even among the latter group there were some who performed well. They concluded that using modern technology is not a guarantee for good performance by learners; this boils down to skilling learners on the use of the gadgets which is the other focus of this study. The researcher feels that modern technology may be gadgets of distraction if learners are not properly guided and monitored on their use. South African schools have been compelled to adopt e-learning at all cost during the COVID -19 pandemic and most of them were found wanting when it came to practical implementation.

1.3. PROBLEM STATEMENT

The study has been inspired by the technological boom in all spheres of life which may yield positive learner academic performance if well handled. On the contrary, abuse of these 21st century devices may yield negative learner academic performance and that will paint technology as disastrous. The researcher is of the view that irrespective of the outcome of the performance, it all depends on how the individual learner uses the device which is what this study will be deliberating on.

The world is changing drastically as technological devices have influence in the running of different sectors of society, including education, where information is power, and learners are using modern technology to acquire knowledge. The 21st century has come up with various modern technological devices which are internet connected and technologically sophisticated.

These devices are intended to help learners acquire the most up-to-date information in a variety of subjects including homework and research. However, these gadgets seem to be more of a distraction to some learners who use them for socializing. Also, abuse of technology may contribute negatively in learner academic performance.

If drastic measures are not undertaken by relevant stakeholders such as parents or teachers to control the use of these gadgets, the teaching process may be grossly compromised, and the future of learners will be jeopardized. These devices are trending, and learners are overwhelmed by their use, which sometimes takes them out of class, thereby constituting distractions for learners. Thus, the reason for this study is to investigate whether these devices, in any way, assist learners with improved academic performance or otherwise, using selected Grade 12 learners in King Cetshwayo secondary schools.

The study considers attempts by governments world-wide, to stress the importance of online communication to avoid close contact, thus promoting the effective use of modern technologies including the actual process of teaching and learning. Through this emergence of online education during this 21st century, teaching and learning have seen the adoption of the most advanced devices including Zoom and virtual meetings as observed during the Covid-19 pandemic. All these have had influence on teaching and learning which is what this study is investigating.

1.4. RESEARCH QUESTIONS

The main research question on this study is:

- How does the 21st century influence Grade 12 learners' academic performance in King Cetshwayo district?

The other short research questions will be:

- How can stakeholders help to improve learners' academic performance in King Cetshwayo district secondary schools amid 21st century technology?
- What are the strategies to be employed by the DBE in proper use of these 21st century technologies in King Cetshwayo district?

1.5 RESEARCH OBJECTIVES

- To determine factors having influence of 21st century technology on Grade 12 learners' academic performance in King Cetshwayo District.
- To explore the role of stakeholders in improving learners' academic performance in King Cetshwayo District.
- To investigate strategies to be used by the Department of Basic Education (DBE) on effective use of 21st century technologies in teaching and learning.

1.6 SCOPE AND DELIMITATION OF THE STUDY

The study is limited to Grade 12 learners within King Cetshwayo District to try and see the extent to which 21st century technology has had influence on their academic performance. The schools are selected from both rural and urban locations in order to get the authentic outcome of the influence of 21st century technology. Although the study is not intended to be comparative, the researcher would like to discover the extent of the influence of these technological gadgets, especially in urban schools where there is also a mixture of races.

1.6.1 SUBJECT COVERAGE

The issue of modern technological gadgets of the 21st century is taking centre stage in the process of teaching and learning by virtue of popular technological demand. In South Africa there has not been much focus on technological gadgets; it was not until the global emergence of the COVID-19 pandemic that educational stakeholders felt the need to prioritize technology in schools in the form of online learning and data supply as covered by this study.

This study explores the roles of learners, parents, schools, District officials and even Department of Basic Education (DBE). Whilst these gadgets are a must-have by learners, how much control should be exercised by each of them so that they do not render themselves as gadgets for obstruction on the side of learners? The study does not deviate from its main course of trying to establish the influence of 21st century technology on learner academic performance with specific reference to the King Cetshwayo district.

1.7 DEFINITION OF OPERATIONAL TERMS

Following hereunder are basic terms in their context of how they are used in this study:

1.7.1 The 21st Century Technology

This study focuses on the development of technological gadgets within the space of the period, 2001 to 2100. According to Poole et al (2009), the 21st century is marked by significant developments in the use of information technology. Likewise, this study purports to investigate the extent to which 21st century influences learner academic performance with specific reference to King Cetshwayo District. In this study the 21st century technology will be referring to modern technological gadgets (synonymously used with devices). Those gadgets are all internet connected like smartphones, laptops, computers and many more as they are dominating the social media and every work environment.

There is an abundant use of 21st century technology in this study; the focus is on gadgets that have undergone massive evolution in the education sphere with enormous influence on both the social and educational life of a learner. Since the focus of the study is on the influence of 21st century technology in learner academic performance, the gadgets used are basically internet-connected which have been transformed from chalkboards and overhead projectors (OHP) to more sophisticated computers, laptops and recently, smart phones. In this study, gadgets, devices, modern technology and digital technology are used synonymously. Currently the whole world is embarking on Zoom and virtual meetings to ensure social distancing without compromising teaching and learning. Tablets and smart phones are used by most learners. Learning institutions and parents do everything in their power to provide learners with some form of technology, in order to cope in the process of teaching and learning. The researcher appreciates that. However, the question remains: are they properly used for their intended purposes?

1.7.2 Stakeholders

In the context of this study, stakeholders refer to those who are the basic custodians of schools for teaching and learning to proceed without hindrance. In this case, it means parents, School Governing Bodies (SGBs) teachers, district and Provincial officials as well as the DBE itself. These are the integral pillars of schools that in this study are tasked with the responsibility of taking overall control of their use by learners of these modern technologies. It is for that reason that questionnaires seek responses from teachers about parents and DBE in a bid to alleviate the abuse of these modern gadgets by learners.

1.7.3 Learners

Whenever learners are mentioned in this study, it will be in reference to any school-going pupil within the Foundation, Intermediate, Senior and FET Phases. The main focus is on the performance of Grade 12 persons to investigate what enhances their good performance or how these gadgets become distractions to them. Since various writers use learner and student interchangeably, even in this study there are instances where a student means the same thing as a learner. It is important to mention that as the study unfolds, learners and students will be used interchangeably especially in Chapter 2. This is because in the Literature Review section some writers use students as synonymous with learners. It is worth mentioning that some authors use learners and students interchangeably, the same may happen in this study.

1.8 STRUCTURE OF THE STUDY

Chapter 1 Orientation of the study provides the general overview to the study, inclusive of the background to the study, problem statement, aims and objectives of the study.

Chapter 2 Literature Review will focus on what various researchers have undertaken research on linked to this study. This chapter is basically about what other scholars say about similar studies in their research.

Chapter 3 This chapter paints a vivid picture of the methodology processes adopted, including the design that will be followed. It displays the systematic approach taken in carrying out this research.

Chapter 4 A detailed analyses of the processes that occurred in Chapter 3 above are outlined and confirm that they are in line with the projected objectives and questions.

Chapter 5 This chapter presents the summary of what was contained in the statement of the problem in the form of a conclusion and recommendations, as found fit by the researcher.

1.9 SUMMARY

A detailed step by step proceeding of what will transpire in the study is given in terms of the focus of the project, namely, the influence of 21st century technology on learner academic performance in the King Cetshwayo district. These incorporated serious considerations of the parameters within which the research was focused, namely secondary school teachers and learners of a selected district.

The succeeding chapter is the literature review, which gives detailed perceptions held by other scholars related to the focus of this study to further prove that 21st century technology and its effects on learner academic performance have also received attention from other interested educationists.

CHAPTER 2

HISTORICAL AND THEORETICAL OVERVIEW OF THE STUDY

2.1 INTRODUCTION

In chapter 1 the issue under investigation for this study was introduced and operational terms relevant to this study were introduced. Furthermore, the aims and objectives of the study were outlined to put this project in its proper perspective. This chapter looks in detail at what other writers and researchers are saying about the influence of 21st technology on learner academic performance. So basically, in this chapter, a wide range of literature will be consulted in support of what has inspired this study. In part 2.13, Theoretical Framework which underpins this study will be deliberated on and various supportive representations will be revealed to adequately locate the study within the existing body of literature.

To put this study and particularly this chapter in its proper perspective, the researcher will zoom into the transit from face to face to online learning which is quickly making its way into teaching and learning in the 21st century. This is not smooth sailing though, considering that there are learners who are geographically situated in remote areas which hinders their access to online learning.

It is worth mentioning at this early stage of this chapter that online learning has been viewed as a privilege of a particular class; however, the emergence of the Corona virus forced the World Health Organization (WHO) to declare COVID-19 a pandemic, and on 11 March 2020, advised the avoidance of close contact with anyone showing symptoms. This was the stance taken globally, and South Africa was no exception. This strengthened further implementation of online learning because education could not be completely compromised.

The study intends to determine the influence on which - either use or abuse - of 21st technological devices by learners have on their academic performance as one of the main objectives stated. This chapter also explores the role of teachers in improving learner academic performance in Secondary

schools through extensive use of modern technology. What are the roles stakeholders can contribute in making 21st century technology improves academic performance of learners?

The study purports to assist the education fraternity and all stakeholders concerned to make good use of these 21st modern technological devices without incurring any regrets such as poor academic learner performance and all other related negative impact such as cyber bullying and sleeplessness. In web-based instruction, it is a fact that those learners' interests and needs vary greatly when compared with the traditional learning approaches. Web in this context refers to the World Wide Web such as internet; this means through the web learners' interest in their studies may be inspired, thus enhancing positive learner academic performance.

2.2 THE 21ST CENTURY TECHNOLOGY

The 21st century teaching strategies are characterized by advanced modern technological gadgets, sophisticated methods of teaching and learning with a completely new outlook on life from a technological angle. From this study, 21st century technology seeks to reveal how technological devices, if well monitored, can help learners improve academic performance. This is the positive side of technology, according to del Cerro Velázquez and Morales Méndez (2018): new technology brings in gadgets which have more sophisticated features that make them more convenient and new apps continually become available that make lives easier.

They further allege that currently 96% of smartphone users can access internet without Wi-Fi connection. In other words, this means that we are in an era of knowledge explosion through these 21st century devices. Song and Kong (2017) concur with Cerro and Morale, by saying during the third quarter of 2018, 2.1 million mobile apps were available. These have prompted teachers and researchers to utilize these devices to promote teaching and learning. This is what this study is all about and specifically is looking to the end product of their use by learners and teachers and the type of result in terms of academic performance.

Edozie, Olibie, and Aghu (2010) view information and communication technology (ICT) as a powerful vehicle through which the 21st century devices can be used with great success in the classroom. This integration of ICT in the classroom will yield not only improved academic performance, but will also change learners' lives for the better. This means ICT is here to strengthen the weaknesses in learners' capabilities and so must be used with caution. The researcher is curious to know if this 21st century technology can produce improved generations of learners.

According to Richardson *et al.* (2013), it is through computer initiatives that learners can be introduced to the digital world of the 21st century. This implies that learners need to be gradually introduced to the

digital environment through strengthening computer literacy. This study undertakes an analysis of what is happening at schools regarding the integration and the general use of information and communication technologies (ICTs) and also closely observes teachers' perceptions about how teaching and learning activities can be improved through the use of ICT. Sangrà and González-Sanmamed (2010) had similar sentiments to Richardson *et al*. This researcher concurs with these scholars.

Various advanced teaching resources, particularly to enhance effective instruction using modern technology to engage learners and improve learner achievement and also identified several challenges have been used by schools. Every learner has developed interest in modern technological gadgets. The actual time that some learners spend on their gadgets at school has not significantly changed and their primary access to computers still is in computer laboratories or libraries, Schifter (2008).

According to Schifter (2008):

- Firstly, using computers is still a fascinating experience for most learners simply because they use them for leisure rather than as a routine part of their school experience. This is true for schools that host traditional computer laboratories.

- Secondly, schools are technologically at different levels of infrastructure development. More advanced computers are more likely to be found in developed, affluent schools while rural schools usually have older models, despite the fact that the No Child Left Behind Act of 2001 requires all learners to be computer literate by the eighth grade, Schifter (2008).

- Thirdly, teachers do not have scheduled time to recognize the changing nature of resources; hence they often resort to utilizing the same resources that they have used for years.

- Lastly, schools, because of their financial status and teachers' literacy level, are not able to cope with the ever-changing nature of technology and so are often technologically outdated. Each time the computing power of technology increases, public schools, given their limited capacity and budgets, are left with outdated computer models and software. The researcher concurs with the views of Schifter considering the financial status of schools especially in rural areas (Schifter, 2008).

Learners who demonstrated exceptional skills in the use of computers and professional developments were classified according to learnes` academic achievement in mathematics, for both fourth and eighth grade students. Consequently, computers seem to be the big craze of the century. Computers are in almost every classroom around the world, whether at each learners` desk or at least at every teacher's desk.

In the James Kulik study of 1994, he used a technique called Computer based instruction which individualizes these educational processes to cater for the needs, interests, and learning styles of each student. Sivin-Kachala and Bialo (1994) opine that positive findings were that learners from technology rich environments demonstrated positive effects of achievement in all major subject areas and they showed increased achievement from preschool through higher education for both regular and special needs children.

Kiehl and Harper (1979) opine that some educators are afraid that following the use of calculators, children will not learn basic mathematical skills. This is the view also held by Niess et al. (2009) as they aver that learners will become dependent on the calculator to perform basic mathematical tasks if allowed to continuously use the calculator. This implies that the continuous use of calculators by learners tends to hinder their expertise in basic calculations. These may be some side-effects of modern technology which can be overcome with proper guidance by teachers provided they have had adequate training; this will be dealt with as this study progresses.

Ramey (2013) holds that technology has always existed in the universe and in educational institutions. It has evolved with time and the level of development has always been improving in all the past centuries up to the current one. Lee and Spires (2009) aver that the 21st century is characterized by the emergence of these modern technological devices: among others, computers, laptops, tablets and smart phones which are internet connected with Facebook and WhatsApp services. Technological devices in this study are inclusive of both Facebook and WhatsApp as social media tools. These devices are suitable for multiple purposes including socializing and shopping, and are also a powerful tool for educational technology that can improve teaching and learning enormously.

Also, in this study, social media is used synonymously with these modern technological devices as they extend beyond the classroom to social interaction. The researcher uses learners and learners interchangeably as some writers prefer to use the term learners for learners; in this study, learners and learners refers to Secondary school pupils. What is good about these devices is that they complement the work of the teachers and train learners to be able to work independently. Learners are able to access different websites for themselves that deepen their understanding and skills.

These devices have revolutionized technology, with touch screens and several `apps' that can be downloaded to suit their various needs, Adams et al. (2014). The researcher wishes to caution against the free use of these gadgets to focus on educational materials so as to yield improved learner academic performance.

Mohammad and Mohammad (2012) opine that social networks are becoming an integral part of our lives. Indeed, they are; the glaring observation is that in almost every household there are cell phones which have replaced land-line telephones. According to Mohammad and Mohammad, learners are so overwhelmed with these devices that they spend much of their time on the gadgets. It is for that reason that this study focuses also on how learners use the gadgets. The researcher concurs with the two scholars. They further posit that in education, some learners will look into the gadgets as instruments for socializing which is distracting. The other set of learners will use the devices such that they benefit from them. This is basically what this study is about. While the devices are in line with the 21st century era, caution must however be exercised to avoid such things as cyber bullying and human trafficking.

Nasser (2014) conducted research with three different groups 1) using traditional method, 2) fair use of phones and 3) extensive use of smart phones in working on a mathematical assignment for school learners

. The results indicated higher performance of the smart phone group compared to the other two groups. This result shows the influence that modern technological devices have on learner academic performance which is the core focus of this study.

Junco, Cotten, and Education (2012) aver that these social networks may be considered a positive influence as they may also be associated with co-curricular activities which play a dual role: social and educational. Junco (2012) came out with some advantages of social networks on learner performance. Among the advantages of social networks mentioned are that they are used as an informal learning tool which is convenient for discussions and communication; they are better for navigation and search so they make education more efficient and effective; learners, through socializing with other fellow learners teachers and external sources in a bid to acquire knowledge, are able to benefit substantially (Hamat, Embi, & Hassan, 2012).

On the other hand, Burak (2012) concludes that learners who use Information and Communication Technologies (ICT) and are involved in multitasking would have lower academic performance. This is risk- taking behavior and needs a certain measure of control. Paul et al. (2012) pointed out the importance of attention span devoted to multiple sources of attractions; they say that such results indicate the importance of using social media tools wisely and point towards a productive time in classrooms and back home. The researcher agrees with this conclusion since the very focus of this study is centered on balancing the use of modern technology devices for educational purposes with social activities.

Junco (2012) highlights some negative influences of social networks on student performance.

- Among the negatives is that time spent on social networks is non-academic instead of spending time on learning.
- He also says learners delay their meals and sleeping time, concentrating instead on Facebook which has health hazards and results in lower academic performance.

The researcher concurs with Junco because lack of guidance on the use of these gadgets may lead to negative perceptions of them, especially to parents who will view them as gadgets of distraction.

2.2.1 THE 21ST CENTURY TECHNOLOGY IN SOUTH AFRICA

Although South Africa is still a developing country in terms technological development, she is quickly developing in technological infrastructure. In South African schools, modern technologies are being introduced with a typical example being in Gauteng, where teaching and learning is now done online; even registration is done online and some other provinces are adopting the same procedures though at a slower rate. Learners are now more technologically inclined and seemingly overwhelmed with these 21st century gadgets for social communication. The focus of this study is to investigate the extent to which these devices influence learner academic performance. The 21st century technology enhances active student participation and the capacity to know more; thus the active student has the ability to use learning by bringing in learners' experiences, (Govender & Khoza, 2017).

Thomas, O'Bannon, and Britt (2014) opine that there is great technological strength in computer usage to transform how we learn by changing the traditional classroom to one that is more interactive and engaging. This implies that through these modern devices, the strategies for teaching and learning will augur good and provide more engagement which is a contrast to the traditionally teacher-centered approach. Most teachers view access to the internet and educational applications (apps) as the most beneficial features of mobile phones for classroom use.

According to Thomas et al. (2014), these apps offer user-friendly information that is deployed for training in many disciplines. In other words, this means the 21st century technology is a stress-releaser for teachers because it comes with devices which are user-friendly and which enable learners to use them on their own. Accordingly, this argument of understanding the technological medium, Hess and Gunter (2013), suggests that research on education and technology should not simply focus on the question of how to use a simple tool. In this 21st century period, technology should provide security and meaning to learners. Drees (2002), warns that whilst using technological devices, it calls for a sound infrastructure upon which technology will be dependent. This implies that through a well-developed communication

infrastructure, we will not have Wi-Fi problems whose erratic availability hinders smooth and consistent communication.

Information and Communication Technology (ICT) facilitates a global network exchange and sharing of ideas, or information and knowledge, through devices such as cell phones or computers, Mdlongwa (2012). Through information technology, we are poised to better understand ourselves; this is true considering that ICT is gradually becoming part of us because that is what circumstances in our vicinities dictate. So as schools adopt a more technologically inclined approach to teaching and learning, this implies a change from the traditional approach which was rather more teacher dominated. The researcher concurs because teaching and learning is entirely dependent on ICT even in rural areas; even the so-called quintile 1 and 2 schools are moving towards digital teaching.

Technology is growing in leap and bounds, not only in the classroom but also in the social space. Allenby and Sarewitz (2011) opine that technology is not only a new development; it supersedes social, economic, cultural and even political spheres. The researcher concurs with Allenby and Sarewitz in that every household currently possesses a gadget, not for luxury purposes but because it caters for individual and family needs in a variety of ways.

Saravanamuthu (2002) posited that technology has become bigger than we ever thought possible. Technology actually prescribes how we ought to conduct ourselves because it has become part of our social interaction and currently, we have no other option to substitute technology. This implies that as we see the development of learners in their respective Grades, their academic lives are now at the level of being technologically controlled, no matter what. The fact that information and communication are mediated through technology makes it very desirable and alternatives are thus almost unthinkable. Therefore, it is vital that whist teaching and learning is now conducted through technology, the content must be educationally aligned. This means the content taught may not necessarily need to be changed just because there has been a change in the medium of teaching (devices).

Due to 21st ICT booming, the researcher feels that there is an urgent need for South Africa to be ready for the task of ICT demands in schools, if we ever hope of being at a global technological level. The Minister of Basic Education, Angie Motshekga, has also alluded to the clarion call on the South African education system to align itself with the rest of the world in terms integration of ICT in the classroom. She stressed the importance of having well-trained technology teachers who can enhance this integration with the activities in the classroom. She declared this a “Big Switch On” – an opening of all gates to digital teaching and learning.

2.2.2 THE 21ST CENTURY TECHNOLOGY IN SOUTH AFRICAN SCHOOLS

South Africa needs to take a leaf out of the book from other countries, including those in Africa, to realize that ICT is the inevitable path ahead. This path will look into the stance that the Department of Basic Education (DBE) has taken to comply with the global move towards online teaching and learning. In South Africa, from 2009 there were two streams of education, namely, Department of Higher Education and Department of Basic Education. This study's focus will be the latter structure. Since schools are categorized into quintiles, those in quintile 1 are the very under-resourced schools, in relation to teaching and learning facilities, and so they fall under no-fee schools. Teachers in this category of schools, are likely to be discouraged to integrate ICT into their teaching (Mirzajani, Mahmud, Ayub, & Wong, 2016).

The Independent Project Trust (IPT) (1998) in South Africa realized that strategies were to be put in place to cater for the introduction of ICT in schools in full force. This of course would come with some challenges. There were some skeptics about the implementation, but eventually it was to be legislated that Technology Education curriculum was to become a reality. Schools ought to be supplied with the basic infrastructure and equipment to sustain the implementation of this huge undertaking at hand, and of course, with the assistance of the Department of Education (Cowan, 2005).

Oliver (2005) concurred with Cowan that schools should be well-equipped with relevant ICT resources. Additionally, materials (resources) should also be provided as per curriculum specifications. There is a need for proper planning of workshops and the provision of follow-up support must also be taken into consideration. All these show that South Africa has felt that she cannot be left behind when it comes to the implementation of technology in schools. Pudi (2002), averred that curriculum planning and design is more related to theory whereas implementation means converting the theory into practice. Attempts to merge the two are likely result in new problems that the curriculum designer and theorist had never anticipated. Generally, the Technology Education (TE) curriculum may seem easy to implement; however, the actual implementation of the curriculum is not done in boardrooms or offices but in classrooms. In the classrooms, the available facilities and technological resources, teacher qualifications and experiences and learners' individual differences are diverse.

By the year 2003, the DBE cognizant of ICT advantages for learners, adopted strategies to integrate ICT in school learning. It had since been discovered that ICT has a great potential to improve learners' abilities to learn across disciplines and fields. This study therefore looks into the effect of that integration of ICT in the schooling system and that will be found in learner academic performance.

Whilst appreciating technological reign in South African schools, it is worth noting that technology cannot just be implemented without impediments. A number of barriers hinder technology integration.

Almekhlafi and Almeqdadi (2010), observed that a number of barriers hinder technology integration in education such as:

- Time
- Access
- Support
- Resources
- Training

Similar or other factors have also been documented by some researchers, who argue that the integration of ICT does indeed come with challenges. Accomplishing that milestone may be elusive considering that there is a category of schools that falls under quintile 1 which are geographically deprived of ICT resources and that further compromises the education of learners.

There is government's drive towards the provision of opportunities and expertise for using ICT in all schools, yet significant weaknesses are supported by policy and practice. The researcher agrees with these findings because extreme caution on the extent to which gadgets are abused, must be exercised. Furthermore, the integration of ICT in education is not smooth sailing as averred by Papaioannou and Charalambous (2011) and Pholotho and Mtsweni (2016) in that there are challenges in the integration of ICT such as internet connectivity, inadequate technical support and proper maintenance of ICT equipment. These challenges are considered common in developing countries. Padayachee (2016) argued that due to existing contextual challenges, ICT integration remains a far-fetched theory and so discourages some teachers in this integration process. He hastens to recommend that DBE should regularly audit the technological well-being of individual schools to ensure that they are coping with the integration. In a nutshell, this implies that even though South Africa is on the right track towards ICT integration, caution should be exercised to ensure that all parties involved (teachers) are well served by the transition, lest they become despondent and the mission collapses.

On the other side of the coin, all the above integration processes have financial implications. What Cowan and Oliver opined did not mean that things will happen on their own. It calls for political intervention to fund the project, training and infrastructure and all related details. This would mean that the failure of the taking off into the stage of technological transition for South Africa would mean putting the future of learners in jeopardy because their technological know-how would have been compromised. So, a concerted effort was indispensable from various sectors of government and non-governmental organizations. Capacity-building plans were to be devised and global connections strengthened.

The current technological status quo in Africa looks very dire; of the world's population, Africa has only 2% of its population with telephone lines and more than half of them are located in big cities. Installing these lines is estimated to be more expensive than anywhere else in the world. The level of reliability of the services leaves much to be desired. If the situation is so dire in Africa, one actually understands the reason for South Africa's lack of infrastructure development. Rural areas have been neglected, so there is a conspicuous wide division between rural and urban areas. The above statistics have a bearing on school technological infrastructure development which is slow to progress, but with time the desired technological development will spread to all schools and may be result in improved learner academic performance.

Hamelink (1988) opined that whether people are for or against the installation of this technological venture, at the end this is an urgent imperative to meet global technological standards. Briefly this means our attitudes (optimistic or pessimistic) about any project to be undertaken cannot be tackled by any form of information, but rather by technology, which provides tools and skills to analyze and validate research information either for public or individual consumption.

According to African Open Week (2011), South African teachers have demonstrated a desire to be part of the technological transition through open-space learning and e-learning in the classroom. The emergence of this 21st century technology has inspired the global community to admire the use of these devices. Everybody wants to be part of the technology class even if it means breaking down international cultural barriers; they want to be afforded access to fresh ideas from the world through online means. The researcher views the findings of Open Week as positive for learners which may yield positive learner academic performance. Acquisition of knowledge is possible through these modern devices.

Professor Johannes Cronje on the same Africa Open Week alluded to this by adding that open-source online learning is the basic source of information gathering. Once a learner has been equipped with technological skills, he is as good as being exposed to the whole universe. South African schools are still experiencing a crisis of being stuck in the text-book era; this era is gradually being phased out. Especially in a South African context, textbooks are not as freely available as web access, so let us harness the web and make use of technology in the classroom. Finally, Fullan and Pomfret (1977) highlighted inhibiting factors to the successful implementation of technology in schools:

The five factors found to inhibit implementation were:

- Educators' lack of clarity about new innovations;
- Educators' lack of basic skills and knowledge needed to conform to the new role model;
- Unavailability of required instructional resources;

- Incompatibility of organizational arrangements with the new innovations; and,
- Staff's lack of motivational strategies.

The researcher believes that if the above factors are attended to by education authorities, then South Africa will be better positioned to compete with the world technologically, thus improving learner academic performance.

2.3 THE INFLUENCE OF 21ST CENTURY SOCIAL MEDIA ON LEARNER ACADEMIC PERFORMANCE

Minty and Panther (2014) have looked at the extent to which Information and Communication Technology (ICT) has become part of people's lives in their daily interactions. It has become the instrument of teaching and learning and that, according to the researcher, augers well for infusion of ICT in schools. This is true in that ICT is gradually becoming the vital and basic modern approach in teaching and learning. Studies conducted by Chigona (2015) Mdlongwa (2012), revealed that the effective integration of ICT provides enormous opportunities for learners.

It provides tools for creating, collecting, storing, using and attaining knowledge through communication and collaboration. This is a very powerful contribution which these scholars arrived at since it categorically shows the extent to which ICT contributes towards learner academic performance which is the concern of this study.

According to Litt (2013) there is evidence that technology tests yield positive results, for instance, in a case where a teacher uses a computer-assisted approach in teaching, learners tend to score higher marks and that is a plus for the use of computers. This is so basically because where the computer is used as a medium of instruction, the 'drill and skill' is emphasized which results in improved standardized test scores. This approach of technology reduces the equation to only a student, a computer and a test. It ignores the effects of schools, teachers, and family and community life on the learning process. Even though we cannot have controls for these variables, we must not discount them.

This helps produce a type of a learner who can do things independently because technology is basically more practical than theoretical. There is a close relationship between results obtained by a learner and the device used; hence this study looks into how learners are making use of their devices which impacts on their performance. The researcher concurs with Litt`s assertion that technology makes things easier for learners, likewise in assessment.

Chandra and Kartick (2020) aver that social media performs multiple roles in our lives, such as socializing, shopping, networking and education. But how big a role does networking through social media play in our lives? The impact of modern Technology in Education is such that they hold that ICT has the potential to increase access to education and improve its relevance and quality.

Tinio (2003) asserted that ICT has a tremendous impact on education in terms of acquisition and absorption of knowledge for both teachers and learners through the promotion of active learning, collaborative and cooperative learning. Researchers have found that typically the use of ICT leads to more cooperation among learners, within and beyond school, and there exists a more interactive relationship between learners and teachers. Bracewell, Breuleux, and Le Maistre (2000), opine that ICT promotes the manipulation of existing information and the creation of one's own knowledge to produce a tangible product or a given instructional purpose. Integrative learning and the use of ICT for learning is student-centered and provides useful feedback through various interactive features.

ICT allows students to discover and learn through new ways of teaching and learning which are sustained by constructivist theories of learning rather than learners doing memorization and rote learning. This means that through ICT, learners get used to working independently. All these assertions point out what this study is advocating: that these 21st century gadgets influence learner academic performance either positively or negatively depending on how a learner uses them.

Tinio (2002) highlighted the impact that technology has in learners, which according to this study serve as a springboard for improved learner academic performance:

- Active learning – ICT-enhanced learning mobilizes tools and provides platforms for learner inquiry. It makes learning less abstract and more relevant to real life situations.
- Collaborative learning - ICT encourages interaction and active cooperation among learners. They may interact with their counterparts from different cultures thus enhancing teaming and sound communication skills.
- Creative learning – ICT-supported learning promotes the manipulation of information and the creation of a real world product.
- Integrative learning - ICT-enhanced learning promotes a thematic, integrative approach to teaching and learning.
- Evaluative learning - ICT-enhanced learning is student-directed and diagnostic.

The above points clearly show how 21st century teaching and learning impact on effective learning with the view that they yield positive learner academic performance as envisaged in this study.

Furthermore, in the journal *Advances in Social Science Research Journal (2020),* Tamim et al averred that learners who use technology in the classroom have a higher achievement than those who do not use it. Accordingly, the average student in a traditional setting does not

enhance his/her learning process. The researcher concurs with this view because of a strongly held belief that ICT enhances learner academic performance.

2.3.1 THE POSITIVE INFLUENCE OF 21ST CENTURY TECHNOLOGY ON LEARNER ACADEMIC PERFORMANCE

The undisputable fact is that ICT has the potential to change the way teaching and learning takes place; it motivates learners and positively influences their performance, Hilton and Education (2018). This implies that through these devices learners are able to do their homework on their own and other school-related activities without supervision by their teachers. Le Thi and Education (2020) echoed the same views as other scholars that ICT resources enable learners to engage in individual research thus enhancing self-study. This means that a strong ICT base in a school environment in the form of computers increases learners' potential and aspirations to learn more.

Social networks, because they are easily accessible, yield various responses from different groups of individuals; in this instance, there may be the emergence of homogeneous groups. Recently, some research findings have shown that curriculum resources, specifically those designed to capacitate learners (many of which are technology-based) produce extremely improved results at scales when they concomitantly attend to the teacher learning, Roblin, Schunn, and McKenney (2018) This then is the extent to which modern technology can help improve learner academic performance.

Masiu, Chukwuere, and Dynamics (2018) opine that the 21st century has vastly increased the use of smartphones because of their exciting features such as accessing emails, social media platforms and many more. Again, Ebiye and Practice (2015) hold that smartphones are geared towards learners achieving their teaching and learning and academic research objectives. Alfawareh and Jusoh (2014) opine that the development of smartphones keeps on evolving as human lives evolve, inspired by new and improved features. Smartphones can be used to download record online lectures, thus enhancing learning. Ifeanyi, Chukwuere, and E-Learning (2018) undertook a quantitative study with a sample of 375 sample and collected information by questionnaire on the usefulness of smartphones. The study revealed that learners use smartphones to record live presentations and download study materials for use at their own convenience.

The digital infrastructure, including individual laptops, is the foundation for a good digital learning environment (Norwegian Ministry of Education and Research, 2017). Laptop use in education increases opportunities for learners at several dimensions and positively affects all subjects. First and foremost, it will give learners increased access to information which will increase available literature, as well as challenge learners' judgment on reliability. Furthermore, learners will get access to programs that can enhance their learning outcome, for example by using educational software that corrects grammar or

software to help learners solve and understand mathematical problems. Overall, the use of laptops in education enables learners to focus on more complex problems, which in turn can increase students' performance.

However, access to laptops and learners controlling their own usage require discipline. In addition to learners being disturbed by the laptop, a major challenge is efficient use of technological devices in school, Hatlevik and Christophersen (2013). Learners confirm that the laptops are used more for entertainment, such as social media, music, and games, during class rather than for educational purposes. Moreover, the results from ITU Monitor (2013) showed that the benchmarks for digital literacy, in general, were not achieved. Thus, one of the main objectives of the digitization strategy of 2017 is to better utilize technology in order to actually improve the quality of upper secondary education (Norwegian Ministry of Education and Research, 2017). It is basically a major concern for this study that students use these devices more for entertainment instead of educational purposes, but if monitoring is exercised on the use and content of the gadgets, this practice can change for the better.

Adeyemo (2015) averred that technology is significant in the improvement of quality of educational experience in learning. The introduction of technology in the educational system has brought improvement and has made it more convenient for both learners and instructors. David further alleged that learners become more interested in learning with the integration of technology in the classroom. This implies that integration of technology in the classroom has made teaching and learning much easier for teachers and learners.

Another main focus of the new strategy is proper training of teachers (Norwegian Ministry of Education and Research, 2017). The use of technological devices in class is not always an integrated part of teaching and may, in fact, pose a threat, rather than an improvement, to learning.

Balaman and Studies (2018) observed that during the early days of digital storytelling, people who ordinarily would have been regarded as average were able to capture their story in an extremely powerful way within a short space of time. This is how technology has contributed towards teaching and learning. The combined use of this powerful, but yet affordable, technology hardware and software mesh perfectly with the current needs of many of today's classrooms, where the focus is on providing learners with the skills they will need to "thrive in increasingly media-varied environments"(Rowsell, McLean, Hamilton, & Literacy, 2012).

Teachers are at liberty to demonstrate previously-created digital stories to their learners as a means of introducing new content that will direct learners' attention when presenting new ideas. This view is shared by researchers such as Burmark (2004) on *visual presentations that prompt flash & transform.* As

an instructional tool, teachers have discovered that the integration of visual images with written text both enhances and accelerates positive learner performance; also, digital storytelling is an appropriate technological tool for collecting, creating, analyzing, and combining visual images with written text. Any multimedia-rich digital story can serve as an anticipatory set or hook to capture the attention of learners and enhance their interest in exploring new ideas.

According to Robin (2008), teacher-created digital stories may also be used to enhance current lessons within a larger unit, as a way to facilitate discussion about the topics presented in a story and as a way to make abstract or conceptual content more understandable. The huge benefit in the classroom may be evident where learners have to perform the task of creating their own digital stories, either individually or as members of a small group. This creative work provides learners with a strong foundation for many teachers, Brown, Bryan, and Brown (2005). Some of the main positive effects of 21st century technologies are:

1. Digital literacy—enables learners to communicate with an ever-expanding community to discuss issues, gather information, and seek help.

2. Global literacy— enhances the capacity to read, interpret, respond, and contextualize messages from a global perspective.

3. Technology literacy—to use computers and other technology to improve learning, productivity, and performance.

4. Visual literacy— enhances a strong sense of understanding, producing, and communicating through visual images.

Oliver (2002) found that ICT:

- ✓ Encourages learners to be more excited to learn;
- ✓ Assists learners with their daily schedules and stimulates them to work at home in their own time;
- ✓ Enables learners to adapt to new technological skills for later use in their work place; and
- ✓ Reduces paper and photocopying costs, promoting a concept of “green revolution”.

This researcher concurs with the advantages mentioned above and holds that skilling a teacher in ICT is key to achieving all the above positives.

2.3.1.1 The 21st century technology provides quality

Information and Communication Technology (ICT) has grown in leaps and bounds in the education sector all over the world, Lawrence and Education (2019). Even underdeveloped African countries have adopted ICT as a most powerful instrument to improve teaching and learning with a view to better learner academic performance. To substantiate that this is the era of ICT, they further opine that ICT has produced good performances, namely, learners' positive response and ICT compatibility/comfort in Teaching and Learning (T&L). Those benefits include: easy access in T&L, global access to information and exposure to current ICT resources, online communication between staff and learners and developing contacts with the world outside theirs by exchanging their academic work. These count among some of the contributions of ICT to T&L. Furthermore, ICT will ascertain that learners are punctual and attend classes regularly; it sharpens their attentiveness and develops enjoyment of ICT usage; it enhances a high degree of interactivity, and modern digital means provide a preferred means of assessment. Learners tend to appreciate the product of their learning through ICT and also appreciate their lecturers' proficiency in ICT skills, which has enhanced their flexibility to adapt ICT to their teaching and learning needs.

- Reforming pedagogical methods
- Expanding their access to quality education, and
- Will improve their management of education system.

The findings of these scholars show how ICT has had a bearing on education ranging from methodology to quality and management. With all these characteristics that ICT possess, the researcher hopes that 21st century technology will yield positive learner academic performance emanating from proper utilization of the devices.

The other scholars, Kirschner and Selinger (2003) also feel that ICT has improved overall student motivation to learn, to stay and behave in school, and it has radically improved teachers' professional development. This is through constant update of their knowledge on the latest developments and technologies and the latest use of computers in content areas. The researcher agrees with this because if technologies can keep learners abreast of the latest technological developments, then improved learner academic performance is a certainty.

According to Lopez (2003), ICT provides learners with a variety of opportunities.

- First, it provides a constructivist approach to learning through the provision of interactive learning experiences.

- Second, learning through ICT is more effective as it provides opportunities for using multiple technologies, thus providing links between theory and practice.
- Third, ICT provides opportunities for learners to gain valuable computer skills which are germane in today's job market.
- It provides opportunities for flexible learning as course information is always available and accessible and thereby caters for learners with different learning styles. This does not relegate the teacher to a level of an observer but makes him more of a facilitator.

The researcher sides with Lopez in that ICT, other than facilitating teaching and learning, further prepares learners for future job opportunities like job search online, online application and even online interviews. Another scholar Meyer (2017) opined that technology is changing the way learners learn, and that schools have responded to the challenges of increasing student achievement through innovative initiatives like one-on-one laptop programs. The researcher concurs with Meyer in that this is the trend that schools in the 21st century have to travel to be at the global level of technological advancement.

2.3.1.2 The 21st century technology and positive learner academic performance

ICTs have impacted greatly on teaching, learning and research and school management in various ways. ICT encompasses software, hardware, connectivity and accessing, processing, gathering, manipulating and presenting information. From this one can deduce that ICT is indeed all encompassing since it 'condenses' all those trivial activities into a combined integrated process. Furthermore, ICT can accelerate, enrich and deepen basic skills in reading, writing, mathematics and the sciences and so learners become motivated and more engaged as independent and responsible learners. According to the British Educational Communications and Technology Agency Becta (2004), ICT reduces teachers' workload through its role in lesson preparation and worksheet design, writing learners report and analyzing individual attainment. ICT incorporates all those activities.

The researcher agrees with this, considering the amount of manual paperwork that ICT reduces which would have compromised effective teaching and learning time. Furthermore, through ICT, global collaboration of instructional content is easy to facilitate. Koch opined that the use of ICT in the learning environment can promote collaborative learning, enabling learners to communicate effectively and share the learning work anywhere and at any time.

ICT can be multi-media for instructional delivery; it also shifts the focus from a teacher-centered to a learner-centered process where the teacher becomes a facilitator, collaborator, coach, mentor, knowledge navigator and co-learner. Galbreath (2000) opines that the prevalence and rapid development of ICT have transformed human society from the information age to the knowledge age. The researcher

concurs with this notion considering that the 21st century is about knowledge acquisition; the only concern though is the relevance of acquired knowledge to better learner academic performance.

Moursund (2005) stated that ICT brings powerful aids to translating theory into practice. Two of these are computer-assisted learning and distance education. He further alleges that ICT is a powerful agent of change; it incorporates and extends some of the power of reading, writing and arithmetic. This is true in that through ICT, teaching and learning have become even easier and simpler because of 21st century devices.

Okeh and Opone (2007) enumerated some benefits of ICT in education:

- Supporting conventional classroom work; the teacher could ask the class to use an ICT approach.
- A lot of learning materials can be downloaded from the internet which may suit specific instructional objectives.
- Accessing electronic teaching materials such as books and journals.
- Facilitating independent study and individual instruction, especially on an open distance-learning program.
- Making learning more vivid and engaging.
- Assisting teachers in assessment and testing.

The researcher concurs with these benefits as they align themselves with the objectives of this project in providing necessary resources to improve learner academic performance.

Guma, Faruque, and Khushi (2013) have also observed the contribution that ICT has made towards the integration of 21st century technology in education. ICT in education has positively contributed to the integration of technology in education by:

- Introducing new methods of learning called E-learning where learners study while they are at home.
- Making communication easy because of the internet.
- Easy and quick access to information.
- Exposing teachers and administrators to the modern world through searching, reading and connecting with resourceful people throughout the world.
- Reducing the burden of hard copies as information is stored in soft form.

These contributions are a step forward for ICT in education and if these devices are utilized appropriately, learner academic performance will improve.

2.3.1.3 The negative influence of 21st century technology on learner academic performance

In 2.3.1 above, positive attributes of using smartphones were highlighted, notwithstanding that there are also negative attributes associated with 21st century technology. Ifeanyi and Chukwuere (2018) opine that certain technology may serve as sources of distraction. The researcher has always maintained that the outcome of the use of these online devices depends primarily on the individual.

If learners are left unchecked on their use of the devices, they are likely to abuse them which could then yield negative impacts on their studies. Kibona, Mgaya, and Technology (2015) postulated that despite positive impacts of these online devices, they may steal away learners' time thus affecting their academic performance adversely. This happens to be the main focus of this study.

Cranmer, Potter, and Selwyn (2008) wrote of divided attention where some miss the work of the group or have private study; there is also a possibility of distraction and/or diversion of group work.

There is also a physical barrier to group participation because a person is using the gadget for social purposes. Many researchers, as evident in this study, have praised the emergence of 21st century technology as promoting effective teaching and learning. There are also other researchers who have seen the negative side of 21st century technology as will be seen in this sub-topic.

Chen and Yan (2016) opined that multi-tasking as one of the negative impacts of technology in education. According to Chen and Yan, multi-tasking has its major focus on demands of cognitive resources; they aver that it undermines overall learner performance, as well as performance of each individual task. This has a degrading effect on learner performance which could result if the gadgets are not properly used. This multi-tasking tempts learners to be engaged with their smartphones or others gadgets during teaching time.

According to Valiente (2010), even schools that have adequate ICT resources, because most teachers are technologically illiterate, are not able to utilize those resources to produce their best results. The researcher concurs fully with this view as training before the use of the device is paramount. Minty and Panther (2014), in line with Valiente above, opine that for ICT to yield positive results, it is imperative that teachers get maximum technological skilling. Again, the researcher concurs with this view especially if they can be provided training at the training institutions.

When focused on a single primary task, our intentional resources are well directed and uninterrupted, and information is adequately processed, encoded, and stored, Naveh-Benjamin, Craik, Perretta, and Tonev (2000). When we add a secondary task, attention must be divided, and processing of incoming information becomes fragmented. As a result, encoding is disrupted, and this reduces the quantity and

quality of information that is stored, Pashler (1994). When we eventually retrieve information that was processed without interruption, as a primary task, we are likely to experience minimal errors.

When we retrieve information that was processed via multitasking or with significant interruptions from a secondary task, we are more likely to experience some form of decrease in performance, Wickens, Hollands, Banbury, and Parasuraman (2015). This clearly shows that a learner has to focus on one task otherwise attention is interrupted. Researchers talk about performance decrement which is a negative impact on learner concentration. Following hereunder are some of the negative influences of 21st century technology on learner academic performance. Storz opined that learners who use laptops in class spend time multitasking and that the laptop in that instance serves as a major distraction. Teachers have also raised the issue of training and professional development as hindering successful integration of technology in the classroom. The researcher agrees with this complaint by teachers; this is a caution that whilst technology integration in the classroom is good for teaching and learning, it also has its hazards. (Meyer, 2017).

2.3.2.1 Lost Learning Time

Teachers in this era have to ensure that technology is the order of the day in every classroom, not by choice, but as per demand of the 21st century. In today's classroom, teachers have to ensure every activity is technologically aligned. Where teachers and learners are not technologically experienced in the classroom, the possibility is that valuable time will be wasted on technical troubles. Additionally, the teacher will most likely encounter a class full of learners who are all at different skills of ICT levels. In most schools in affluent areas, learners will have gadgets with Internet access, whereas schools that are in rural or underdeveloped areas may have a large number of their student body with little to no computer experience. Given the 21st century era in terms of technology, it is imperative that these learners are also provided with ICT education; it must however be done such that it meets every individual's needs lest more learning time be wasted.

2.3.2.2 Overuse and Distraction

There is a growing tendency that technology is overused in some classrooms. Considering the cognitive abilities of some learners, there are those who find it easy to comprehend when they physically and mentally interact with what they are studying. The fact about computers is that they cannot substitute hands-on experience with art supplies, science equipment or musical instruments. If the larger part of the teaching is through computer images or PowerPoint lectures, learners' needs are most likely to be compromised in the process.

Whilst technology should be used to supplement the classroom curriculum, caution should be exercised that it is not used as the only valuable source of learning. Moreover, the hype around the sophistication

of new technology may result in learners not paying attention to the information being communicated with splashy visuals and sound effects.

2.3.2.3 Game Mentality

The reason these modern devices are admired so by learners, is that they perceive them as gadgets for playing games; this is a major concern for teachers. Depending on the type and nature of the subject, game playing may assist some teachers as it can serve as an additional resource. For others, such a practice may be a source of extreme distraction and may derail learners from the originally intended task. This is so because learners are not aware of the dangers of internet surfing and undesirable consequences of such engagement in the games.

The researcher agrees with these problems especially because this study is investigating the influence of 21st century technology on learner academic performance. Accordingly, Shirazi, Ngwenyama, and Morawczynski (2010) mention some of the negative impacts of ICT on education:

Declining Writing Skills:

As a result of overuse of these modern devices by learners, in some instances, it has hindered writing skills, and rules and their spelling command have declined tremendously. Through constantly using computers and the internet, even their basic grammar command is negatively affected, hence this study emphasizes that close monitoring of the use of these devices should be exercised.

Increasing Incidents of Cheating:

In most instances cheating using modern technological developments like graphical calculators, high-tech watches, mini-cameras and similar equipment has become the norm. learners have become familiar with writing formulas and notes on graphing calculators, without being caught. This may also be caused by the fact that some learners are very technologically advanced, even more than some of their teachers, and so, caution on the use of the gadgets should always be exercised.

Lack of Focus:

One common form of communication among the youth of the 21st century is through SMS or text. More often learners are seen playing with their cellphones - day and night - or while driving and very often even between lectures. They are ever-connected to the online world which results in a lack of focus and concentration on academic activities and even in sports and extracurricular activities. The same researchers also came up with disadvantages of ICT on education, namely:

- Most experts and experienced people say that, due to such technology in education, it affects imagination and reduces their thinking potential.
- It may be time-consuming from the teachers' point of view.

- Requires massive financial support.
- Some health risks may be incurred in the process.
- Some learners can't afford modern computer technologies due to their home backgrounds.

All these negative impacts and disadvantages are in line with what the researcher has alluded to, namely that unless caution is exercised regarding the content on the devices, there is likely to be poor learner academic performance in schools.

2.4 FACTORS PROMOTING 21ST CENTURY TECHNOLOGY IN SOUTH AFRICAN SCHOOLS

As background to this sub-topic, Isaacs (2007) has this to say regarding ICT in South Africa: According to the World Economic Forum (WEF) Global Information Technology Report, South Africa has the most modern and best developed telephone system in Africa and a vibrant ICT sector with an annual investment of USD 9.6 billion. The report uses the Network Readiness Index (NRI), covering a total of 115 economies in 2005-2006, to measure the degree of preparation of a nation or community to participate in and benefit from ICT developments.

The WEF ranks South Africa 37th out of the 115 economies, SURVEY OF ICT AND EDUCATION IN AFRICA: South Africa Report. Yet, most of South Africa`s infrastructure is also poorly linked and spread unevenly throughout the country. When one considers that Isaacs gathered this information in 2007, in 2019 the picture has changed dramatically in terms of ICT distribution throughout the country. The researcher holds that even though ICT is not currently evenly distributed, most schools and learners have access to it. The most vexing question though is whether those devices are used for the intended intention, which according to this study causes the negative influence on academic learner performance. In view of all this, numerous endeavors were done by South Africa to further ensure extensive distribution of ICT resources to schools through a White Paper which stipulated that every learner by 2013 must have adequate access to ICT resources.

According to Isaacs (2007), there are factors that have led to a serious consideration to adopt a stance of going the ICT way. As the current ICT in education policy framework has been evolving since 1996, it is embedded within a broader national government economic, social and development strategy which includes:

- Attention at the highest level in government to the role of ICTs in the promotion of economic growth, job creation, social development and global competitiveness.
- Linkages of South Africa's strategy to a broader pan-African mandate as expressed in the commitment to the New Partnership for Africa's Development (NEPAD).

- Overhaul in the education and skills development system at all levels.
- A dedicated policy on the transformation of learning and teaching through the use of ICTs, particularly in the formal schools.

Additional to the above promoting factors, the South African government developed some provisions aimed to further improve ICT, among them:

- National Government Strategy - this was a strategy aimed towards national economic growth, social development and general job creation.
- Presidential National Commission on Information Society and Development (PNC on ISAD) - this commission advises the government on the optimal use of ICTs to address South Africa's development challenges and enhance the country's global economic competitiveness.
- Presidential International Advisory Council on ISAD – this council would advise the government on addressing the digital divide with education as key focus area.
- Accelerated and Shared Growth Initiative for South Africa (ASGISA) – this had its focus on electronic communications as the cornerstone to commercial and social infrastructure development as well as education and skills development.
- State Information Technology Agency (SITA) – this serves as a Public Sector ICT Company focused on the effective and efficient provision of ICT services with government at national, provincial and local levels.
- The e-education White Paper – this would ensure that every learner in the primary and secondary school should be ICT competent and this would apply both to communities of teachers and learners. The e-schools which falls under this category would accommodate:
    - Learners who utilize ICTs to enhance learning.
    - Qualified and competent leaders who use ICTs to enhance teaching and learning.
    - Use of ICT for planning, management and administration.
    - Access to ICT resources that support curriculum delivery.
    - Connections to ICT infrastructure.

The researcher is convinced that South Africa is on the right track towards full scale adoption of ICT aligned teaching and learning so as to put our learners at a technological global advantage.

The whole world has adopted 21st century technology as a norm and South Africa cannot turn a blind eye towards that 21st century trend. The emergence of the digital era brought about some technological transformation in all sectors. For instance, it has enhanced global connection with rural and under-developed countries. The fact is, the use of ICT in education is becoming a trend in this 21st century; however, for some teachers, it is still difficult to use ICT freely and proficiently and so they are facing obstacles in actually using computers in their teaching. This is due to either inadequate or absent training.

The main objective of implementing Educational policy on ICT hardware and software in schools was not to teach children how to use technologies. Instead, it was that ICT use will improve educational outcomes across the curriculum, as revealed in examination grades and other standardized measures of assessment. Also, the objective was that ICT use will improve educational outcomes across the curriculum, as revealed in examination grades and other standardized measures of assessment.

There has long been a plea to educational administrators and policymakers to make instructional technologies in schools focus more on educational technology for learners to cope with the current digital space. The glaring observation is that young people are more skilled in technology than their teachers, though it is for socializing purposes. It is for that reason that in this study, the researcher is investigating the influence of the 21st century technology on learner academic performance. The computer-focused youth are not concentrating on a particular Web (My Space or YouTube); to them the gadgets are just for socializing. The list also includes blogs, Wikipedia, podcasts, and social bookmarking tools.

These resources are unfamiliar to teachers (and parents), but today's learners are using them at an ever-increasing pace and in ways that are helping to define a new generation of not just information-gathering, but information-creating learners as well. ICT, when well-integrated into the classroom, enhances self-paced learning; the use of ICT supports independent study. Selwyn, Potter, and Cranmer (2009) posit that it offers variations in implementation across schools, with implications for social and economic dimensions of classroom practice and some varying educational benefits. Once ICT implementation succeeds in improving the basic skills of reading, writing, mathematics and science, enhancing exam results and reducing disadvantage in traditional assessment processes, it will have accomplished one of its major objectives.

2.4.1 Factors hampering 21st century technology in South African schools

The adoption of ICTs in education continues to pose challenges locally and globally, Hodgkinson-Williams, Sieborger, Terzoli, and Learning (2007). The White Paper on E-Education, classified challenges which can be summarized into three main areas:

- Participation in the information society;
- Impact of ICTs on access, cost-effectiveness and quality of education; and
- Integration of ICTs into the learning and teaching process (DoE2003:8)

The researcher concurs with the issues that the White Paper on E-Education intended to address, hampering factors for a full-blown roll-out of ICT directed instruction. As much as Isaacs (2007) has highlighted factors promoting 21st century ICT in South Africa, there are nevertheless hampering factors also averred by Isaacs, namely:

- Lack of comprehensive ICT policy on education that covers all sectors in education.
- The continued need for leadership and co-ordination of various initiatives.
- The promotion of enhanced learning through optimal usage of the technologies.
- Need to demonstrate the value of the investment in ICT through improved performance of learners and teachers and improved employability in the labor market.

These are very vital points made by Isaacs regarding the hampering of the implementation of ICT in schools. The researcher is however optimistic that as of 2020-21, during the emergence of the COVID-19 pandemic, South Africa has seen an exponential rise in the improved usage of 21st century technologies to counter the spread of the scourge in the form of online teaching and learning. This, from the researcher`s point of view, has been done with resounding success despite this being at an elementary level in terms of the technological development of South Africa and Africa at large.

This century has undoubtedly reinforced the use of ICT in schools; however, Hu and McGrath (2011) have observed that it is not every teacher who can utilize the available resources at his disposal to benefit the learners. This is due to multiple factors, namely:

- insufficient and inefficient CPD,
- insufficient access to ICT facilities,
- unfavorable ICT policies,
- lack of technical support,
- unfavorable appraisal systems related to ICT use,
- difficulty in changing deep-rooted roles of teachers as well as roles of schools and learners,
- inappropriate beliefs and attitudes towards ICT use, and as noted above,
- lack of ICT knowledge and skills among teachers and learners, and
- poor ICT pedagogy,

Besides these hampering factors of 21st century technology, there are numerous others as will be seen below. The researcher, however, is convinced the above hampering factors pose a challenge to DBE to attend directly to problems as tabulated in the bullets above.

Concerning full adoption and implementation of ICT, most schools in some developing and underdeveloped areas, are still in the early phase of ICT adoption. They are still victims of the uncoordinated provision and use, some enhancement of the learning process, some development of e-learning, but no profound improvements in learning and teaching. (Balanskat, Blamire, & Kefala, 2006).

Wellington* (2005) averred inherent problems that hamper 21st century technology, one of them being the conceptual and methodological nature of literature—the conflation of diverse forms of educational technology under the all-embracing term 'ICT'. Wellington says that content may be integrated into a single component under the umbrella of ICT and this could be costly in a negative way to learners. A second problem relates to policy and practice. The failure of getting technology into the classrooms has had a resource-intensive effect. This has resulted in hindering effective implementation of ICT and the expected technological experience is greatly compromised. The other problem Wellington raises is that as schools change their approach to teaching, so must homes. Since some learners do not have ICT at home, this holds negative implications, thereby creating a bleak community technological vision.

There are several infrastructural and personnel hurdles that are encountered towards implementation of ICT. They include:

- few schools with ICT facilities,
- inaccessible internet,
- inadequate information sharing,
- limited skills for ICT integration
- shortage of labor force due to the failure of training institutions to produce ICT technicians and professionals needed for the labor market,
- limited electricity supply,
- fixed telephone networks and number of computers.
- The lack of policy framework, inadequate infrastructure and cost of bandwidth, and
- Inadequate in-service training on ICT integration in education has deprived some people exposure and access to ICT. (Hare, 2007)

Al Gamdi and Samarji (2016) opined that even though technology is essential in teaching and learning, it has some barriers that retard faculty members and learners in a digital and connected 21st century. They found that there are external barriers which require strategic policies to overcome those barriers. There

are also socio-cultural factors that hinder proper integration of technology in the classroom. This implies that policies must be in place to cater for training and professional development of teachers considering the ever-changing nature of technology.

2.4.1.1 Access to resources

There are many schools which are found to be technologically wanting due to the inadequate supply of material and physical resources. The shortage of textbooks and other teaching materials, classroom shortages and lack of facilities such as libraries and laboratories are testimony to that. According to the information contained in the School Register of Needs Survey (1996), only 17% of schools have libraries and about 50% of schools have an adequate supply of textbooks, from Edu source. Accordingly, schools in the Northern Province and Eastern Cape are no better in terms of infrastructure such as the condition of buildings, libraries, laboratories, water supply, electricity supply, ablution facilities and telephones. Schools in the Western Cape, Gauteng, and the Northern Cape are generally in a better position, although there are also major supply discrepancies within provinces.

Learners' needs regarding provision and upgrading of classroom facilities vary from province to province which further proves the discrepancies already alluded to. In the North West province, there is a reported backlog of 4 000 classrooms. 511 classrooms were constructed during the 1995/6 financial year (SAIRR, 96/97:7). In Mpumalanga, 48 new schools were built, and 226 damaged schools were renovated during 1997. The province estimates that an additional 4 325 classrooms are needed to overcome backlogs (SAIRR, 96/97:7).

In the Northern Province, during the 1995/6 financial year, 1 000 new classrooms were built, and an additional R200 million was set aside in 1996/7 for new schools (SAIRR, 96/97:7). In Gauteng, which is among the fast-improving provinces, 2 219 classrooms were built over the past four years. Accordingly, the Eastern Cape department of education reports that its 1998/99 budget did not allow it to make provision for the building of classrooms, thus leaving the department with a shortage of about 20 000 classrooms (Edu source).

It is important to note that although some provinces may have an average teacher/pupil ratio within the national norm, 10 significant classroom shortages mean that, in reality, teachers have much larger classes. In the Northern Province, for example, the average provincial teacher-pupil ratio is within the national norm. The shortage of classrooms in the province (as indicated by a teacher-classroom ratio of 1,4:1) implies that about half of the primary school teachers are likely to have classes larger than 40 learners, and as many as 519 000 primary and secondary learners (37%) are in classes of about 70 learners (JET, 1997:4).

A similar situation exists in the Eastern Cape, which has a teacher-classroom ratio of 1:51, requiring teachers to teach up to 51 learners. The national norm for teacher pupil ratios, proposed by the national Department of Education, is 40:1 in primary schools and 35:1 in secondary schools. The national Department of Education recently proposed a 'national ceiling for teacher/pupil ratios of 39:1 for the 1999 school year. In a nutshell, these statistics imply that conditions in all provinces are not yet conducive for an affordable teacher-pupil ratio and sound school infrastructure which hinders effective teaching and learning.

2.4.1.2 Access to computers

The School Register of Needs Survey reveals that only 2 311 schools were in possession of one or more computers. This amounts to approximately 8.8% of the total school population, i.e., in 1996 less than 10% of schools had access to computers. On the same note, as with other resources, the pattern of computer resource distribution displays inequalities between and within provinces. Glaring inequalities are also evident when the distribution of computer resources is looked at comparatively between schools in rural areas, schools in urban areas and those in urban areas.

The role of parents in school funding becomes even more significant, particularly for ICT provision, when the trends in spending on non-personnel items are considered. This implies that despite the commitment on the part of the government to reduce the ratio between personnel and non-personnel expenditure, wage increases continue to push up salary costs. Importantly, however, in considering the impact of this scenario, parents have to carry the burden of footing the funding to schools: As non-personnel expenditure at school-level is decreased, parents are made to share a bigger burden of the education expenditure. In certain instances, this will result in improved service delivery at a lower cost but in many instances, the ability to pay will influence the quality of service received.

In a country in which there are large disparities in earnings among parents as well as high unemployment, the above scenario suggests that inequities between schools may actually increase at the expense of sound service delivery. It is likely that such disparities will be particularly evident for items that may be regarded by some as 'nonessential', including computers and other technology hardware.

Jenkins (2007) opined that most youths do not have parents who could level technological ground for them in terms of providing sophisticated technology that promote 21st-century skills. Because of this, the extent of the academic achievement gap between youth from dominant, and youth from non-dominant backgrounds is widened, (Neuman & Celano, 2015).

This is a great concern especially in this period of technological development. There are other inhibiting factors for full range computer use in schools. A number of early studies investigated why teachers do not

use computers in their teaching, Rosen and Weil (1995), Dupagne and Krendl (1992), Hadley and Sheingold (1993). Not surprisingly they found a list of inhibitors:

- lack of sound teaching experience with ICT;
- lack of conducive on-site support for teachers using technology;
- lack of additional help supervising children when using computers;
- lack of experienced ICT specialist teachers to teach learners computer skills;
- lack of supply of computers;
- lack of adequate time required to successfully integrate technology into the curriculum;
- lack of sound financial support.

2.5 THE ROLE OF STAKEHOLDERS IN LEARNER ACADEMIC PERFORMANCE IN USING 21st TECHNOLOGY IMPACT ON ACADEMIC PERFORMANCE

The stakeholders in this study refer to parents, teachers and education authorities involved in the educational affairs of learners. Teachers, parents and the Department of Basic Education (DBE) have a very crucial role to play in helping learners achieve their educational goals, especially now that the 21st century has come up with modernized teaching and learning facilities in the form of ICT. In this sub-topic the researcher focuses on how technology enhances teaching and learning but also looks at how the very same technology can have negative effects on the much-intended teaching and learning goals.

The fact is, DBE should acknowledge that the teaching-learning process in schools is unthinkable without the use of technology, especially because of its impact in developing the necessary skills and abilities in the 21st century. These 21st century transformations have yielded a more sustainable model of education, (V. J. K. C. Makrakis, 2017).

Simuforosa (2013b) sites some very interesting positive effects of modern technology, namely:

- ✓ technology unlocks educational boundaries,
- ✓ simplifies access to educational resources,
- ✓ enhances learners` motivation,
- ✓ improves learners` writing and learning skills,
- ✓ makes subjects easy to learn,
- ✓ promotes individual learning,
- ✓ encourages differentiated instructional approaches,
- ✓ increases collaboration between teachers and learners,

- ✓ prepares learners for future technological jobs and increases students` innovation and creativity.

With the above positives attributed to 21st century technology emergence, some writers have also identified some negatives of 21st century technological advancement.

Fairlie and Kalil (2017) hold that even though there is abundant information on the internet which serves as a great learning tool, it may hinder creativity. Some learners are found to be lacking in fields they claim to have specialized in; this is most likely caused by the cut and paste method which is done in order to qualify for progression to the next grade. So, in the field of work they are found to be wanting in their chosen areas of operations.

These graduates cannot solve technical problems even though they are degree holders. This is one of the saddest negative effects of technology on learners. V. Makrakis and Kostoulas-Makrakis (2021) are of the view that the current and future challenges and opportunities of the 21st century society respond to an imperative need for education. This is true in that the 21st century technologies give shape to the future of learners in terms of acquiring their intended goals using these modern smart devices. Concerns related to the introduction of emergency distance learning include: unequal access to information and communications technology (ICT) at home, skill gaps in parents' ability to use ICT to support learning, skill gaps in teachers and learner to teach and learn through ICT, and lack of supporting materials, guidelines, and electrical power (infrastructure) (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2020a). Distance learning was the only solution to the lockdown of schools, even though teachers, learners, and educational systems at large were unprepared to meet its challenges and demands. What Kostoulas-Makrakis opine is very explicit regarding what education stakeholders are supposed to do to counter any sort of impediments towards successful integration of ICT in the classroom.

This view of Fairlie and Kalil, in the context of this study, does not discredit the emergence of 21st century technology completely, but warns that the devices must be manipulated such that they produce individuals who will contribute to the growth of society in various spheres of life (socially, economically, educationally).

They further highlight what they call the negatives of these modern technological devices: they say they lead to some form of distraction which will manifest when learners should be studying. Rather, they spend most of their time on social media sites and television shows. As an indication of being addicted to social media, they are found glued to their Instagram, Snapchat, Twitter or Facebook instead of focusing on their school work, which amounts to addiction.

The fact is the internet is information-rich which calls for careful selection of information one may need. Everybody can post anything on the Internet, whether fake or genuine and that is where caution needs to be exercised; misleading information needs to be discarded from the genuine information.

These are some of the predicaments, that the current educational fraternity encounters, which can be attributed to 21st century technology. Educational stakeholders are bound to ensure that the content of the devices is monitored. Also, some researchers have complained about the amount of time spent by learners socializing instead of doing school work; this situation calls for parents to watchful.

In education-American-decades/technology (1990), one enormous effect that has been observed in the classroom, is how some learners have been so used to internet short-hand that they have become ignorant of the basic language rules. This is in terms of writing complete sentences and some words wrongly spelt as per computer influence.

Another angle of negative effect is the trend of learners often being unable to complete assignments that do not involve some aspect of technology. Also, teachers are more often attracted to good-looking Power Point presentations or discussion boards, which are considered as quality work. Teachers are themselves victims of being flattered by good-looking Power-Point presentations presented by learners yet which contain nothing of substantive information on the topic itself. This implies that a 'colorful' presentation has substituted the genuinely required contextual information in the name of technology; hence intensive caution is always stressed in this study.

All that has been said above confirms what the focus of this study is, that is, abuse of 21st century technological devices may yield unwanted results in learners - among them poor academic learner performance. Poor academic performance may not only have a bearing on individual learners, but may affect national, economic, social and educational development.

The 21st century era is therefore characterized by technology-mediated learning environments which provide new opportunities for people to learn at their own convenience and pace. This shift in education from an instructor-centered to a learner-centered focus requires learners who are motivated and self-directed, Maclellan and Soden (2004). The researcher concurs with what Lee says; however, the researcher still holds that some control measurements must be exercised on how learners use their devices so that targeted end results are ultimately acquired.

Dochy, Segers, and Sluijsmans (1999), opine that unmonitored use of these 21st century devices by all stakeholders concerned may make learners overly dependent on technology and that they will get too used to performing trivial activities that are educationally unrelated, hence close monitoring is essential. Learners should rather be encouraged to perform activities such as research, study, and

investigation and enjoy the analysis of information to enhance their thinking processes; this is one of the suggestions on the positive use of the devices.

So finally, stakeholders have to ensure that devices intended for educational purposes achieve just that. The question is how they do that. There are various propositions towards that, but the bottom line is that it calls for the collaboration of all stakeholders, who whilst encouraging the use of technological devices, do not hinder learner academic performance but rather intensify positive social interactions. The 21st century social networks are emerging with both positive and negative challenges for teachers and learners and should be embraced as such.

2.5.1 Parental Roles

The role of parents in the education set-up of their children cannot be over-looked because they form part of a triangle, namely: teachers, learners and parents. So , their input in ICT integration is immensely integral, Witmer (2005). They do not have to leave this responsibility with the teachers only, but should also be involved in the process.

Parents are aware of the work on the development of children, but at the same time they need pedagogical information on the right to education for their children. The educational level of children in the family depends more on the level of the parents' education, so this factor strongly affects family relationships and the successful development of children. Singh, Mbokodi, and Msila (2004) believe that the more confidence parents instill in their children regarding their success in school, the greater their involvement in their children's education.

According to Clark (2015), visiting the school and becoming an advocate, encouraging children and families to develop hobbies and extracurricular activities, and finally, spending quality family time together, are factors that contribute to children's academic success. Epstein (2013) clearly explains that some types of activities could influence learners' skills, achievement, and test scores while other types of involvement may influence attitudes, attendance, and behavior. She also states that poorly designed activities could have a negative result; therefore, schools must carefully choose practices that meet the needs of learners, families, and community.

The striking point is the one raised by Clark above, where he mentions encouraging children's hobbies and extra-curricular activities. This will no doubt have a link on social networks because learners use these gadgets for socializing, so parents must play their roles in this respect. The researcher, having looked into what the above scholars aver, is of the view that parental role is integral in ensuring that their children do have the technological devices. Also, they must perform a monitoring role on the use of the devices, and to some certain extent even monitor the content of the device. This will complete

the triangle mentioned above and will relieve teachers of some responsibilities that parents can also shoulder.

2.5.2 Teacher Roles

West and Bleiberg (2013) have come up with supportive strategies to help improve the use of technological devices to the best of learners' benefits. Following hereunder are some of the important points they mentioned so that learners cope well with these technological devices. Teachers rightly reject education technologies that divert their attention from instruction. The best education technologies enable teachers to do more with fewer resources. So, this says that gadgets must be aligned to what teachers are going to teach thus rendering them user-friendly to teachers. According to Darling-Hammond (2016), teachers should take the lead in creating engaging tasks that give learners meaningful work to do. They provide learners with foresight over the course of a lesson which will progress towards the construction of meaningful ideas. The researcher concurs with this view, and for teachers to do this successfully and quicker, modern technology is indispensable. In a nutshell, the researcher believes that teachers must perform an advisory role to both parents and learners. They recommend the best device for a particular activity for parents to purchase. They then guide learners on how to use the device, thus also relieving parents of the know-how of using the devices, so their joint functioning benefits the implementation of ICT teaching and learning.

2.5.2.1 Teachers and the use of technological e-learning tools

The emergence of 21st century technology has compelled schools to adopt rather more technologically-inclined teaching modalities and abandon the traditional ones. The new technological innovations need to be reflected in the lesson content through adoption of modern 21st century technological devices. This means the education authority should endeavor to ensure that devices are aligned to educational content offered in schools; the policy on ICT should accommodate that.

E-tool learning makes teaching and learning easier for both teachers and learners. For teachers, they can do their planning and general management such as monitoring tasks and online communication with learners. For learners, since they are network connected, they can consult, search and reference activities with teachers and their peers using digital technology. ICTs encompass the effective use of equipment and programs to access, retrieve, convert, store, organize, manipulate and present data and information.

E-Learning is defined as the use of ICTs to enhance or support learning and teaching, Gay, Mahon, Devonish, Alleyne, and Alleyne (2006). It covers a continuum of educational technologies. At one end are the applications like MS-Word and PowerPoint with little impact on education and institution, while at the other end are virtual learning environments (VLEs), which have Sife, Lwoga, and Sanga (2007). Broadly, educational technology refers to the supplemental use of techno-significant impacts on learning

and teaching strategies as well as the organization of technology in the classroom, through blended or hybrid uses, comprising a mix of face-to-face and fully online instruction, with fully online synchronous and asynchronous distance learning environments delivered to remote learners (Nawaz & Kundi, 2010).

2.5.2.2 Teachers and Open-Source Technologies

Starr and Milheim (1996) aver that while most applications of ICT were in the area of improving business competitiveness in business sectors, the application of ICT to improve quality of education has drawn attentions to researchers in the last decade. ICT is expected to generate a breakthrough in education as it did in the area of business. Various efforts in integrating ICT into educational settings to support teaching and learning have been initiated since the 1980s. The current status quo in South Africa is that just like ICT was used to improve the business sector, it must likewise be used to improve education and raise it to a global digital level through open-source technologies.

Many mistakenly believe that education technologies are expensive and complicated to use. The truth is open-source technologies are stable, secure, and compatible with other platforms. These researchers are saying that modern technological devices are easy to land on and also for learners to have them; their availability is not a problem if means have been provided.

Simon and Ngololo (2018) shared their experiences with Namibian teachers of Life Sciences. As a developing country, Namibia saw it fit to recognize the importance of integrating ICT in education for teaching and learning. Those Life Sciences teachers with access to technologies could use it (integration) through collaborative and creative teaching. The final recommendation of this experiment was that teachers needed to be provided with necessary tools and be trained.

2.5.2.3. Technology and the Assessment of Learners

Teachers need to guide learners to choose wisely from a variety of online portfolio providers structured to suit their classroom needs. Teachers must also present themselves as mentors for learners' technological growth. They need to emphasize the significance of online portfolios which have many advantages over paper-based activities. This is because they cost less and allow for more robust outreach. Online portfolios are also amenable to a wider variety of formats including video, music or other interactive features. These online portfolios will render technology relevant and contribute to improved learner academic performance.

2.5.2.4 Teachers should embrace the Common Core State Standards:

Common standards simplify teaching. Teachers need to provide lessons that comply with district, state, and national technological standards. Every day teachers face choices about how to implement the curriculum and instruct learners. Those moments are opportunities for teachers to engage in education

reform that has a real impact on learners. Teachers should use education technologies that are inexpensive, easy to use, and improve student learning.

2.5.3 Learner Roles

The focus now is on the main target, the learner. What do researchers say about the perception on learners and 21st century technology? The researcher holds that a learner is the focal point where parents' and teachers' supportive efforts are directed.

It has since been proven that active engagement in a learning community is associated with reflective discourse and deep learning outcomes, Chapman, Ramondt, and Smiley (2005).

Teachers are now realizing that new and emerging communications technologies are radically changing the educational landscape in terms of flexibility and connectivity. They are providing the means to create fully engaged communities of learners independent of time and space. These technological innovations are not exotic or expensive; they are technologies that have permeated most aspects of life in our increasingly connected society. The ability to connect instructors and learners in a sustained manner has changed the expectations and approaches to teaching and learning in education.

The significance of ICT in the educational environment is it acts as a catalyst for change in this domain. ICTs by their very nature are tools that encourage and support independent learning and to a large extent yield technological transformation. Learners using ICTs for learning purposes become immersed in the process of advanced technological learning. This mobilizes more and more learners to use computers as information sources and tools for cognitive skills development. Jonassen, Reeves, Hong, Harvey, and Peters (1997), averred that the influence of technology on supporting how learners learn will continue to increase. The researcher concurs with these researchers especially that technology is gaining momentum among learners; this study is focusing on the implications thereof.

2.5.4 School Governing Body Roles

As per the South African Schools Act of 1996, schools are mandated to form school governing bodies (SGBs) to effectively run the management of the school as the Act dictates. This structure is formed by parent representatives, educators and non-education members of staff. The researcher is of the opinion that as parents have been empowered by the South African Schools Act of 1996 to be in the majority in decision- making related to the school, so should they also take control of their children's gadgets. Karlsson (2002) opines that parents are not taking full responsibility for their majority number in the body, though that is not the focus of this study but should be taken note of.

According to Heystek (2003) this structure is an essential component for successful education and teaching at school level. This parental involvement manifests itself, among other ways, in organized

structures such as SGBs and parent associations at schools. It is against this background that the researcher feels that SGBs have a decision-making role in connection with the contents of the learner's gadgets.

2.5.5 Department of Basic Education Roles

This section acknowledges that ICT is abundant in schools, not by mistake but by legislation. The issue is whether technology is good or bad, so this study is an exploration of how the devices are used by learners and the consequences thereof. It is not the view of this study that ICT needs to be integrated in pedagogy; it is an on-going process at a rather slower pace especially in rural areas. It is for that reason that Nkula and Krauss (2014) opined that integration should by all means target to involve all curriculum related activities. The researcher, considering what Nkula and Krauss (2014) opined, feels that DBE has an obligation to ascertain that ICT is integrated in the teaching and learning process without fail.

"Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013" (SADoE, 2004, p.10). This means that ICT use in South African schools is legislated and should therefore be controlled for good usage. Furthermore, the current ICT in education policy framework has been evolving since 1996 and is embedded within a broader national government economic, social, and development strategy.

Evoh (2007:64) examined "the prospects and challenges of the" NEPAD e-schools initiative using "the policy network theoretical framework" to examine the transformation of secondary education through ICTs in Africa. From Evoh's statement one learns that ICT purports to transform South African schools.

According to the DoE (2004:19), the "use of ICTs is a continuum that takes learners and teachers through learning about ICTs (exploring what can be done with ICTs), learning with ICTs (using ICTs to supplement normal processes or resources), and learning through the use of ICTs (using ICTs to support new ways of" effective teaching and meaningful learning). In South Africa there is the Curriculum and Assessment Policy Statement (CAPS), implemented in 2004 (DoE, 2002) which stipulates that learners are expected to have access to relevant information through the World Wide Web, which is an important facility in the implementation of NCS vis-à-vis the National Senior Certificate (Department of Education, 2006). There is a call for ICT to be integrated into school curricula globally. The curriculum transformation and development in South Africa was based on the Constitution of the Republic of South Africa (Act 108 of 1996).

This is good news for South Africa that there is such a provision for education, but the question still remains whether the ICT that is provided for in the legislation ensures that the content in the learners' gadgets is aligned to the school curriculum.

2.6 SOCIO- DYNAMIC EFFECTS OF MEDIA TECHOLOGY ON LEARNERS

The influence of 21st century technology goes beyond education boundaries and extends to social life. This sub-topic looks into the extent to which social media impacts learners' social lives because the researcher believes that as they interact with their peers and of course unknown social friends, their lives are likely to take a particular trend. The researcher looks intensively to what other writers have observed as effects (negative or positive) of 21st social media on learners. Quan-Haase and Wellman (2004) hold that ICTs play a major role in our social life as our everyday life revolves around them.

Alkan and Meinck (2016) have tabulated some of the common current communication methods used as means of communication, namely:

1. Posting comments to online profiles or blogs.
2. Uploading images or videos to an online profile or online community (for example. Facebook or YouTube).
3. Using voice chat (for example Skype) to chat with friends or family online.
4. Communicating with others using messaging or social networks [for example instant messaging or (status updates)].

2.6.1 Socio-economic background as moderating variables

Alkan and Meinck (2016) further aver that the national index of learners' socio-economic background be factored into the model, and that the availability of internet access and communication devices may depend on the socio-economic status of the learners.

The "digital divide"—referring to the gap between those who do and those who do not have access to ICTs generally affects individuals who are unemployed or in low-skilled occupations, and who have a low income and/or a low level of education. Learners from families with a lower socio-economic status tend to be less confident and capable in navigating the Web to find credible information (Adler 2014).

Also Adegoke and Osokoya (2015) support the theory that socio-economic status influences learners' access (exposure) to ICT and internet. The findings of Hargittai (2010) suggest that even when controlling for basic Internet access, among a group of young adults, socio-economic status is an important predictor of how people are incorporating the Web into their everyday lives. Bozionelos (2004) showed that socio-economic status had a direct positive relationship with computer experience and an indirect negative relationship with computer anxiety. The findings are supportive of the digital divide and they imply that

information technology may, in fact, be increasing inequalities among social strata in their access to employment opportunities.

Although the focus of this study is not on blended learning per se; however, since blended learning also involves online learning, the researcher saw the relevance of what Karatas and Arpaci (2021) and Parisi, Kemker, Part, Kanan, and Wermter (2019) opined on blended learning. They opined that it contributes to learners becoming lifelong learners who have the ability to learn continuously anytime and anywhere outside the school and in their professional lives by acquiring self-directed learning skills, which are described as the ability to manage their own learning process.

They stress that blended learning with face-to-face instruction and online distance instruction should be included in schools. In this 21st century era in which educational technologies are highly developed, the implementation of such models should be seen as a requirement of the period. This blended learning is even more relevant in the current period which has seen the emergence of the COVID-19 epidemic crisis and has exacerbated the urgent need for online teaching. In 2020 this has yielded positive results, even though in most rural South African schools, it is still at an elementary level.

The outcomes of the child-computer interaction (CCI), reveal that ICT can have unintended impacts on the social behavior of children, Antle (2013). These can be both positive and negative. The positive impacts include facilitating interaction and pro-social (benevolent) behavior, while examples of the negative are increasing social misconduct and schism, Tiilikainen (2018), Tiilikainen and Tuunainen (2014). According to the current research, the negative evidence outnumbers the positive.

The researcher is impressed by the mention that research has shown that the study conducted resulted in the negatives outnumbering the positives. For this particular study, one learns that ICT should be used with great caution, otherwise these devices will not yield intended results. It has been suggested that stemming from the critical period young children are in, their social behavior can be especially prone to the unintended impacts of ICT. There are many researchers whose study has shown that the abuse of ICT may result in unintended negative consequences including academic research, education, health, municipalities and ICT design (Tiilikainen, 2018).

ICT can have positive impacts on the social behavior of children. Examples include them promoting social learning and increasing interaction, Van Deursen, Helsper, and Eynon (2016), staying in contact with and feeling close to peers and dispersed family members. ICT can also resolve family impasses by mitigating tensions between parents and children by facilitating constructive interaction between them in face-to-face (f2f) settings , Arvinder-Singh et al. However, the impact of ICT on the social behavior of children is not always positive, Connolly, Boyle, MacArthur, Hainey, and Boyle (2012); Sawyer and Chen (2012). The

negatives include, among others, a situation where game and smartphone addiction disrupt cordial family relationships and peer relationships, Cho and Lee (2017); Turel, Brevers, and Bechara (2018). Learners may also develop problematic social behaviors that are against the norms and ethics of their surroundings, such as preferring ICT and isolation to meeting with other children and objecting to parental authority, (Cho & Lee, 2017).

According to a study by Passey, Rogers, Machell, McHugh, and Allaway (2004), there are two sets of learners: those who are constantly using mobile phones and those who abstain from that, with the latter outperforming the former. The study also concluded that frequent messaging which was not related to class content interferes negatively with student learning while in class. This is one major observation that has been made regarding the effect of these 21st century technological gadgets. Numerous other studies have also been conducted to find the relationship between academic performance, educational objectives and the use of social networking sites. According to the paper by Kirschner and Karpinski (2010), it was found that learners who spent additional time on Facebook usually have lower GPA compared to others. About the outcome of this study, the observation speaks volumes about frequent Facebook use as against academic performance.

Another finding on the use of Facebook for collecting and sharing information was positively predictive of the outcome variables, while using Facebook for socializing was negatively predictive (Junco, 2012; 2012).

All the above researchers agree that social networks have positive and negative effects, depending on the purpose for which one uses them. Some writers speak of social networks leading to multi-tasking. In multi-tasking, one does not focus on one thing at a time and that may cause one to tend to do things haphazardly in life. Another study by Junco (2012) directed its focus on the impact of multitasking. The finding was that multitasking may affect the capacity for cognitive processing and hinder objective learning.

Rosen and Weil (1995) in another separate study found that learners who received more text messages during class presentations become victims of distractions with the result that their term marks are reasonably negatively affected. Other research was conducted to study the impact of technology-based multitasking behaviors inside and outside classrooms. The study demonstrated that learners who multitask frequently in class have lower GPA.

This in a nutshell implies that multitasking and school work does not match in terms of producing positive academic results. This incidentally is the focus of this study which is the influence of 21st century technology on learner academic performance.

Chisăliţă (2013) agreed, mentioning that schools need to nurture the type of student who can withstand the emerging technological stage through adapting well to various situations. He must be able to think creatively and resolve problems in a reasonable manner considering the high technological level of the 21st century. The more schools promote technology and the use of ICTs, the more learners will gain the skills needed to be productive in a highly technological society.

Youssef and Dahmani (2008) posit that little is known about ICT and its impact in the learning process; however, they opine that ICT can strengthen the relationships between teachers and learners and their parents. This will eventually yield sound teaching and learning outcomes. All these researchers are in unison that ICT has an impact on the social life of a learner; hence this study assumes that all stakeholders must play their roles in ensuring that gadgets are used to accomplish their intended purpose.

Computer use among children has risen steadily over time, and so too have concerns over its negative effects on social development, Subrahmanyam, Greenfield, Kraut, and Gross (2001). In essence what this statement says is that as much as learners are overwhelmed with 21st century technology, so are they negatively impacted as well. Increased computer use could displace putatively more meaningful face-to-face social contact and weaken social bonds with family and close friends, Kraut et al. (1998). This stresses the importance of all concerned stakeholders to be vigilant about the use of devices by learners, lest there be `weakened social bonds' (Kraut et.al, 1998).

According to Sharp and Huett (2006), who have written about the importance of learner-learner interaction in distance education, they posit that for proper learning to occur, there is a need for sound student interaction with one another and for the instructor to arrive at shared meanings and to make sense of what they are learning. Interpersonal interaction provides the social context for the mutual construction of understanding. It is very significant that Berge speaks of 'interpersonal interaction' which revolves around technological devices. In view of all the above citations, the researcher is convinced that indeed, technology has impacted much on learners' social lives and humanity in general.

2.7 SUPPORTIVE STRATEGIES BY THE DEPARTMENT OF BASIC EDUCATION (DBE) TO PREVENT ABUSE OF SOCIAL MEDIA BY LEARNERS

This study strongly emphasizes the use of 21st century devices by learners and for them to be guided by their parents and teachers, not forgetting the indispensable supportive role of the DBE. Prior to 1994, the South African education system was characterized by separate education systems as were prescribed by the apartheid system. After 1994, all separate education systems were amalgamated into a single education system and the new education principles and philosophies were expressed in the White Paper 1 on Education and Training of 1995. The funding and general governing of schools were

outlined in the South African Schools Act of 1996. These are the two documents that currently serve as the backbone of the South African education system. In view of the above, the researcher feels that as the integration of ICT in schools is the topic of the day, DBE cannot be a spectator in this process, but needs to initiate supportive structures as the custodian of both the Basic education level and Higher education level to see this transition through.

The 21st century is characterized by widespread hypnotization of learners on social media devices. The DBE also does not want to be left behind in terms of the modern technology trending. Testimony to that is that in Gauteng in recent years there has been enormous transition towards online learning and online registration which has proved to be quite successful, and other Provinces are in line to follow suit. The Province is distributing teaching and learning devices to schools so that effective teaching and learning are enforced through them (devices).

Yusuf (2005) opines that ICT must be categorized into sectorial needs such as education, health and tourism. According to Rowland and Hafkin this policy already exists in Nigeria, so one is inquisitive to know the following about this policy:

- What does the Nigerian National Policy for Information Technology tell us about education?
- How adequate is the policy for the integration of ICT in the Nigerian education system?

As for this study, these are fundamental questions that need to be responded to when formulating the ICT policy by the DBE. Once these questions are attended to then the DBE may decide on the content relevant to education issues which will alleviate socialization using devices.

The ICT status quo in South Africa is not unusual; in Nigeria they experienced the same predicaments and they came out with resolutions which the researcher feels DBE could emulate in preparation for sound ICT development. For effective instructional delivery at all levels of the Nigerian educational system, the groundwork should be done at teacher training institutions.

Teaching of methods course in the colleges should be integrated with the ICT course so as to enable the teacher trainee to acquire the ICT skills of teaching alongside the methods of teaching through modeled examples by teacher educators. This integrated approach has been empirically found to yield better student achievement, Garba, Singh, and Yusuf (2013) than the stand-alone ICT courses as prevalent in the Colleges of education in the country.

Yusuf (2005), avers that the incorporation of ICT in teachers' training will assist in addressing challenges in teaching and learning, which they say are neglected. Computers are not the only thing learners need to learn about; instead Nigerian schools should be structured such that ICT is integrated for the

development and management of teaching and learning. For successful integration and infusion of ICT in the classroom, teachers are an indispensable factor. Due to the level of incompetence of Nigerian teachers, the introduction of computer education since 1988 has largely been unsuccessful (Yusuf, 2005).

Teachers' ability and willingness to use ICT and integrate it into their teaching has been found to be largely dependent on the professional development they receive. This was established by the empirical studies conducted, Davis, 2003; Pearson, 2003; Selinger and Austin, 2003; this according to Yusuf (2005). The Nigerian national IT policy is silent on teacher education and teachers' ICT professional development as envisaged by the review of (Culp, Honey, & Mandinach, 2005). In Britain the National Grid for learning initiatives, and the strategy for Education Technology, specifically addressed ICT issues in the United Kingdom and Northern Ireland, respectively. This is pure evidence that technologically advanced countries devise specific plans for ICT infusion in the classroom, (Selinger & Austin, 2003).

Learning through ICT entails the development of nationally relevant context software for school use. The national policy does not recognize the need to create quality software. According to Culp et al. (2005), a review of 28 key policy documents over 20 years in the United States, puts forward seven key recommendations. The second emphasizes the creation of more high-quality content and software. The available software in Nigerian schools is imported with no local content. The policy document does not address this issue. However, the adoption of the Nigerian National Policy for Information Technology in 2001 is the right step in ICT application in every sector of the nation's life.

This is despite the fact that Nigeria came late into the ICT world; it nevertheless had profound impact. Yusuf, (2005) concludes by saying the document is designed to ensure that Nigeria as a nation recognizes the strategic importance of ICT for national development. Successful application in every sector can only be assured through adequate coverage of needed areas. Identified gaps should be filled through the involvement of important stakeholders in education. Bringing this to the South African scenario, this is pure evidence that there is a strong need for the DBE to come up with an ICT policy that will accommodate not only education-aligned content, but also the skilling of teachers regarding ICT related content. The researcher agrees with Yusuf that it is the responsibility of the stakeholders to ensure vital gaps are covered in the ICT policy; those gaps, according to this study will accommodate content of the software being decided by the DBE.

It is important that policy makers look at the effects of policies on different sectors of the population, and not concentrate on a policy just because it is currently in fashion, Kozma (2005). Governments in other parts of the world have produced policies that address the use of ICTs in schools. Most of these policies form part of their overarching policies and aim to articulate the efforts of different groupings

towards development. There is a response to Kozma`s view that increasingly, all that governments and parliaments do, is to react to policies that are established in the international area. It is happening in Europe; it is happening in Africa; it is happening everywhere. The difference for Africa is that we have the least room for manoeuvre and the impacts are direct and devastating.

2.7.1 ICT Policies in Schools

As the wheels of change after 1994 were moving forward, it became imperative to formulate ICT policies to ensure the successful integration of the transition to the digital arena. In view of this, the Department of Education commissioned the formation of Technology Enhanced Learning Investigation (TELI) of 1995. This was supposed to be the watchdog in the running of ICT introduction in schools. This was an assurance that indeed ICT has a place in South African schools, though there has been glaringly slow progress, if any, especially in rural schools, but the fact is, technology, through TELI, has been given a go-ahead as a vehicle for teaching and learning.

In South Africa, September 2016, the National Integrated ICT Policy White Paper was released after the government had realized that social, political and economic had changed and ICT policies had to be responded to after the cabinet had reviewed the ICT related policies in 2012.

Robin (2008), referring to Carnine's statement of "the educational establishment", arguing that "just like that of any other professional, teachers' efficacy is dependent on the tools at their disposal" (p. 13) and that "if teachers are to be held accountable, then the educational establishment must be held accountable for providing relevant knowledge and the viable professional tools derived from that knowledge" (p. 16). In other words, there must be policies in place which will accommodate that "educational establishment" (Carnine) to provide those viable professional tools.

Any distance education program for teachers and learners will be relevant if it operates within a particular policy environment and is shaped by it. This means that there is a need for provision of ICT policy that will guide teachers in their teaching duties, and assist them in using these 21st century technological gadgets. Researchers have found that for ICT to be properly implemented, the teachers' involvement is crucial. Regarding ICT-related CPD policies and practices, there has been an observable gap between what teachers perceive to be their needs and the current policies in the provision of CPD opportunities.

On the contrary, management claimed they had provided enough resources, varied kinds of opportunities for ICT-related CPD and that teachers had opportunities to be involved in related policy decisions. Again, on the contrary, teachers were adamant that they had been provided with limited ICT training opportunities which resulted in deficiencies such as (1) a concentration on technical skills (basic

ICT skills) rather than pedagogic skills (ICT–pedagogy integration skills); (2) a lack of individualized CPD models. What teachers thought would be 'needs-based training', according to Karagiorgi and Charalambous (2006) with more flexible training structures tailored to each teacher's needs for ICT CPD, was unfortunately not to be. This affected the approach being taken to CPD, since it did not meet the needs of most teachers, simply because of their differentiated needs, and also because of the methods used.

2.8 THE LINK BETWEEN SOCIAL NETWORKS AND SOCIAL EPIDEMICS

In this sub-topic, the purpose is to further confirm that social networks have profound influence in society, in terms of developing social dynamics. The researcher has observed with great interest how people use these technological devices to get information in the luxury of their homes, relieving themselves of the trouble to stand in long queues. Likewise, education has not been left behind in adopting the most recent methods of teaching and learning with success, but as Junco (2012) maintains, there are also negative impacts of these social networks resulting from abuse by learners.

The book by Nicholas Christakis and James Fowler "The Surprising Power of Our Social Networks and How They Shape Our Lives" is relevant. Christakis and Fowler (2009) focused on the relationship between individuals and their networks of people that either directly or indirectly influenced their lives. In their account of the widespread and often bizarre qualities of social networks, the authors explain why obesity is contagious, why the rich get richer, and even how we find and choose our partners.

There is a general perception that we are largely in control of our day-to-day lives, whereas most of what we do, from what we eat to who we sleep with, and even the way we feel, is significantly influenced by those around us, and those around them. Our actions can change the behaviors, the beliefs, and even the basic health of people we have never met. In a subtle fashion, social networks help spread contagions; create "epidemics" of obesity, smoking and substance abuse; disseminate fads and markets; alter voting patterns, and more.

Social networks can spread the flow of generally undesirable things such as anger and sadness, unhappiness, and vice versa; desirable things can also spread those desirables like happiness, love, altruism, and valuable information. "It is the spread of the good things that vindicates the whole reason we live our lives in networks," Christakis says. "If I was always violent to you …you would cut the ties to me and the network would disintegrate. In a deep and fundamental way, networks are connected to goodness, and goodness is required for networks to emerge and spread."

Accordingly, to a large degree, our mood, be it happiness or unhappiness largely depends to those around us. The author suggests that our happiness is connected with the happiness of people around us; whether we are happy or not, depends in part on our friends' friends' friends.

The influence that each person has on another is vividly demonstrated in Christakis's first paper on obesity which was published in the New England Journal of Medicine in 2007. If someone in the Framingham study became clinically obese, their friends were 57% more likely also to become obese. A friend of a friend of that obese person was about 20% more likely to become obese, and this was the case even if the weight of the linking friend remained unaltered. A year later came their paper on smoking, which contained similarly arresting ties. If a person began smoking habit for the first time, the chances of their friend doing the same are likely to increase by 36%.

The reality is that one's behavior and actions can influence connections, a step removed, is an astonishing thought. And to add to that, our own behavior, actions, and habits are likely to be largely more influenced and impacted by social media than we ever could have imagined. The two paragraphs above show the extent to which social network epidemics can influence individuals' obesity and smoking habits.

Globally there is the emergence of the Corona virus which the World Health Organization (WHO) is doing its best to manage; these are health issues which inevitably spill over into schools. This has resulted in behavioral changes like hygiene and sanitation, social behavior (social distancing, wearing of masks and constantly washing hands). Hofman & Goldstein (2020) have alluded to these changes, and warn that failure to comply results in dire consequences. Alluding to these social changes also, is Blunt (2020), who warns that non-compliance may lead to infection from one person to another. These social changes are easily conveyed to learners through social media because they are now away from teachers but there is still online communication. So, in a nutshell, these 21st century devices go beyond the classroom and cover the social epidemics.

2.9 GADGETS AS TEACHING MEDIA

The incorporation of ICT into the teaching and learning stream is not by choice, but is a global demand. Teachers are generally overwhelmed by trending 21st century concepts such as technology integration, technology immersion and technology-enabled learning - terms that dominate the vocabulary of teachers and administrators. These concepts, to an average person, mean computers, Internet, online video, cell phones, iPhones, and iPads. Selwyn and Facer (2014) opine that digital technology has already become part of both formal and informal learning; the classroom in a well-resourced school is now awash with digital equipment, which opens new kinds of opportunities for schoolwork.

Naidoo (2020) posits that the advancements of technology, particularly in the ICT sector, have brought some great possibilities for teaching and learning. However, ICTs are dynamic; it is proceeding at a rapid pace and in some instances, we are trying to play catch-up. Therefore, the influence of ICT has enhanced eLearning into becoming more prominent and growing into an accepted form for lesson delivery. Furthermore, ICT has transformed the teaching and learning space by removing classroom/lecture hall restrictions, allowing for the use of various teaching and learning methods.

Dede (2000) and Jenkins (2009) opine that the ultimate success of ICT integration in schools will be when there is evidence of collaboration of competencies such as self-direction, systems thinking and complex communication. This current century requires an individual who can productively participate in a vastly global, technological and information-based society. Ito et al. (2013), in the connected learning framework, articulate a vision for using new media to develop learners' 21st-century skills and knowledge, in a variety of formal and informal contexts, and for sharing these skills and knowledge across networks, groups, and communities. This study looks into this very powerful approach of information dissemination through 21st century devices. All these scholars (Dede, Jenkins and Ito) are unanimous about the way that ICT paves for the learners, so that schools do not produce social misfits of the 21st century in technological terms.

In the past there was a stereotypical belief that technology promoted 'drill and practice' types of exercises; this would involve introducing new subjects like computer studies and teaching basic computer skills. However, Aviram, (2000) presented a different vision to the above; Aviram averred that technology should promote a student-centered approach to learning. There is a greater emphasis on project and teamwork, in the student-centered approach and ICT is integrated into the curriculum and produces learners with incredible communication skills, high thinking and problem-solving skills.

According to Aviram`s views, one cannot but agree with this view, considering that through technological gadgets learners have the whole world in their hands; they are therefore better positioned to network throughout the corners of the world, thereby extensively developing cognitive and communication skills which finally leads to the production of a `complete' individual.

Through technology, individuals have matured to the extent of developing higher order thinking skills. Dede (2010), basing his views on the centrality of technology in today's society, posits that technological fluency itself constitutes an important 21st-century skill. Though technology is emerging at an alarming speed, it still has to reach the low-income communities which are struggling especially with infrastructure development.

It has since been observed that in most learning environments, low-income learners are not used to being provided with technology that will develop learners' technological literacy and other higher order thinking skills. This then jeopardizes their technological advancement which is a basic requirement for this 21st century period, Cuban, Kirkpatrick, and Peck (2001); Hutchison and Reinking (2011); Reich, Murnane, and Willett (2012). This, according to these researchers and this study, needs to be looked at from the perspective of reaching all levels of learner developments in terms of 21st century technological input. These 21st century gadgets will contribute immensely in helping under-developed learners cope with the booming speed of technology.

We are now going to look closely at which gadgets (used interchangeably with devices) the 21st century has produced and what contribution they make towards learner academic achievement. These gadgets may be called different names, but the bottom line is that they are the product of modern technology, even though they flourished in different centuries. They are evolving with time and used by both young and old, in all meeting points (churches, homes, schools and in any place of social gathering). On using technology in a classroom, caution must be exercised as a huge amount of research has been conducted worldwide to find out if technology was really very helpful to teach the learners or, not. Excessive use of technology could be harmful for the learners because they could be addicted to the consistent use of technology, hence in this study, the aspect of monitoring the use of gadgets is strongly stressed, lest they serve as gadgets of distraction.

Hembrooke and Gay (2003), decided to demonstrate the effectiveness of technology by undertaking the following experiment. They divided a class into two groups for their research; one group was allowed to use all kinds of technology and digital tools such as those linked to social media, laptops and cell phones. The other half of the learners was not allowed to use any kind of technology; they had to attend lectures in the class, and they could use their course book materials. The result was astonishing. The research shows that the group who was allowed to use technology did unnecessary work most of the time. They did online shopping, browsing in different sites apart from the study sites and also, they were on social media most of the time. The other group was busy with their assignments, examination preparation and taking notes from the lecturers. Hembrooke & Gay did other research on the same two groups. They asked both the groups about the class lectures when the previous research was going on. The result of this research was even more shocking.

The group, who used technology during the class, did not get any of the lectures properly and they even did not remember the topic of the lectures. So, in this research the group, those who avoided digital tools during class were more successful in their study. Unprincipled behavior by the pupils during inspection, it was learnt from research that, the use of cell phones in the classroom increased cheating during

examination. Learners typed short notes on their cellphones and while the examination was going on, they cheated. Besides this, it was also revealed that sudden loud ringing from learners' phone while an important class was going on, was disturbing for the whole class and also for the teachers as well.

So, what do the results of the research by Hembrook & Gay mean? They mean that some control measures must be exercised on the use of these gadgets by learners; otherwise they will use them for other unimportant purposes which are not what the gadgets (according to Hembrook & Gay) were intended for. The 21st century is from the era of chalk and slates (19th century) to the current era of smart phones. The environment is a crucial factor in determining the extent and type of modern technological devices to be used. The teacher-centered teaching is gradually being replaced by a more learner-centered approach which is dominated by the emergence of these technological devices. Many researchers are unanimous that the 21st century technological devices are coming with positives, especially in terms of improved academic learner performance. There is also a strong warning that abuse of these modern technological devices will yield negative learner academic performance, if not well monitored. The researcher in this task is sharing the same view to which others have alluded.

Kowalsky and Haluza-DeLay (2013) concur with Herald (2013) who illustrated some 21st century gadgets which are used as teaching and learning devices.

I) Smartphones – These gadgets are trending in every household, school and in every social gathering. They are internet-connected and contain the most advanced software of the time. They can be used for any learning project activity, mathematical problem solving, and previous exam papers.

ii) Laptops and tablets – Technology users are moving towards being more mobile, and teachers and learners are a significant part of that trend. Laptops are also portable and share functions with smartphones.

iii) Interactive whiteboards – Calgary-based SMART Technologies' SMART Boards are popular with both teachers and learners. Teachers can project presentations onto the SMART Boards, and they can write, touch and interact with their content.

iv) Document cameras – Document cameras are a fun way for teachers to show learners new and interesting ways of looking at objects. Whether they are zooming in on the smaller details of a 3D object, or observing science experiments, learners can share an equal view of the lesson – without crowding the teacher's desk.

v) Mp3 players – Whether a student is listening to his own music while studying, or a teacher is playing an audio book to her learners, Mp3 players are an increasingly common sight in schools. Both teachers and learners can make full use of Mp3 players in their school activities.

These gadgets and many others will be frequently referred to in certain sections, because they are relevant instruments for this study.

2.10 THE 21ST CENTURY TECHNOLOGY AND A LEARNER-CENTERED APPROACH

One of the innovations of the 21st century is a shift from a teacher-centered approach to a learner-centered approach. In this approach, no one teaching strategy is used alone, but rather a variety of strategies are employed, so teachers perform the roles of information givers as well as facilitators in student learning, Darsih (2018). This implies that with the advent of online teaching and the evolution of teaching and learning gadgets, the approach is such that learners are getting more involved in their learning activities and the teacher is merely a guide.

With the advent of technology-mediated learning, new opportunities for people to learn at their own convenience and pace have come to the fore. This transition from an instructor-centered to a learner-centered focus, enhances learner's motivation and self-directedness; however, empirical data are lacking on how to positively affect self-directed learning and satisfy the motivational needs of learners, Keller (2008). Accordingly, there arise needs for more literature examining motivation in technology-mediated learning environments.

Keller (2008) opined that instructional designers have to overcome greater challenges in self-directed learning environments than with traditional instruction, especially with regard to satisfying the motivational needs of learners. Furthermore, Amiel and Reeves (2008) who analyzed decades of research studies in information technology (IT) opine that most studies in the field of learning have problems including insufficient sample sizes, specification errors, lack of connection to theoretical foundations, meagre treatment implementation, various measurement flaws, inaccurate statistical analyses, and futile discussions of results.

The use of ICT may help foster co-operative learning about the content; this is possible because computers serve as resources from which learners can build knowledge. The use of ICT may foster co-operative learning and reflection about the content; it is therefore imperative that ICT be in place for the creation of a sound pupil-centered learning environment. Smeets and Mooij (2001) claim that this is a very important aspect of ICT that enables learners to do things on their own. This learner-centered approach is not a sudden event; it is a gradual process. Ahmed (2013) opined that a learner-centered

approach creates an environment conducive to learning and promotes the highest levels of motivation, learning and achievement for all learners.

This is unlike in a traditional teacher-centered approach where the teacher presents to a group of passive learners; in a learner-centered approach the teacher and learners share and engage in the content of the subject and the teacher becomes the facilitator, who engages learners as partners in learning, Radu and Law (2016). This means that in a learner-centered approach, the teacher oversees learners' activities, receives their input and performs a guiding role. Wise (2017) confirmed that in the learner-centered approach, the seating arrangement is important; the set-up looks more informal but allows active learner involvement through interaction as they may be facing each other.

2.10.1 The Evolution of 21st Century Gadgets

The 21st century has witnessed a reduction in the rate of illiteracy in various ways. The advent of the 21st century technological gadgets has changed the entire outlook on how we perceive the use of these gadgets. At first, possessing a gadget was for leisure purposes and only a few could afford them. That perception has completely changed. The E-Generation, as the youth digital experts of this century are called, possess the digital competencies needed to effectively navigate the multi-dimensional and fast-paced digital environment of computers. We are now getting rid of the world of carrying books physically and now live in the world of e-books, e-learning and virtual communication. In fact, Prensky (2001) recognizes non-literate individuals as burdened with an accent—a non-native speaker of a foreign language, struggling to survive in a strange world (Jones & Flannigan, 2006).

Prensky (2001)had a vision that the world was moving towards the digital era which is currently manifested by the Fourth Industrial Revolution. The evolution of computers though gradual has gained rapid momentum in recent years. Since the late 1970s, there has been a rapid growth in the use of computers throughout PreK-12 education. Computers have also replaced human resources by technology to the level that nobody would have expected. When computers were first introduced into schools, they were used largely for secretarial tasks and administrative purposes, Schifter (2008). During this time, computers increased administrative efficiency in many areas including the processing and printing of student schedules, monitoring library usage, storing student and faculty records, taking inventory, and doing accounting tasks. Schools were able to produce and maintain financial accounts and student reports.

Computers helped improve organizational accuracy and efficiency. Computers were used to calculate student grades, which saved teachers time and energy compared to previous methods of scoring and grading. In addition, teachers could create and store individualized student records with details about learners' needs, academic progress, and social development. In the 1980s, teachers began using

computers for instructional purposes, including preparing lesson plans, worksheets, tests and reports. Thus, computers enhanced teachers' productivity, accuracy, and ability to analyze data in order to improve teaching and learning in the classroom, Murdock and Golding (2004). In time, teachers expanded their use of computers and are now utilizing them for a further variety of purposes.

Many teachers utilize computers on a daily basis to blog, engage in online learning networks, Skype with other classes, use online textbooks and utilize Web 2.0 tools. The use of computers in education has dramatically increased and is only limited by time for training and hardware that varies among schools. We now live in a digital rather than an analog world; many schools are implementing 1:1 computing initiatives to help accomplish these academic goals and many others are considering making the transition. Schools use a variety of tools, particularly effective instruction and technology, to engage learners and increase student achievement (Schifter, 2008).

2.10.1.1 The 21st Century Classroom

Glaringly, there has been a wide shift in transition to the current classroom, compared with the classroom of the previous century. A time traveler from the mid-20th century would probably have a heart attack if they walked into a modern classroom during a lesson. The current classroom is more learner-dominated instead of being teacher-dominated. Now, you will most likely find learners working together using various forms of educational technology. In this context, the term technology refers to any device used to supplement and enhance student learning. There are various types of devices that fall under this umbrella, and each will be discussed in this lesson.

2.10.1.2 Computers

In the context of this study, computers are gadgets which are internet-connected that are used at home, school, and church and in any institution. They are used for a variety of purposes and have seemingly replaced physical human effort. The fact that they are internet-connected (uses Wi-Fi and data) means they can perform activities faster than an ordinary person can. There are a few different devices that fall under the definition of computer. These are the traditional computer (with a tower and attached monitor) and the laptop, which is a portable computer where the display, keyboard, and internal mechanisms are all housed in a single device. You might find both of these in a 21st century classroom and they can be used in many different and creative ways by learners.

2.10.1.3 Laptops

Whereas computers were installed in offices and only used during working hours, laptops are modified computers. They serve the same purpose as computers but can be carried by an individual and be used at

any time when the need arises. Because this study is about technology, it is for that reason they are included in this sub-topic.

Computers and laptops are ideal for research projects and student-created work. For example, you can place learners in groups to research a certain topic. They can all sit around a laptop, research, and then put together a document or presentation to show what they have learned. There are also many educational websites that learners and schools can access to help deepen understanding and practice skills.

2.10.1.4 Tablets

Students today are basically trained from birth to interact with technology through touch. For example, you may have seen a young child attempt to swipe the screen of a laptop or television, only to be perplexed that nothing on the screen moved. Tablets are even more sophisticated and easier to carry around, and very conducive as technological gadgets for education. There are a huge number of educational 'apps' that schools can load onto these tablets to facilitate learning. Many schools keep their tablets in carts that teachers can sign out. For example, if you just spent several days teaching learners how to add two-digit numbers with regrouping, you can then use an app on the tablets to give them some time to practice the skill. Practicing in this way is much more natural for learners who are growing up with touch-screen technology.

Another exciting use for tablets is through various websites that interface with both the tablets and an interactive whiteboard. For example, a website that allows you to create a trivia style game can be used to project questions on the whiteboard while learners select their answers on their tablets. There are many creative and engaging ways to use tablets that are only a web search away.

2.10.1.5 Interactive Whiteboards

In classrooms of the past, if you wanted to show something to the whole class, you probably had to draw or write on a clear sheet of paper to use on an overhead projector. If you showed a student today this device, they would probably try to find a place to plug their phones into it. Luckily, modern classrooms often come equipped with interactive whiteboards. Interactive whiteboards are actually two pieces of technology used together. One part is the projector, which can attach to a laptop, computer, or tablet to show the screen to the whole class. The other part is the interactive whiteboard onto which the image is projected. However, the whiteboard is also an incredibly powerful collaboration tool. You can write over and interact with the projection using a stylus-type tool.

2.11 THE 21ST CENTURY GADGETS: DISTRACTIONS TO LEARNER ACADEMIC PERFORMANCE

The 21st century media gadgets have been receiving praises from all corners about how they enhance teaching and learning. However, there are those who feel that, as good as these gadgets may be, they somehow contribute towards poor learner academic performance.

Junco (2012)) identified some negative influences attributed to 21st century social networks among learners. Besides Junco, there are others who share the same feelings about the distracting effects of media.

There has been an observable negative relationship between GPA (Grade Point Average - an average learner achievement in school). This means learners spend more time on Facebook, Paul, Baker, and Cochran (2012). Junco opined that when these gadgets are monitored, they may have a bad influence on student engagement in learning. They cite Facebook where learners spend their time on non-academic activities. This means learners mix learning time with socializing time but the latter gets more time. Tariq, Mehboob, Khan, and Ullah (2012) say learners delay their meals, sleep less, and get addicted to Facebook activities. This means that Facebook activities do not only affect their learning, but also have negative health hazards.

GPA (Grade Point Average) will be influenced badly by multi-tasking in classrooms. This means learners get involved in using multiple social media tools, Sana, Weston, and Cepeda (2013). Gafni and Deri (2012) have observed that spending time on fun and social activities of Facebook will influence GPA and academic performance. This means learners' time cannot equally be divided between learning time and socializing time.

In summary, social media gadgets have bad influences: addiction, wasting time, information overload and physical isolation from society. This is what this study is focusing on: in Chapter 1, the researcher mentioned that even though the 21st century media enhances learner academic performance, if abused, they may yield negative results for the learners.

With the poor quality of the inputs to research syntheses in the field of instructional technology, one is not surprised that the literature reviews and meta-analyses in IT yield disappointing results that provide practitioners with insufficient or confusing guidance. Similarly, Kulik and Kulik (1991) conducted an extensive literature review to examine the effectiveness of computer-based instruction. This statement by Reeves and Kulik proves that one cannot completely rely on technology because in some instances it has produced unreliable results.

One other thing about these modern technologies is that the ground for their implementation has to be leveled well and that may not suit the economically struggling communities.

According to Bates (2018), there is a need for reorganization and restructuring to level the ground for successful implementation of digital technologies to be successfully implemented. However, reorganization and restructuring are costly. Therefore, schools have to invest in digital technologies that enable minimum organizational challenges, and these do not necessarily have a high impact on student learning.

Moore and Griffin (2014) wrote about the extent of multi-tasking which she says is taking its toll among learners. These learners who become engaged in two or more activities at the same time, she says, are not able to fully concentrate on their studies. There are various causal factors for lack of concentration; among them are physiological factors such as insufficient sleep, anxiety, and depressive disorders which can potentially lead to an inability to concentrate.

According to Mao (2014), there is evidence that full-time learners say they spend little time on academic work while interacting with their gadgets and spend more time on other non-academic engagements. The researcher attributes this to non-monitoring by either teachers or parents. This, according to the suggestion of the researcher, is due to distractions and short attention spans. There is also the factor of cognitive overload; Fried (2008) concurs with the momentum that the transition has taken and calls this "Google speed." The Google speed makes people want to accomplish more and more, faster and faster, similar to the results we expect from the Google search engine.

People are overburdened with huge technological tasks, and thus bounce from task to task on a multitude of devices. The multitude of devices include among others: desktop computer, a laptop for portability, a tablet for even more portability, a smart phone, plus other assorted devices. We can theoretically be using different applications on each device simultaneously to do homework, play games, listen to music, write emails, and chat or text. In learning education, this translates into a learner being committed to too many activities, and not seeing school as a full-time endeavor. Such learners may also be disorganized, contributing to the overload.

Additional to multitasking obsession is the aspect of technology addiction which has contributed to the decline of academic performance and other undesirable consequences. Rugai and Hamiliton-Ekeke (2016) have referred to Bugeja (2007) where he talks about "digital displacement" and also Young explains it in the following lines. The bottom line is that a lot of learning time for learners is wasted. According to Young (1998) there is an emerging element related to the gadgets. In the context of this study, this means extreme preoccupation with gadgets which do not put learners' behavior in good stead. The danger of this computer addiction is that whatever behavior is witnessed, the individual may be unable to overcome it, simply because it is an addiction, (Oulasvirta, Rattenbury, Ma, & Raita, 2012).

There are numerous other causes of behavior addictions which among other things emanate from learners` preference to text other than to engage in eye-to-eye contact. According to Cell phone addiction.org, there are several behaviors that suggest possible technology addiction, including where they prefer texting rather than face-to-face communication, the sharing of minutiae about oneself, and risky behavior. In the classroom, symptoms of potential addictions are listed as:

- Where learners find it difficult to concentrate on basic tasks, classroom activities, or face-to-face conversations because of a desperate need to check Facebook, text messages, or some other application.
- Learners find it difficult to put away the smart phone or device, despite knowing the consequences for its use in the classroom.
- Become rude and insulting to the people in the class, leading to broken relationships and isolation.

Gorlick (2009) averred that frequently multitasking people are characterized by not fully paying attention to anything they do, by not fully controlling their memory, and suddenly switching from task to task unlike someone who completes one task before starting another. His research found that multi-tasking learners are unable to distinguish between things that are relevant and irrelevant to what they are doing.

2.11.1 EFFECTS OF MULTI-TASKING IN THE CLASSROOM

Fried (2008) posits that many studies find that the use of laptops and smart phones by some learners in a classroom is a distraction not only to the student using the device, but to others as well. The distraction is both physical and audible: Kay and Lauricella (2011); Lohnes and Kinzer (2007). The temptation to do things other than classwork is great, and some learners can be seen looking at email, pornography, surfing the web, using IM, or playing games (Kay & Lauricella, 2011).

Despite the prevalence of distractions in class in various ways, technology seems to be more distracting, possibly due to its visual attraction and motion. Kulik and Kulik (1991) found decreased participation by learners using internet devices; this in turn affects the teacher's control of the classroom, ultimately reducing the teacher's efficiency and effectiveness. Moran, Christoph, Puetz, and Walters (2007) observed that there is a substantial decline in instructional effectiveness which has been documented as learners gaining experience with tablet PCs. There is a barrier that is created by the learners' use of laptops between the learner and the teacher, Bugeja (2007); Reddick (2011). The general observation is that, learners' use of laptops and cell phones negatively affects how teachers view those learners, since it usually tends to be the weak learners who use cell phones and laptops (Galluch, Long, Bratton, Gee, & Groeber, 2009).

There are numerous negative effects that can be attributed to computer usage in the classroom with multitasking being but one of them. Kulik and Kulik (1991) opined that the use of technology in class may require some kind of multitasking, which in addition to other effects dulls a learner's interest in learning.

Another side effect of multitasking is that it affects one's ability to pay attention and comprehend the material, leading to lower test scores and grades, Bugeja (2007); Fried (2008); Lepp, Barkley, and Karpinski (2014). Hembrooke and Gay (2003) had mixed findings though. They found that learners using laptops showed worse performance when tested for memory of lecture content, and those learners performing multiple tasks performed significantly poorer.

However, they also found that as learners become more experienced at browsing, their grades were not much negatively affected. Hembrooke and Gay (2003) also found that distractions cause learners to have skill deficits in reading, writing and cognition.

Technology seems to have decreased normal functioning of our minds; these devices are now more like the extension of our minds, Turkle (2007). In most gatherings or in the classroom, people demonstrate their importance by ignoring those they are meeting with, to give priority to online others who are more relevant. This means that their colleague or classmate is "put on hold" while their companion checks an email or takes a phone call or text (Turkle, 2007).

Reddick (2011) defines etiquette as "how you behave when considering the impact your actions have on others". The use of technology in the classroom or meetings to carry on unsanctioned activities sends a message of lack of respect for the speaker and for others in the class, Reddick (2011). It displays rudeness and a lack of civility, business savvy, professionalism or concern for others in the class, similar to a verbal side conversation, Reddick (2011). Bugeja (2007) suggests that we are creating a society of largely uncivilized computer users.

There is demonstration of a lack of empathy for the speaker. How does one feel when the audience is "tuning out"? In brief, all this means that learners who are computer addicted will find it even difficult to concentrate at tertiary institutions and in the outside world at large and so caution on the use of these gadgets should be exercised.

To sum up this multi-tasking issue, it is apparent that most scholars in this section are of the view that multi-tasking leads to distraction of learners; the researcher is, however, not completely convinced of the distractive nature of multi-tasking. The researcher is of the view that due to the exponential rise of technology, in some circumstances, in their field of work, people may require some basic multi-tasking skills. The distraction that the scholars complain about may be due to the relaxed guidance either by teachers or parents.

Kay & Lauricella (2011) cited pornography as one of the possible distractions; the researcher has mentioned several times in this writing that there is a need for the content of learners' gadgets to be monitored by parents or teachers to avoid distractions.

2.12 EDUCATION, TEACHING AND 21ST CENTURY TECHNOLOGY

What roles do the 21st century technological devices play in learner academic performance? How should teachers handle the teaching process in the midst of these devices? The 21st century devices were discussed in 5.1 and how they negatively affect teaching and learning in 5.2. This part will not look at the devices as distractions, but as being inevitable tools for effective teaching and learning in the 21st century. Educational technology and teaching will be the main focus of this part of the study.

The Oxford dictionary meaning of Education is the process of receiving or giving systemic instruction, especially at a school or university. There are many other definitions of education, but this study will focus on the school level. Education is as old as mankind itself; it has evolved with time; this study will only look into the 21st century set-up within a school situation.

In line with Bates (2018), Charlton, Magoulas, and Laurillard (2012) also address the strong relationship between education and technology. In the address there is agreement with Bates that education and technology cannot be divorced and especially not in this 21st century where they form a coin. This study is basically about that, and so the researcher concurs also, hence tracing the influence of learner academic performance whilst utilizing these modern technologies.

Kurti, Spikol, and Milrad (2008) have done some research on school educational activities and also looked into findings of other researchers. Researchers have opined that society`s economic, cultural and social systems form the basis of how the educational system is shaped and structured. Within each educational level, what should have been learned and what is to be taught are influenced by two things: (1) what is worth knowing? And (2) what is the social significance of this knowing? The driving forces behind educational structure are the ideological documents which specify what the purpose of education is, and also the surrounding environment which defines what knowing and knowledge is. There is a historical inheritance for each subject curriculum and educational system. Culture has tremendous influence in shaping educational development which will incorporate understanding of what education is and what is essential within it, which can be identified in different related discussions of the school, education and learning.

Broome, Bobick, Ruggiero, and Jesup (2019) hold that with the rate at which media is growing, it is taking control of learners lives. It is therefore the prerogative of the parents, teachers, policy makers, and content creators to work in synergy towards ensuring smooth generational transition using ICT amid

these 21st century gadgets. This is what the researcher earlier on in this writing alluded to in 2.2 by saying that all stakeholders should play their part in learner development in accommodating these 21st century devices in teaching and learning. Technology is a source for the emergence of critical aspects of life; it provides teachers and learners with access to a variety of educational resources that inspire creativity, critical thinking, communication, and collaboration.

Schools have to ascertain that they embrace technology and start using technology both in classrooms and outside classrooms, otherwise learners will get bored of the present education system, because the outside world is providing them with what they need, and schools are taking this for granted.

So how can schools use technology and prepare learners for the next technology-based generation? Ramey (2013) wrote about promoting equity of access to educational materials. He holds schools should equip themselves well with technology conducive environments that will enable learners and teachers to access educational materials with ease. According to this study, that will be the technological devices.

2.12.1 Education and 21st century technology in schools

The 21st century has brought about technological transformation at a very high speed. Actually, the world has been turned into a global village and has transformed teaching and learning processes as a result of the emergence of technology integration into classroom. Instruction has gained much ground in both developed and developing countries. Since the concept and the process of ICT integration has gained much needed momentum, many researchers have investigated and explored various effective ways of integrating technology into the school curriculum, Maninger and Anderson (2007); Wood and Ashfield (2008). There is a great need for 21st century technology to be integrated into schools.

Based on what Wood and Ashfield have alluded to above, the researcher will view technology integration as the reliance on various information and communication technologies for effective teaching and learning processes. There is close monitoring on the final product of this integration, which is learner academic performance as the main focus of this study. It is through technology that learners use technology to construct new knowledge and enhance their learning process, and teachers integrate technology into their teaching process for effective lesson delivery (Juna, 2018).

A school must establish a global learning environment with effective and appropriate use of technology in the classroom. This is mentioned as one of the all-embracing objectives of technology integration as alluded to by Almekhlafi and Almeqdadi, (2010). They allege that successful integration of ICT in schools will be accomplished when technology enables learners to access educational material, even when they are not in class or at school. This can be implemented by digitizing educational material and storing it on a remote database. Each student can have access to this database using their user names and passwords.

So, teachers can use the same platform to post assignments and provide notes via this remote system. All this can be achieved by embracing the internet technology. Student ''X'' will simply go the website of their school and log in to access educational data. Making the access of data by use of technology, benefits both the student and the teacher. If teachers can provide assignments remotely and reply to any queries from learners, this will create a certain degree of interest in learning because the student uses the means they are familiar with. This in a nutshell has given `birth' to online learning and currently virtual meetings exacerbated by COVID-19 which through technology we have been forced to cope and manage the cumbersome situation.

In reviewing early research on innovative use of networked computers in language learning, Beauvois (1998) found that learners in networked writing projects demonstrated more fluid conversation. Learners might have more time to think, phrase responses, and participate in networked writing, eLearning and ''online education''. Technology can help schools put education in the palms of learners' hands across the globe. Rather than the old system of attending a physical class, schools can embark on technology and open up their boundaries. This helps them reach more learners across the globe and improve learning abilities of those learners. The private sector has played a big role in embracing this technology, by inventing educational mobile Apps which allow learners access to library content via phones; so too can schools adopt the same culture to reach more learners.

Online discussion encourages learners to voice opinions and provide feedback, leading to more interactive dialogue being built into the learning experience as learners need not concern themselves with pronunciation issues or worry about oral communication in the target language, Beauvois (1998). He stresses that online education enables discussions as well as sound feedback, which are an advantage to teaching and learning.

Structure education as an entertainment: Today, many learners get bored attending normal classes. It has been a routine for too long and has to change. Technology has helped solve this by making learning visual and fun. For example, instead of listening to verbal and reading text on the black board, teachers can use projectors to illustrate data with images and less text. Visual illustrations are not boring so the student will be active in class. Also, schools should invest in educational computer games which can help learners solve puzzles. This makes education fun and interesting. Entertainment engages the hearts and minds of learners through these devices, whilst active learning is in progress.

Projects viewed from their devices in general engage learners in authentic, real world tasks that enhance teaching and learning in schools. Education is centered on what was learned before. Teachers keep teaching the same thing over and over. This is so boring. So, schools should use technology to make research and find new things to teach. Give learners what they want, not what you want. Interestingly,

Ryan Pinto, CEO of International Group Institution in a paper delivered on 15 June 2020 highlighted some advantages of e-learning thus:

- Efficiency – E-learning offers efficient way to deliver lessons. Use of videos, sharing of resource links, serving assessment tests can all be done at the click of a button. Additionally, the lectures can be recorded and shared for reference with a wide range of audiences. It also allows for a much larger set of children to be taught.
- Affordability – E-learning is affordable as compared to physical learning. E-learning primarily eliminates 2 major cost points – real estate and transportation. The course or study material is all available online and you can access it as many times as you want.
- Less absenteeism – There are fewer chances of learners missing out on classes, as they can access easily anytime from the comfort of their home.
- Increased Access & Reach – E-learning can happen in any place, as long as there is a device and connectivity. A physical class requires the student to come to school but in this mode, the student can access lessons sitting anywhere in the world.
- Encourages shy kids – We have seen that many children who are usually withdrawn in a class environment, open up in the online classes. They are far more forthcoming with their questions and participation. This could be because of a comfortable home environment.

Schools are obliged to improve their education systems; this they can by the of use technology and by opening up their education material to other professions in the society for review. This will lead to discussions and suggestions on areas of improvement.

Since learning depends on effective teaching; schools can use technology to connect teachers to their learners all the time. If a student can learn anything anytime and the boundaries of classroom hours can be removed, this will make learners active all the time, compared with being active only during class time and becoming redundant after class time.

From the above, it is now clear how teaching and learning in a technologically evolving environment can effectively be implemented. It is on the basis of these points that the DBE can lay a proper platform for technology to thrive in a school environment.

2.12.2 Teaching and 21st century technology in schools

The 21st century technology has its `site' basically in schools. It is therefore incumbent for education authorities to ensure maximum support in the form of funding and provision of digital infrastructure. Educational institutions cannot ignore the possibilities that educational technologies could offer and therefore time and money should be invested in training staff to utilize educational technology in a

pedagogically sound manner. Oliver (2015) conducted research on the integration of technology into theological education at the University of South Africa (Unisa). She places the development of technology within the framework of a revolution and gives a concise description of revolution as a process that is accompanied by stress, uncertainty, discomfort and a need to adapt. Her findings were very valuable and laid foundation for a leveled ground to implement ICT integration. This commitment to adjust in a changing educational environment must include continuous training for staff and learners to use technology and research on how to make use of technology in a manner that is pedagogically viable.

It is not the availability and affordability of sophisticated computers and telecommunications that is important for the evolution of a school curriculum, but the way these devices enable powerful learning situations that aid learners in extracting meaning out of complexity, Dede (2000). This view by Dede is what the researcher in this study is focusing on: that 21st century has come up with modern technological classroom sophistication in the form of iPads, computers and all other modern devices that influence learner academic performance. That is the focus of this study.

ICTs have a multiplicity of roles to perform. Among these roles is the need to ascertain that network technologies have been found to encourage active learning, support innovative teaching, reduce the isolation of teachers, and encourage teachers and learners to become active researchers and learners. They can also strengthen teaching through the provision of powerful tools to teachers.

Lynch (2020) hold that technology must motivate teachers and learners to inspire creativity, critical thinking, sound communication techniques and collaboration through access to a variety of educational resources. In view of this, the researcher fully concurs, but is still curious to establish whether technology cannot be the cause, on the other hand, of poor academic learner performance. The adoption of ICT will yield positive teachers' attitudes towards ICT in education and also have significant influence on its proper implementation and behaviors in the classroom. There is already a positive perception by teachers that computers constitute a valuable tool and they are positive about learners' attainment of ICT knowledge and skills. In many cases, they perceive ICT as new subject matter in education rather than a new way of teaching and interaction between learners and knowledge.

2.12.3 Learners and 21st century technology in schools

The era of paper materials in schools is gradually disappearing with the full-blown emergence of the 21st century technology as replacement. Kirkwood (2001), avers that children today need a global awareness and new economic and civic literacies to work seamlessly with various technologies and integrate those in dynamic social environments. In our rapidly changing society, an urgent need exists for schools to address and infuse global awareness into curriculum instruction. Learners are increasingly confronted

with many issues that require a global education focus. These learners will face a new world order thereby creating a need for a global education.

This shows that learners are getting globally connected through these social media devices. From what Kirkwood alleges above, one at this stage can see the influence that modern technological devices have on academic learner performance.

The new, booming, smarter learners are riding these technology tools and using them to the fullest. But is it happening in reality? Are the 21st century learners using the technological tools to their benefit or has the technology added to their distraction? Of course, like other things, technology too has its benefits and limitations, Chattopadhyay, Shankar, Gangadhar, and Kasinathan (2018). The very same writers go on to say, "We don't condemn a student using a mobile or internet. But the concern grows when the learner uses it for rather non-beneficial purposes, like sitting for hours together on 'Facebook' or 'Instagram' and chatting rather than using it for his/her benefits, like studies or improving general knowledge." This study is precisely linked to that concern, the how part of the use of technological devices, so that one can conclude that they contribute positively or negatively towards academic learner performance.

In California a random trial was executed where over a thousand computers were freely distributed randomly to children attending 6th-10th grade for use at home, Fairlie and Kalil (2017). The final findings were that the children who were given computers were more likely to have a social networking site, but also spent more time interacting with friends in person. There were no causal effects found concerning educational outcomes, and only a small positive benefit to children's social development was noted.

This, according to Fairlie and Kalil (2017) means that these devices are more likely to be abused by learners for socializing with friends which is what this study focuses on. Researchers are unanimous that the use of ICT in education can bring about a lot more positives, among others, strengthen learners' motivation level, instill lifelong learning, promote easy access to information and help them be able to think creatively. In other words, this implies that technology contributes immensely towards integrating a student with the wider global world. (Jonassen, 2000).

2.13 THEORETICAL FRAMEWORK

The framework theory that underpins this study is called the Unified Theory of Acceptance and Use of Technology (UTAUT) by Vankatesh, Morris, Davis, and Davis (2003). The theory is most suitable for this study, since it has its focus on technology adoption and its use in various organizational environments. The researcher is convinced of the relevance of this theory in this study as it looks deeply into these technological devices in their different environments like the school in this case. Besides the fact that the

21st century is technologically inclined, this theory states that the devices will enhance teaching and learning.

The Behavioral Intention (BI) comes into place at this time since the purpose of the study is to demonstrate the impact of either proper use, or abuse, of these gadgets by learners. So the theory covers that as well. The use of these 21st century devices as learning tools in schools shapes learners' behavior and so their integration into teaching and learning strategies should not be contrary to learner development. The theory looks at the four main pillars i.e., performance expectancy, effort expectancy, social influence and facilitating conditions as direct determinants of usage intention and behavior. The four pillars mean the extent to which the theory covers a wide range of field covered by technology and eventually influencing behavior, hence this study.

Lambert (2013) holds that social networks improve learning through interrelationships, communication and social relationships in any environment; this is true for this study and framework. The researcher seeks to design a model to be adopted by secondary schools in using 21st century devices in selected schools with a view to make them effective teaching and learning tools. This framework is in line with mobile learning systems which is also a characteristic of the 21st century technology. Mobile learning enhances the performance of learning and teaching through devices like smartphones, Almaiah, Jalil, and Man (2016). Researchers have found that UTUAT has the upper explanatory power compared to other models and theories.

According to Al-Mamary, Shamsuddin, Abdul Hamid, and Communications (2015), the UTUAT is the most popular model in the field of technology acceptance and focus on the technology factors for the successful implementation of information systems. Taherdoost (2018) opine that UTAUT has higher explanatory power as compared to other models. It is for that reason that the researcher deemed this theoretical framework most relevant for this study.

Abdulwahab and Dahalin (2010) this is the level of an individual user who believes that using the devices will help enhance organizational performance. This theory is seen by the researcher as the solution to the Basic Department of Education (DBE), schools as teaching and learning institutions as well as parents in proper use of these 21st century technological devices. (Juna, 2018)

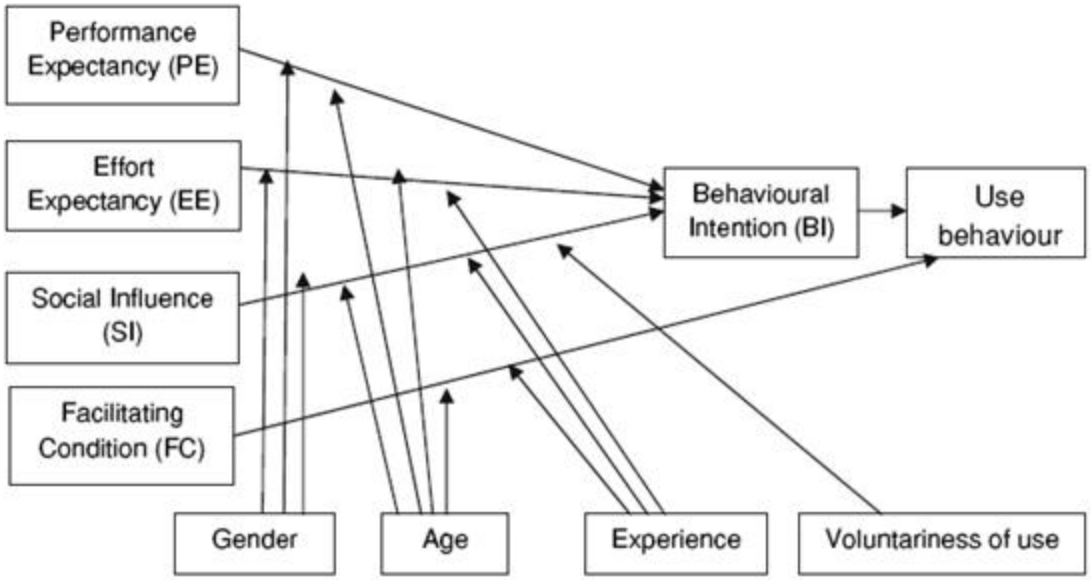
The researcher is convinced that learners of the 21st century emerge successful from a technologically sound background of smartphones and rich environment of WhatsApp and internet. The impact of computer technology has since been discovered to be the source of a set of factors that positively affect its use. First, there are those who hold conflicting ideas about the value of technology and subsequent conflicting advice to teachers about how technology should be used in schools (Cuban, 1999). This results

in a state of confusion for teachers about the educational value of technology. Second, the ever-changing nature of technology makes it difficult for teachers to keep themselves updated with new technological developments. Third, technology is inherently unreliable and so makes itself less appealing for most teachers, Zhao and Frank (2003). Due to its unreliable nature, and the possibility of breaking down at any time, teachers may choose not to use it in their teaching unless there is a strong need for it and reliable support.

Venkatesh, Morris, Davis, and Davis (2003) synthesized models into the unified theory of acceptance and use of technology (UTAUT). UTAUT identifies four key factors (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) and four moderators (i.e., age, gender, experience, and voluntariness) related to predicting behavioral intention to use a technology and actual technology used primarily in organizational contexts. According to UTAUT, performance expectancy, effort expectancy, and social influence were theorized and found to influence behavioral intention to use a technology, while behavioral intention and facilitating conditions determine technology use.

In brief, 21st century technology shapes a learner's life background, since he is born in the midst of these social media networks at home (TV, cell phones, laptops) and as he begins his (Schipper & Yocum, 2016) school journey, gets used to a variety of devices, hence his background and development is surrounded by media devices. This part of the study looks in detail into what Venkatesh and others say in their theoretical framework which is the gist of this study. UTAUT (Unified Theory of Acceptance and Use of Technology) is a technology acceptance model proposed by Venkatesh et. al (2003). This model details how behavioral intentions of users in using a technology are influenced by factors such as Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions (Figure 1). Additionally, there are four other factors that can affect the mentioned factors. Performance Expectancy (PE) may be understood as the level where an individual believes that by using the system/new technology can help increase the performance in their work. Similarly, Effort Expectancy (EE) may be understood as the level of ease provided to an individual when using the system/new technology. Social Influence (SI) is how far an individual perceives that other individual who is of a higher level than him/her believes that s/he should use the system/new technology. Facilitating Conditions (FC) is how far an individual believes that the organization or the technical infrastructure exists to support the system/new technology.

Following hereunder is the diagrammatic representation of the view along which Venkatesh et al (2003) define their UTUAT theory:



From the representation above, the researcher concurs with the structure because all the factors, namely, Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Condition point towards Behavioral Intention which has great influence on Use behavior. Gender, Age, Experience and Voluntariness inter-link with all the performances, hence technology influences individual behavior when it comes to use of the devices. In other words, how, an individual uses the gadget has a bearing on the social behavior.

It is for that reason that the researcher looks into the influence of the 21st century technological devices. The dependent variables in this study are the Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions, whereas the independent variable is Behavioral Intention. These are the main constructs of Unified Theory of Acceptance and Use Technology (UTUAT) developed by Venkatesh, Morris and Davis (2003). The researcher in this study looks at performance expectancy along the lines of a learner determined to attain a goal of better academic achievement through these 21st century gadgets. This is so because learners, if properly guided, will understand that using smart phones will enable them to achieve improved academic performance.

Effort expectancy is also a construct of UTUAT which ensures that the level of ease of use associated with the use of information technology. Ghalandari (2012) opined that effort expectancy which is based on a belief that there are relationships between the efforts put forth at work, the performance achieved from that effort, and the rewards received from the effort. The researcher is of the view that effort expectancy is directly linked to the use of smart phones for mobile learning because learners are influenced by how easy or complex it is to retrieve information within a shortest time possible. On the other side, facilitating conditions as a construct of UTUAT refer to the extent to which an individual perceives that

organizational and technical infrastructures required to use the intended system, are available, Ghalandari, (2012). What all this means for this study, is that, UTUAT is saying performance expectancy, effort expectancy and facilitating expectancy influence learner academic performance, since it revolves around the use of smart phones as suggested earlier in this study.

Oye, Salleh, and Iahad (2011) in their study 'A Model of ICT Acceptance and Use for Teachers in Higher Education Institutions', found that among the four UTAUT constructs, Performance Expectancy is the most influential factor in the acceptance and use of ICT among teachers. 78% of the respondents believed that the use of ICT in their workplace can increase their opportunity in job promotion. They claimed that there is monetary reward or incentive related to the usage of ICT and also a future prospect to get a better job with better salary.

Effort Expectancy may be positively perceived when using and understanding ICT and is considered to be easy and user-friendly. Effort expectancy may be defined as the degree of ease associated with the use of an IS, Venkatesh et al., (2003). Earlier researchers have suggested that the more complex an innovation, the lower its rate of adoption, especially among consumers. In the previously adopted technology models, such as the TAM and the theory of planned behavior (TPB), the role of effort expectancy on intentions is mediated by attitude, Venkatesh et al., (2003). Social Influence, on the other hand, is perceived satisfactorily positive by looking at the personal support or promotion done by other service provider to use the product. Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new IS, Venkatesh et al., (2003).

Facilitating Conditions is considered as averagely positive by the respondents because they admit that they have the knowledge to use ICT and they look at how the service provider provides support to users when they need help. Facilitating conditions is defined as the degree to which an individual believes that organizational and technical infrastructure exist to support the use of the IS, Venkatesh et al., (2003).

Other researchers have also explored the extent to which modern technology influences individual learner behavior. In the work by Bhattacherjee and Premkumar (2004), they proposed a two-stage model of belief and attitude change, linking usage-related beliefs and attitudes in the pre-usage stage with those in the usage stage and posited disconfirmation and satisfaction as emergent constructs affecting post-usage beliefs and attitudes, which in turn influence continuance intention. This is one view that these researchers hold; however, since this study is underpinned by UTUAT, the focus will be on Venkatesh and his co-researchers.

UTAUT has been validated using data collected in the workplace at multiple time periods, and outcomes showed it outperformed the eight individual models it envelops. The generalizability of the beliefs in

UTAUT was demonstrated by a number of studies on the adoption of different technologies in both work and non-work contexts, Venkatesh et al., (2003).

2.14 GLOBAL OVERVIEW OF 21ST CENTURY TECHNOLOGY – INFLUENCE IN EDUCATION

This part looks into the extent to which the 21st century technology has had influence in other parts of the world including South Africa. T. W. Cavanaugh (2006)) writes about the digital reader in this 21st century which is predominantly e-learning structured.

Parents buy Internet access to give their children an advantage over their peers; children need a lot more than going to school to succeed in years to come ,Yeo and Quek (2011) GM, M-Web Studios. This is what is happening all over the world according to this quotation. In this writing it has been mentioned that no parent would like his/her child to be technologically left behind, hence this race for `technological advancement'.

2.14.1 ICT and educational technology in China

In most of the Eastern countries, there are special governmental agencies responsible for the overall planning and management of ICT in schools. In China, it is the system of educational technology centers that governs the planning and development of ICT in K-12 education. This hierarchical system, which aligns with the overall centralized educational administration system, consists of the national center, provincial centers, metropolitan centers, and county centers. In Japan, the Center for Educational Computing was set up to promote the general use of computers in schools. It is jointly controlled by the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Economy, Trade and Industry (Zhang, 2007).

The overall development of basic education in China can be identified in two stages; the first is the technology-dominated phase which ranged from 1986-2000. The second stage is the symmetric phase between technology and education, which took over after the lapse of the first phase in 2000. Jong and Wang (2009) aver that in the first stage, the main concern was about ICT infrastructure implementation. The second stage focused on improving the effectiveness of ICT integration, e.g., facilitating ICT integration in classrooms, teacher training, and designing and developing education resources.

The results of the Sixth National Population Census of China revealed that nearly 31 500 people out of every million citizens have a bachelor's degree or above. The illiteracy rate is less than 2%, while the national average is 4% (National Bureau of Statistics of China, 2011). This says a lot about the speedy educational progress in China with specific reference to Beijing. A lot of emphasis is put on internet use for effective teaching and learning. According to the same National Bureau of Statistics of China Internet,

the education resources must be made available everywhere, which helps schools in rural and less advantaged districts to enrich their teaching resources.

The Beijing Digital School was started in 2012. It is a government project that provides citizens with good quality online educational resources. The advantage is accessibility through digital means. Learners and teachers can also access additional course materials created by famous teachers through their accounts.

Also, this enhances discussion with teachers or other learners who are also supported by the website, as users can chat in real time. This system requires that users register their real names with school information included, so offline discussion is available in some circumstances.

The international effort towards building a sustainable knowledge-based society has made stakeholders of the education industry recognize the potential need for ICT integration in education. According to T. Bates and Poole (2003), they posit that the global drive toward building sustainable a knowledge-based society has made stakeholders of the education industry recognize the potential need for ICT integration in education. This is considered a necessary step in creating a suitable 21st century learning environment to prepare learners for becoming effective citizens of knowledge-based societies that are ICT driven. This shows that, in China, they saw a need to incorporate ICT into the education system for the best national outcomes. Diallo et al. (2013) are of the view that the 21st century is characterized by amazing developments in information technology.

Development in computer and internet technology in particular has over the years revolutionized all aspect of human activities. The integration of these technologies in socio-economic and political institutions is gradually making human interactions more and more dependent on these technological developments, thus increasing human interaction with computers and internet. In China the situation is very different compared to South Africa: children in China are exposed to ICT at very early stages and as they reach school going age, they are already used to it, Tapscott (2009) and Prensky (2001). In Southeast Asia, Singapore and Malaysia they are at a more advanced stage in their effort to effectively integrate ICT in education. Generally, citizens to these countries have access to internet connection at home, at work, in public places and in schools.

Almost every family has access to desktop computers connected to the internet for family use, in addition to other computing devices (laptop and smartphones). Children are therefore generally born with access to technology (digital natives of the 21st century). Such children naturally acquire technological competence as they grow to school age. They grow to be more dependent on technology for information (as they prefer to Google than to ask individuals); in the way they interact with each other

they rather use instant text messaging than communicate verbally and prefer the active use of technology in their learning process.

Bhatti, Ahmad, and Khan (2014) opine that teachers do access online information through which they develop their lesson plans, improve the content of their lesson note, learn new techniques and methods of teaching; and, update their knowledge of pedagogy and subject content. Learners on the other hand, also access useful information that helps to broaden their understanding of the subject content they are learning in schools. The advantage of online social media forums is that they provide teachers and learners with a platform for collaboration in teaching and learning at local and international levels; this also helps to extend communication and discussion among learners and between teachers and learners beyond the classroom environment, Ainin, Parveen, Moghavvemi, Jaafar, and Mohd Shuib (2015). So, ICT, according to these researchers, becomes a vehicle for interaction between teachers and learners which the researcher agrees with.

In the teaching-learning process, the use of power point presentation and smart board technologies can facilitate teachers' delivery of subject content in classroom instructions. Serow, Serow and Callingham (2008) opine that ICT simplifies learning, makes it easier and concrete for the student, particularly if the teacher uses relevant images, videos and documentaries in his presentations. Hammond and Manfra (2009) also agree by adding that effective and innovative use of these ICT tools helps to retain learners' attention and makes the learning process more fun and joy-like in the classroom.

Researchers have also observed that teachers are encountering problems with learners. Having 21st century teachers is essential in handling 21st century learners who are characterized by: short attention spans, multitasking, and the desire for speed in communication and accessing information using digital technology; preference for problem-solving activities, social learning and unrestricted access to the use of technology for learning. Because of their attachment to technology, they are audacious, self-motivated and more likely to set highly challenging learning goals for themselves. Their curiosity and desire for more knowledge depends on their satisfaction with the learning process. 21st century teachers are therefore required to have a good knowledge and understanding of the 21st century learners' attachment to technology and what they do with it in their learning process, Childers, Williams, and Kemp (2014). These are some of the negative impacts that the researcher has mentioned in this study and it is evidence that they are encountered the world over.

Mishra, Koehler, and Kereluik (2009) opine that on top of these categories of knowledge is that knowledge of teaching subjects is necessary, but not enough, for effective use of modern technology integration in teaching. Innovative use of technology in the teaching-learning process as desired in 21st

century learning environment, requires teachers to have good technological pedagogical knowledge (knowledge of the interplay between technology and pedagogy) and the skills of its application in teaching subject content (technological, pedagogical content knowledge). The researcher feels that what these researchers opine happens all over, attests to the fact in South Africa, even teachers in the rural areas are acquiring a reasonable level of basic ICT literacy skills and competence; focus on in-service teacher training should now be geared toward the developing knowledge of the interplay of technology and the pedagogical approach in teaching school subjects. This will definitely put our learners in a better position to technologically compete with the world at large.

The researcher concurs with the view that, among the arguments raised in this study, is the relevance of the content of devices to education needs, so if these researchers talk about pedagogical content knowledge, it addresses the very issue the researcher is raising. China has also ascertained that ICT also accommodates distance learning to bring both mainstream and distance learning on board; the adoption of distance education and ICT has the potential to distribute opportunities for learning more widely and equitably across the teaching force. It has a potential to improve the quality and variety of the resources and support available to teachers, opening up new avenues to professional development. If social justice is to be achieved however, in terms of equity of educational opportunity and services, the provision needs to be planned in ways that make it available, accessible, acceptable, and adaptable to all teachers and head-teachers, empowering them to make choices about what and how they learn.

The Chinese government held a strong belief that before they roll out ICT programs country-wide, teachers as custodians of the education processes should be incorporated into the roll-out program. Consequently, some research studies were undertaken as will be seen from the following conclusions. Teachers control the classroom activities, so the concept underpinning any innovations would have to be accepted by teachers before they could be integrated into classroom teaching, Cuban (1986). Furthermore, based on a quantitative study of factors affecting technology use by teachers, Baylor and Ritchie (2002) concluded that “regardless of the amount of technology and its sophistication, technology will not be used unless faculty members have the skills, knowledge and attitudes necessary to infuse it into the curriculum” (p.398). In order for technology to enable learning, pedagogical change was found to be critical, Meng, Martinez, Holmstrom, Chung, and Cox (2017).

When teachers adopt technology into their teaching they have to adapt themselves to their new roles, because the change challenges not only their ICT competence, but also their existing pedagogy, beliefs, and relationships with learners, Hargreaves and Fullan (1992) and M. J. Cox and Marshall (2007). Hargreaves and Fullan go on to aver that the educational qualifications of teachers need to be given first priority, since technology is always undergoing developments, and the teacher too must be made to face

up to those changes. Such preparedness of teachers will benefit learners as well. However, the level of teachers' professional development will determine the extent of their willingness and ability to integrate ICT into their teaching, (Rosen & Weil, 1995).

This implies that the main consideration is based on the type of teacher training obtained, which will be manifested through his technological professional development, which equips them more for their new roles and teaching strategies that will improve learner technological achievement. In this particular study, ICT integration in the classroom activities is lacking in the South African context, as with most developing countries.

There is evidence that China and all Eastern countries have gone steps ahead in adopting ICT in education with profound success; testimony to this is to look at the aspects that ICT in China covers, namely: multimedia teaching, computer-mediated communications, ICT-enhanced learning, computer-enhanced or technology-enhanced learning, computer-assisted learning and online or e-learning, Skinner, Furrer, Marchand, and Kindermann (2008). Furthermore, Romeo and Walker (2001)) summarize two perspectives on ICT use in education. They aver that the first one is influenced by behaviorist learning theories; the activities focus on the computer as a mechanism by which to deliver information.

The second one is influenced by constructivism: activities help learners focus on the use of computers as a system to enhance teaching and learning. This latter view is aimed at 'exploiting technology's versatility and uniqueness' to help the teacher establish powerful environments for learners' learning. This the researcher views as a win-win situation for both the teacher and the learner.

Ng'ambi, Brown, Bozalek, Gachago, and Wood (2016) posit that the school should guide teachers to increase the education information infrastructure, encourage the teacher to develop high quality software resources and to provide adequate information technology training for teachers; teaching in the classroom should be based on the teaching objects and features of subject integration. It is therefore no surprise that China has progressed so much in terms of ICT development, because it has placed more emphasis on teacher development. Moreover, China ensured that ICT is entrenched in all spheres of organizations; in recent years, the Chinese government has organized many programs for facilitating teacher ICT education. Examples include: Facilitating Education Information for Teachers (MOE, 2002), Enhancing High-Quality Teacher and Management Team Engineering (MOE, 2004), and Planning for the Development of National Teachers' Competences of Educational Technology in Schools (MOE, 2005). Distance training programs were also added to the national training program and over 2.7 million teachers attended IT-aided subject training. At the school level, all high schools, 95% of middle schools,

and 50% of primary schools are required to provide ICT compulsory courses to learners (MOE, 2012). These structures were formulated to ensure that ICT is used in various work areas.

According to Jingtao, Yuanyuan, and Xiaoling (2010), the government has given big emphasis to the effect of ICT integration, and is dedicated to making ICT an important means for teaching, as well as a new type of tool for learning. Since China has huge differences in its geographic, economic and education development in different regions, the way that ICT is being integrated in teaching and learning is diversified. In developed areas, such as Shanghai and Beijing, many schools make full use of their advantages, conducting various kinds of ICT innovation activities that cultivate learners' problem-solving abilities by integrating ICT into classrooms. One-to-one e-learning, mobile education, miniature learning and digital whiteboard-based interactive learning, are all new approaches of using ICT application in the teaching and learning process.

However, ICT implementation has never been without its own barriers. Based on the research, two levels of barriers have been recognized as barriers for teachers' ICT integration efforts: external barriers and internal barriers, Ertmer (1999). External barriers include those that are often seen as key obstacles, such as inadequate access to technology facilities and insufficient training and support in terms of using ICT. Internal barriers are closely related to teachers' philosophy of teaching and learning, and they are deeply rooted in daily practices. Hew and Brush (2007) analyzed existing empirical studies of technology integration from 1995 to spring 2006 in the United States, and other countries, and they found at least two categories of barriers were related to teachers' behavior: the lack of specific knowledge and skills about technology integration, and attitudes and beliefs toward technology. The researcher has observed that even though many teachers have strong desires for integrating ICT into teaching, they encounter significant barriers, such as lacking confidence and competence, or having negative attitude and inherent resistance.

To crown it all the success of ICT implementation in education, is the adoption of Technology Acceptance Model by Davis, Bagozzi, and Warshaw (1989). The Technology Acceptance Model (TAM) has explicitly been developed in view of describing and explaining technology adoption and use. The TAM theorizes that an individual's behavioral intention to use technology is basically determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using the system will enhance job performance, and perceived ease of use, defined as the extent to which a person believes that using the system will be free of effort, Tearle* (2004) This theory links well with Venkatesh UTUAT, which is the underpinning theory of this study; hence one observes such ICT progress in the Eastern countries of the world. The Chinese government, to further ensures that ICT is implemented without resentment, strategized on working on teachers' positive attitudes towards computer use instruction. Studies were

conducted on attitudes and results proved positive. Attitudes towards computers influence teachers' acceptance of the usefulness of technology, and also influence whether teachers integrate ICT into their classroom. Clark (2015); Liu, Tsai, and Huang (2015) also state that among the factors that affect the successful use of computers in the classroom, teachers' attitudes towards computers play a key role. Research of Van Braak, Tondeur, and Valcke (2004) also supported that class use of computers was strongly affected by attitudes toward computers in education.

Research of Van Braak et al (2004) expands to supportive ICT use, which refers to the use of ICT for pro-active and administrative teaching tasks, such as student administration, preparing worksheets, developing evaluation activities and keeping track of pupils' learning progress. The second classroom ICT use, aims to support and enhance the actual teaching and learning process, such as the use of computers for demonstration purposes, drill and practice activities, modeling, representation of complex knowledge elements, discussions, collaboration and project work. The results of this research show the power that ICT can have in teaching and learning.

In China ICT integration to education has been a priority for decades. Chairman Deng Xiaoping stated, when visiting a secondary school in Beijing, that "Education should be oriented towards modernization, globalization and future construction." (Yang 1996).

The mere mention of modernization and globalization is indicative of the route that Chinese education is intended to pursue, which in the current era is a great milestone that other countries of the world wish to emulate. ICT cannot be incorporated in education without any problems just like we have seen in the case of China.

2.14.2 ICT and educational technology in Australia

In a country like Australia, technological development is paramount. There are structures in place to look after the educational needs of the youth: there is the Ministerial Council on Education, Employment, Training and Youth Affairs (1999) on Education. At a glance, this structure is self-explanatory as to what its functions are. One of the objectives of this structure is to ascertain that learners produced are capable and productive and able to manipulate new technologies. Another striking objective is ensuring that every teacher in each school is provided with a laptop computer to use during their teaching sessions. On the side of science teachers, they are expected to be able to use a wide range of ICT-related resources in the science classroom. The researcher views this as a major milestone which, from the look of things, South Africa is far from reaching. It must be noted that in Australia teachers do not encounter ICT in schools, but their training is technology inclined.

In an attempt to have a global overview of ICT use in education, Australia comes to the fore as it has demonstrated a high level of ICT integration into its education system. This will aid this study accomplish its intention of establishing influence of 21st technological devices on learner academic performance. A number of researchers have explored theoretical bases for teaching and learning in the ICT discipline, all in the context of introductory programming. An Australian study by Mason and Cooper (2014) investigated lecturers' perceptions of the mental effort required for different aspects of their programming units.

In their quest for ICT integration to education, Australians came out with a number of education linked theories and models, as will be seen in the following pages. Sweller (1999) proposed that many low performance learners fail to learn due to cognitive overload. Australian national and state education initiatives over the last 25 years stress the integration of computing technologies into compulsory education (AEC 1989; State of Victoria, 2001; Tas 2002; MCEETYA 2003; 2005). Like Western governments worldwide, in Australia computing technologies are key solutions to the needs of a highly skilled and technologically capable workforce.

Guha, Meyerson, Mishra, Motwani, and O'Callaghan (2003) feel that teacher ICT competency has in the past been likened to a 'skills continuum', embedded in school-based ICT professional development - teachers must be willing to adapt to change, assemble reasonable ICT competencies, and demonstrate capacity for time management. What is noteworthy in this point is that for ICT to be well integrated in education, teachers must take the lead and adopt a positive mindset on ICT as a vehicle for teaching and learning. This was the same approach adopted in China.

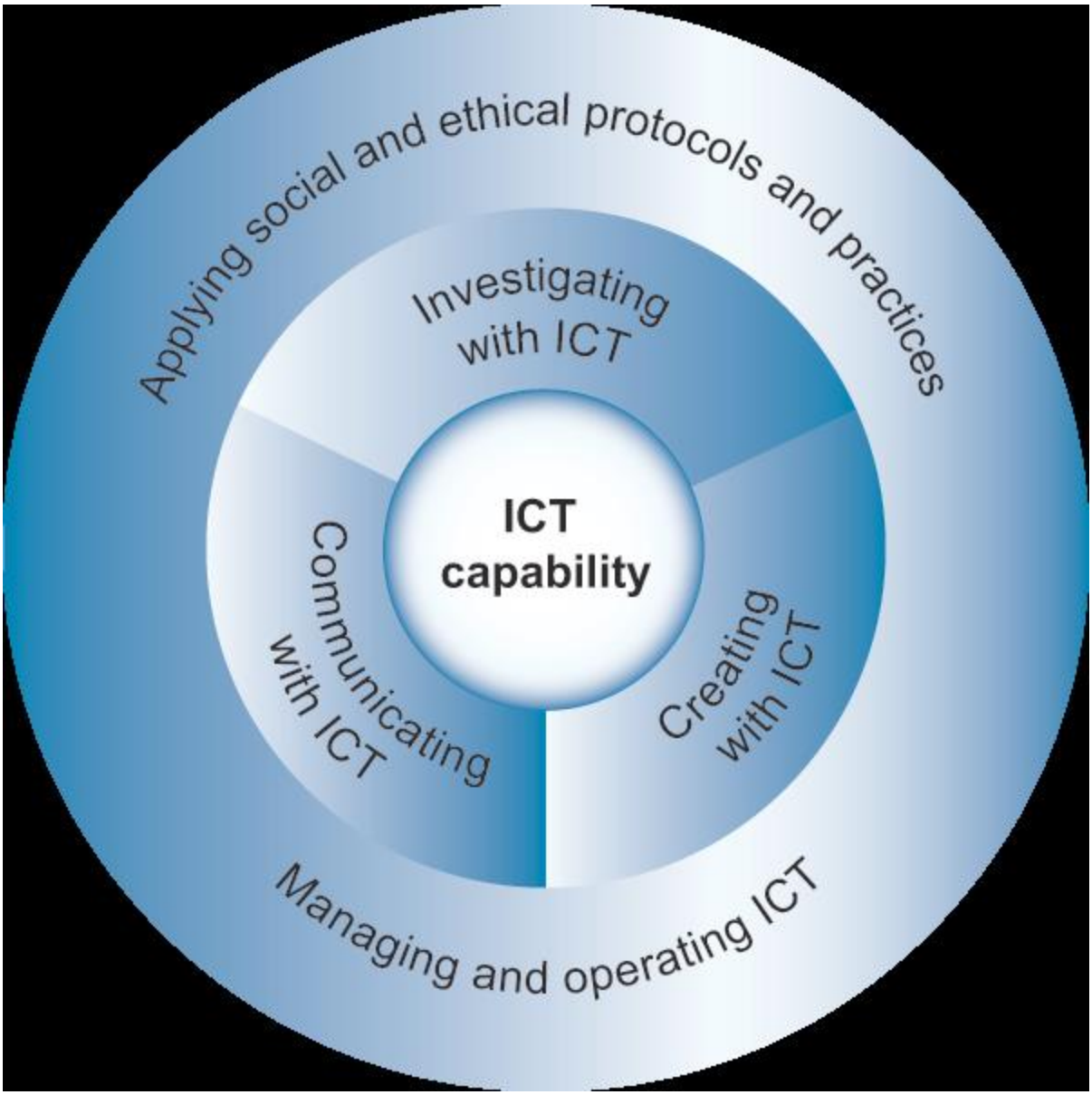
The researcher in some parts of this writing has mentioned that the content of the devices should have a more pedagogical content and the researcher is of the view that stakeholders must shoulder that responsibility. Some researchers are also of the same view. Not only must the teacher have access to a 'working' ICT tool kit, but this skill set must be matched by pedagogical compatibility, and social awareness, Zhao, Pugh, Sheldon, and Byers (2002). Variations in access to ICTs and levels of school-based ICT infrastructure are also critical to the successful uptake of ICTs in the classroom, Ellis and Loveless (2013); this is deeply connected to levels of teacher and systems support, such that the stronger the ICT culture of a school, the more likely it is to 'use' ICTs as a teaching and learning platform, Bitner & Bitner (2002). The researcher totally agrees with these findings as they touch on social awareness while also in this writing there is a section dedicated to social- dynamics.

ICT affects the way knowledge and power influence all aspects of society and in turn, how each societal aspect influences ICT education in multifaceted ways, Stoilescu (2005); Technology Education Network

(2010). Being a global phenomenon yet developed by various countries with different cultural and social views, ICT education has been implemented in diverse ways and perspectives, Kozma and Vota (2014). More than a decade ago, in Canada and Australia, access to ICT devices and Internet connectivity became ubiquitous at schools (OECD, 2005). However, even the basic notions and key terms in ICT curricula are different in every country.

From what we have seen with ICT integration in China, it is obvious that Australia is not different. Like China, Australia has adopted a capability stance that can ensure ICT integration in education. Lockyer and Patterson (2007) say there is need for knowledge or understandings about ICT systems, components, operations, capabilities, limitations, and use in society. ICT operational skills are to be instilled at an early stage to yield informed attitudes toward ICT use personally, and in society. ICT capability is relative to the person, the community and the technology available. It relies on the development of transferable and useful conceptions, skills and perceptions that mature over time. As with the development of other capabilities such as literacy and numeracy, what is learned in earlier years supports later years; so, in Australia technology is a building block for the future, and there needs to be progression over time.

So, from this capability vision, one learns that it has a vision of the future and so according to the researcher it is worth adopting, provided some measures are in place to have a pedagogical inclined content. To clearly understand the capability vision of Australia, the following definition will suffice: Information and communications technology (ICT) capability refers to the capacity to use ICT appropriately and ethically to investigate, create and communicate ideas and information in order for individuals to function effectively at home, at school, at work and in their communities (Australian Curriculum, 2012a). This clearly states that ICT integration will capacitate an individual to be self-sustainable in every work environment he finds himself in. The incorporation of ICT does not come without any resentment; Research also indicates that many teachers have positive attitudes toward technology but they do not consider themselves qualified to effectively integrate ICT into their instruction Ropp (1999). This implies that lack of adequate training and experience is considered one of the main reasons why teachers have negative attitudes toward computers and do not integrate technology in their teaching. These are the inhibiting factors even though it is generally agreed ICT is the way to go.



The above represents the ICT structure of Australia as taken from Australian Curriculum, 2012c.

Curriculum (Australian Curriculum, 2012c).

This representation is an all-round demonstration of ICT capability which the Australians developed. The structure illustrates that with ICT capability one is able to investigate with ICT, create with ICT, communicate with ICT, and manage and operate ICT. Australian Curriculum (2013) came up with computer related technologies. This structure was made to focus on developing the basic knowledge and understanding of information systems which involved among other things: data, processes, digital systems, people and their interactions.

It also included understanding of the impact of digital technologies in people's lives. From this it is safe to say that digital technologies have a profound influence on an individual's social life which is also mentioned in this study. Collis and Van Der Wende (2002) report that Australian institutions have among the highest scores for the extent to which ICT influences general teaching practice, with the highest score

on the actual range of ICT options and tools that are used. However, there are no substantially high or low scores concerning the flexibility offered, except for low flexibility with respect to teaching language. But with English as the lingua franca, this does not hinder the Australian institutions from having an extremely explicit international orientation in their ICT policies.

Teaching globally, Australian learners obtain the highest scores (way above all other countries) in terms of the importance that it has for the mission of the institutions. Australia also has the highest score on the effect of the international student demand on current ICT policy and among the highest scores for this effect in the future. Furthermore, the Australian institutions have among the highest scores for the role of foreign cooperation in the current and future ICT policy. Lifelong learners as a target group that could benefit from ICT options is much less pronounced: among the lowest scores for now and the future. This is the extent to which ICT has made teaching and learning easy in Australia.

According to McCausland, Wache, and Berk (1999) the Australian Education system want to ascertain that in every educational institution their graduates are able to demonstrate the required level of information literacy "the capacity to identify and issue and then to identify, locate and evaluate relevant information in order to engage with it or to solve a problem arising from it". The 21st century is of course about information literacy and Australia, according to these researchers, is right on track.

Contemporary learning theory is based on the notion that learning is an active process of constructing knowledge rather than acquiring knowledge and that instruction is the process by which this knowledge construction is supported rather than a process of knowledge transmission, Bala (2018). This notion is supported by Oliver (2015). Steketee (2005) holds that the good thing about constructivism is that it emphasizes a process of personal understanding and the development of meaning in ways which are active and interpretative. In this way learning is more about construction of meaning rather a mere memorization of facts; in other words learning is acquired through active interaction with the devices, be it on networking or otherwise.

According to Osborne and Hennessy (2003), there are vital benefits of using ICT in the science classroom. Benefits include the development of learners`' critical thinking skills, ability to collect data, the manipulation and application of appropriate skills to access knowledge in a visual format, and enhanced motivation and engagement. At some point in the United States, research on technology use in schools (Cisco Systems, 2006) showed that the use of technology results in a small, but significant, improvement in student learning. There is even some evidence that using ICT will reduce teacher workloads (Selwood & Pilkington, 2005).

It must be noted though that there are common challenges all over where ICT is to be implemented as it has been discovered in Australia. Even though in Australia there is a wide range of the availability of computers and software in schools, Webb and Young (2005), the range of ICT types used and the overall use of ICT in secondary school science is alleged to be inadequate, Cox et al. (2004). The following lines should reflect a true reflection that no place is Utopia in terms of having everything in a perfect state. Some review of ICT uses in science classrooms found that use focused on the Internet, email, word processing, simulations, and data logging.

Reasons for the poor uptake of ICT in schools included school-related factors such as lack of access to computers and technical support, and teacher-related factors such as low levels of confidence and ICT skills, concerns about reliability of ICT, beliefs about the role of teachers, resistance to change, lack of time to prepare resources, and lack of awareness of pedagogical issues, (BECTA) British Educational Communications and Technology Agency (2004). A review of the research literature on barriers to the uptake of ICT found that teacher-related factors, especially beliefs about science teaching, were more significant than school factors. Osborne and Hennessey (2003) identified similar constraints and also found that learners' ICT skills impeded ICT use by teachers.

Dawson, McWilliam, and Tan (2008) have come with significant concluding observations on the positive and negative aspects of the introduction of ICT in Australia. Among conclusions made were teachers` allegations that they had not been provided adequate time to interact with ICT resources, rather they were only shown them. Also, they alleged that the applications were rather more complex beyond their manipulation ability such as web design, online simulations, and data loggers.

The issue of pre-service education also came to the fore; the feeling is that more needs to be done to cater for the variable ICT skills of the pre-service teachers by, for example, providing self-paced modules of variable difficulty. Such considerations would help put everyone at the level of being able to manipulate the applications thus enhancing desire and inspiration to be part of the ICT integration process with aplomb. On the other side, early-career science teachers do not feel hard done by, they are content that what has been given to them is adequate and value ICT use in teaching and believe that they have the necessary skills to use ICT, but in most cases ICT use is limited to lesson preparation (word processing) and personal communication (email), not ICT use with learners in the science classroom where research indicates there are the most benefits to lerners' learning.

Some of the teachers believed that student ICT skills negatively influenced their use of ICT and it may be that this limited their classroom use to teacher-centered PowerPoint presentations. The school culture was seen to be a positive influence on ICT use, and it seems that technical support was adequate and that, in most schools, ICT use was promoted. The two most important teacher-related factors inhibiting

ICT use were workload and behavior management issues. Workload impacted negatively on access to computers and time to prepare resources and activities.

The first years of teaching are demanding as curriculum is planned, prepared, and taught for the first time while also coping with the demands of a new career. The most significant negative school related factors are access to computers and the Internet. These issues need to be addressed if science teachers are to use ICT regularly. In the early years of teaching, it may be difficult to book a computer laboratory as teachers do not know in advance exactly when it is needed, whereas a more experienced teacher may know well in advance and have the pedagogical skills and confidence to be flexible in their teaching.

This is very powerful and well-grounded conclusion and observation by Dawson; in a nutshell, it says even though there are unanimous positives on the use of ICT, there are barriers that need to be attended to before full swing implementation. It is for that reason that the national government of Australia took it upon itself to provide ICT legislation of ICT implementation.

2.14.3 ICT and educational technology in Nigeria

As a prelude to this part, Agyeman (2007) states that The Federal Republic of Nigeria has no specific policy for ICT in education. The Ministry of Education created its ICT department in February 2007, notwithstanding several government agencies and other stakeholders in the private sector having initiated ICT-driven projects and programs to impact all levels of the educational sector. What is important in this prelude is that even though there is no specific ICT policy in place in Nigeria, there are however, ICT-driven projects aimed at the educational sector. According to the National Information Technology Development Agency (NITDA) - the implementing body, Nigeria started implementing its ICT policy in 2001. The policy entitles NITDA to form strategic alliances and joint ventures and be collaborative with the private sector to realize the specifics of the country's vision of, "making Nigeria an IT capable country in Africa and a key player in the information society by the year 2005, through using IT as an engine for sustainable development and global competitiveness." Outlined objectives of Nigeria's ICT policy:

- To ensure that ICT resources are readily available to promote adequate national development.
- To ascertain that the country benefits maximally, and contributes meaningfully, by providing the global solutions to the challenges of the Information Age.
- To empower Nigerians to participate in software and ICT development programs.
- To encourage local production and manufacturers of ICT components in a competitive but healthy manner.
- To establish, provide and develop ICT infrastructure and maximize its use nationwide.
- To empower the youth with maximum ICT skills and prepare them for global competitiveness.

- To integrate ICT into the mainstream of the education and training system.
- To cascade ICT awareness and ensure universal access in promoting ICT diffusion in all sectors of national life.
- To create an enabling and conducive environment and facilitate private sector (national and multinational) investment in the ICT sector.
- To encourage the government and private sector in a joint venture collaboration to promote ICT.
- To develop adequate human capital with the emphasis on creating and supporting a knowledge-based society.
- To build a wide mass pool of ICT literate manpower using the NYSC, NDE, and other platforms as a train-the-trainer scheme for capacity-building.

Though Agyeman says there was no specific policy for ICT, to the researcher this was adequate to accommodate full-blown ICT implementation in schools if one looks at what is covered above.

Apart from Agyeman, many other writers have written about ICT in Nigeria, the likes of, Oboegbulem and Ugwu (2013), Adejoh and Ozoji (2005) and Osaat and Oyet (2012) who have given definitions of ICT which this part will not focus on, but on the progress that Nigeria has made towards ICT implementation and barriers encountered in the process.

Anekwe and Modeme (2013) opine that the use of computer in the classroom can be viewed from two perspectives: as an object of instruction, and as a vehicle for instruction. The computer, when used as an object of instruction, means the study of computer itself and data processing, and when used as a vehicle of instruction, it is concerned with instructional delivery system. Osaat and Oyet (2012), and Onah (2016) hold that the delivery of instruction, the computer, plays two important roles namely, Computer Assisted Instruction (CAI) and Computer Managed Instruction (CMI).

In CAI, computers are used as learning resources, information is stored in the computer and the learners are allowed to access the information. While in CMI, the computer assists the teacher in storing information about the learners and the information can be retrieved when required. An interesting view is aired by Agbanu, Ofordile, and Osuigwe (2011) who opine that education reflects the values of the society to which it belongs. This is true especially for this study which in some parts mentions that social media influence the behavioral pattern of an individual, hence in this writing, it is mentioned that the content of the device should, per legislation, be monitored by concerned stakeholders.

As the society is advancing, it is no longer possible for the teacher alone to provide all the information the learner requires to be relevant in the new age. To this end, ICT has offered the greatest assistance to the

teacher (education). For instance, the integration of the internet and other ICT services into the classroom increase the independence and autonomy of the learners and changes the role of the teacher to that of a facilitator, who plans, structures and organizes meaningful learning and collaborative opportunities for learners. His function is no more than that of transmission of knowledge because ICT makes new things possible in new ways, Selinger (1999). ICTs brought a lot of changes to the way education is dispensed in the classroom; it introduces individualized instruction, which means that the dissemination of instruction depends largely on the characteristics of the learners. It also introduces methods such as E-learning, teleconferencing and others which enable learners from different locations and countries to attend the same class at the same time.

Osaat and Oyet (2012) note that: As an instrument for instructional strategy ICT can be used to present difficult and abstract topics and concepts through varied pedagogical approaches in an existing and captivating way. ICT will, to some extent, help to minimize the problem of teacher scarcity in certain areas of specialization. So, ICT comes with a solution of teacher shortages and also enhances learners' understandings when it simplifies abstract concepts. Osaat and Oyet (2012) concur with this notion when they say the introduction of ICT services into education to date remains the most fundamental change in education.

With its introduction, the learner no longer depends solely on the teacher as the only source of knowledge. Both the learners and their teachers can access information which before now was almost impossible.

Osaat and Oyet, (2012) came up with conclusions and recommendations on the implementation of ICT. Before embarking on conclusions and recommendations, they allude to some challenges of ICT implementation. These challenges are two-fold. First, there are problems of inadequate funding and facilities, power failure and a lack of space for the display of the little available facilities for use coupled with large student population, amongst others. Second, the change from traditional strategies mastered by the teacher to the new ones with sophisticated learning facilities is not properly understood.

These problems threaten the teachers` intellectual ability and self-confidence, hence his profession. What the teacher needs most in this dispensation, is training and effective knowledge update. The teacher would need to acquire new skills to be able to handle these new responsibilities. More so, some institutions are not sufficiently equipped with ICT facilities, which include computer, internet services, teleconferencing, and others. What they do is teach the theoretical aspect of ICT, whereas it is supposed to be practical for the skills to become part and parcel of the teachers in training. The inadequate

knowledge of ICT will lead to the teachers' ineffectiveness and negative perception of the computer application.

Subsequent to these observations, the following recommendations were made:

- The government, in conjunction with the tertiary institutions that train the teachers, should work to change the course program of the trainee teachers to include ICT courses.
- Government should, as a matter of urgency, employ qualified ICT personnel in the tertiary institutions to help in training the teachers.
- The government should try to provide ICT facilities to the tertiary institutions and other levels of our education system, so that the learners can access these facilities.
- A monitoring team should be set up to help in checking how teachers use these facilities in teaching their learners.
- For those who are already in the teaching profession, regular training should be organized for them on the use of ICT facilities to better their teaching.

These recommendations concur with what the researcher has alluded to in this study: that the content of the devices is to be checked for being pedagogically aligned, in order for the teachers to be fully competent in the functioning of 21st century technology. That, according to recommendations, should start in the teacher training institutions. Through such proposals and recommendations emanating from numerous researches, Nigeria has emerged as one the leading African countries in technology.

Gidadawa and Dogondaji (2014) wrote about computers as epitomizing the fourth revolution in education. They say it is characterized by the 'e-', namely e-government, e-commerce, e-medicine and e-education. According to Gidadawa and Dogondaji (2014) ICTs have the potential of being used to meet the learning needs of individual students, promote equality of educational opportunities, offer high quality learning materials, increase self-efficacy and independence of learning among students, and improve teachers' professional development.

The Milken exchange on educational technologies (1998) has noted the potentials of ICT on education; she says:

- it has the potential for acceleration;
- it motivates and engages students in learning as they are encouraged to be more independent and responsible for their own learning,
- ICTs provide opportunity for connecting the school with the world, as learning is expanded beyond the classroom, thus relevant real-life contact can be established.

- Finally, students and teachers can access information and resources, and they can communicate with experts and peers and make useful contributions to knowledge through electronic publications.

Looking into these potentials, they sound very realistic and if properly adopted, can take any country forward with technological advancement. The researcher agrees with these potentials, but still feels that freedom to the use of devices, without any monitoring, may result in the undesired results of poor learner academic performance which is the core investigation of this study. Despite the fact that ICT holds great potential in supporting and augmenting existing educational as well as national development efforts in Nigeria, several challenges remain.

Sinko (2001) discussing the barriers to successful integration of ICT into the teaching/learning process, distinguishes the following factors:

- Lack of strong support for the educational personnel and learners;
- Lack of teacher competencies to use certain software;
- Insufficient financing (of teacher professional developments in the ICT field, of appropriate computer hardware and software etc.);
- Lack of cooperation among academic personnel in the same, and in other schools.

Gidadawa and Dogondaji (2014) also came up with following recommendations after identifying challenges mentioned above:

- ICT infrastructures including computer hardware and software should be made available in all our educational institutions.
- Skilled manpower as well as training facilities for ICT should be provided adequately at all levels.
- People should be enlightened and oriented so as to be able to accept changes and innovations, particularly the technology-based and learning methods.
- Education sector should be funded adequately to cater for all learning needs and aspirations.
- The government of Nigeria, in particular, should get ready to prepare to participate in, and benefit from, ICT development.
- There should be effective co-ordination of all ICT programs for education initiatives.

2.14.4 ICT and educational technology in South Africa

In 12.14 above, a reference to Petroni and Cloete (2005) is made on what parents do for their children to cope with 21st century technology in schools. Petroni and Cloete made reference to Tracy Burrows (2002),

where she observed that in SA, there is a problem of access to basic supplies such as pens, textbooks or even classrooms; much less electricity and ICT are not accessible to most children. Not excluding urban schools, which are equipped with electricity, there is still a large number of teachers who have never used a PC. Observers say schools in Johannesburg have been known to teach children using PC keyboard skills by sending them home to practice typing on a drawing of a keyboard. The researcher can say at this stage that South Africa is not relaxing, but rather doing her best to match the global stage in terms of technological development.

South Africa is still undergoing ICT transition; most schools are still battling with introducing the ICT teaching approach, due to a number of barriers as will be seen in the following pages of this section. Using the White Paper on e-education (DoE, 2004), The South African Department of Education through its ICT in Education policy and the Guidelines for Teacher Training and Professional Development in ICT (DoE, 2007) have developed guidelines for the distribution and use of digital resources in schools, such that equity and quality in education are achieved at school level.

This is testimony that South Africa is on track to adopt ICT policy in schools. Despite all these attempts, there are factors supposedly beyond their control; previously disadvantaged schools are still struggling to acquire well-resourced schools, where adapting to new teaching and learning approaches with available ICTs is concerned. Aksela and Lundell (2008) in their study on the use of computers in South African schools argued that the problem is not always caused by the lack of resources, but by how teachers use the available educational tools in their teaching. In the same study, the researchers give evidence that teachers in schools with limited resources do not maximize the use of computers for pedagogical purposes. The critical issue, therefore, is if the usage provides quality education, or not, through the use of ICTs. The point is clear in what Lundell and his team is saying, that resources may not be the only inhibiting factor, but the know-how of the device. It has been proposed in other countries in this study (China, Australia and Nigeria) that teachers are crucial in the implementation of ICT, otherwise the whole process will fail.

Lundell goes on to say even though some schools do encounter financial constraints, they do rise above that and implement ICT even if one does not know the extent to which they use them. Davies (2002) made a reference to Oppenheimer (1997:61) where he argues that schooling is not only about information but making learners "…think about information. It's about understanding and knowledge and wisdom".

It is crucial that learners are provided with opportunities to interact with the information to an extent that they are able to manipulate and use it to come up with strategies that are critical in addressing individual or societal challenges. Such an experience demands that the teacher create a learning

environment that promotes and equips learners with advanced thinking capabilities through the effective use of appropriate digital tools. Access without an intention to improve the status of the user, deems the instrument redundant. This, in other words, means that ICT may not be the `ready-made stuff' for learners' consumption, but must be manipulated such that they eventually come up with strategies to address certain critical issues. This will not happen naturally but will require skilled teachers to take the learners through the rigorous paces of ICT learning. This study agrees with this notion, as it pronounced that the intervention of all stakeholders is imperative to ease the teachers' burden of dealing with learners who are IT crazy, thereby compromising their school work.

The South African Teacher Development Framework (DoE, 2007) presents five teacher capacity levels to illustrate the development of ICT usage in subject teaching. They are innovation, appropriation, adaptation, adoption and entry level. Without dwelling much on these capacity levels, it is sufficient to say that the Framework describes innovation at the highest level of the hierarchy and the entry level is at the base of the hierarchy. According to these capacity levels, most teachers are at entry and adoption levels. The lowest two levels in the framework denote teacher abilities that are restricted to using ICTs for limited generation or interaction with knowledge. The reasons range from the teacher not having skills to tailor-made learning activities that will promote advancement in learning abilities, with the new teaching tools, or simply not having appropriate knowledge to integrate them into their teaching.

As the levels ascend, teachers are able to adapt ICT use to suit learner educational needs, and thus be able to extend their thinking skills. Policy development on ICTs in education dates back to 1995, with the establishment of the Technology Enhanced Learning Initiatives (TELI) which was followed by the Feasibility Study for the Establishment of a Dedicated Educational Channel. In 2001, the National Department of Education and the Department of Communication jointly released a Strategy for Information and Communication Technology in Education, which is believed to have laid the basis for the e-Education White Paper adopted in 2004. The goal of the policy is that every learner in the primary and secondary school sectors should be ICT-capable by 2013. To achieve this, schools are expected to be developed into e-schools, consisting of a community of both teachers and learners. E-schools are further defined as having:

- ✓ Learners who utilize ICTs to enhance learning;
- ✓ Qualified and competent leaders who use ICTs for planning, management, and administration;
- ✓ Qualified and competent teachers who use ICTs to enhance teaching and learning;
- ✓ Access to ICT resources that support curriculum delivery, and
- ✓ Connections to ICT infrastructure.

In spite of all these suggestions, the researcher is still convinced that unless the content of the devices by learners is monitored, these technological devices are likely to be abused and that will result in poor learner academic performance. Eze, Adu, and Ruramayi (2013) opine that the integration of ICTs in education offers several benefits: sharing of resources and learning environments as well as the promotion of collaborative learning and a general move towards greater learner autonomy.

However, technology integration is more than supplying computers and an internet connection; it involves the infusion of learning activities with the pedagogically-informed use of ICT tools. Mereku and Mereku (2015) attempted to develop a guideline for mathematics teachers to infuse ICT into pedagogy.

This is precisely what the study is advocating - to infuse pedagogic material into curriculum content and somehow into the devices. There is evidence that in South Africa most teachers are still not able to integrate ICT into their classroom teaching which may render the devices futile. Studies show that few teachers have effectively integrated ICTs in the classroom, Nkula and Krauss (2014).

Accordingly, studies indicate that ICTs are being used in the classroom; however, more in-depth knowledge is required towards understanding the categories of technologies used, and how this facilitates pedagogy and content knowledge. Previous studies point to a lack of self-efficacy of teachers, Nkula and Krauss (2014), and misconceptions as to why teachers are not engaging with ICTs in the classroom. Tamim, Borokhovski, Pickup, and Bernard (2015) assert that 'there is a misconception that by simply putting this technology in the hands of students, educational access issues will be resolved, and educational transformation will occur'. There are several factors that negate the use of ICTs in the classroom; these include lack of time, Assan and Thomas (2012); lack of clarity regarding the e-Education policy, Vandeyar (2015), lack of support, both in terms of infrastructure and policy, Vandeyar (2015) and the lack of skills, Msila (2015). However, one of the major challenges, as identified by Tamim et al, is that the focus is more on the technical aspects, rather than the pedagogical and theoretical frameworks.

As much as South Africa is doing its best to cope with 21st century technology, it is still trailing behind with ICT integration in the classroom due to many factors, which are also evident in other countries. Alignment of ICT to curriculum content is hard to manage. The Department of Basic Education, RSA (2004) white paper on e-education spells out the framework, objectives, funding, resources and implementation strategies for ICT integration in the classroom, at a very basic level.

The policy indicates that e-Learning may involve the use of the 'Internet, CD-ROM, software, other media and telecommunications' (Department of Basic Education, RSA, 2004, p. 15) while 'online learning refers more specifically to the use of the Internet and associated web-based applications as the delivery medium for the learning experience' (Department of Basic Education, RSA, 2004, p. 15). Evidently, the

policy does not directly identify the categories of technologies that would be used in the curriculum. Vandeyar (2015) indicates that practical enforcement of the e-Education policy is clearly lacking.

In a study by Ndlovu (2016), which considered the pedagogical integration of ICTs involving seven teachers, they found that inconsistencies in the understanding of policies may be a factor in the slow uptake of ICTs in the classroom. From Koehler and Mishra (2009)'s perspective, the successful integration of ICT in the classroom must consider three components: content knowledge (i.e. knowledge of subject matter), pedagogical knowledge (i.e. knowledge of teaching and learning praxis) and technological knowledge (i.e. technical skills). This perspective of Koehler and Mishra is very important because this study is all about the latter aspect mentioned (technical skills). They talk about Technological Pedagogical Content Knowledge (TPACK) which is the integration of all these aspects, within the curriculum structure. This is precisely what this study is advocating, so that teachers are not left behind since learners seem to catch up easily with this technology. Content must therefore be ensured to be pedagogically oriented.

2.15 IMPACT OF ICT IN EDUCATION

There is a slow transition in South African schools from the traditional teaching and learning methods to ICT based learning. Some researchers have mentioned that in the past there has been poor academic learner performance in schools which resulted in a very disjointed transition to higher learning, Pitan and Muller (2019) and also Gayathri and Meenakshi (2013) attest to what Pitan and Muller alluded to, in terms of poor performance, by mentioning the issue of under-qualified teachers, lack of libraries, inadequate text-books and general lack of motivation on the side of teachers and learners.

Awolusi and Atiku (2019) also concur with the other scholars mentioned above on the persistent low performance in academic achievement. It is worth mentioning that the above scholars were looking into the situation before South Africa got committed into online teaching and learning. It is for that reason that Asrar-ul-Haq and Kuchinke (2016) and Awolusi (2013) had another viewpoint: that ICT integration would have a great positive impact on changing the status quo for the better. Meenakshi, (2013) also agreed with the ICT integration in schools as he believed that it would help achieve the highest educational standards. This implies that once the system in education is fully ICT-oriented, we will have learners who are more receptive to the digital world, which is congruent with the global trend.

Rampersad (2012) drew our attention to two learning theories - behaviorism and constructivism. According to Rampersad, the former is more teacher-centered and the latter is learner-centered. Constructivism enables learners to think outside the box, be creative, learn from the experiences of the world and be active to create new knowledge. From what has been said above, one can confidently say that through ICT integration into teaching, learners can be able to transform theory into practice.

Whether a country is technologically advanced or under-developed will determine learner academic performance.

There is evidence from some countries that some schools have embedded ICT into the curriculum and demonstrated high levels of effective and appropriate ICT use to support teaching and learning across a wide range of subject areas. However, in other countries, schools are in the early phase of adopting ICT, characterized by important enhancements of the learning process, some developments of e-learning (ICT-enabled learning), but without any profound improvements in learning and teaching.

The impact of ICT on teaching and learning globally necessitates its integration in the classroom. In school and classroom settings, teachers and school administrators are attempting to find the best ways to harness ICT technology to support their teaching and students' success. However, accomplishments that are convincingly the result of the direct causal impact of ICT use, are not always easily identifiable, (Kang, Heo, & Kim, 2011).

The full impact of ICT use in schools may not be very obvious; various researchers have come up with conflicting conclusions on ICT integration in teaching and learning. In contrast, Trucano (2005) reviews a series of studies on ICT's impact on schools, and concludes that the impact of ICT use on learning outcomes is unclear. Moreover, M. J. Cox and Marshall (2007) point out that ICT studies and indicators do not demonstrate solid effects. Aristovnik (2012) explores what Empirica (2006) said about the access and use of ICT in European schools in 2006. It presents information for 25 EU member states, Norway and Iceland, but does not look into student results, so it is impossible to study this important aspect of ICT impact.

Provision of computers is considered a significant approach for promoting technology in high schools, Simon & Ngololo (2015). There is a clear case for using ICT to enhance the computer skills of students. There is neither a strong, well-developed theoretical case, nor much empirical evidence supporting the expected benefits accruing from the use of ICT in schools, since different studies find mixed results, Kirkpatrick and Cuban (1998), as mentioned by Aristovnik. Aristovnik further alleges that while Becta (2002) and Kulik (2003), Aristovnik (2012) finds a positive effect on the use of ICT on educational attainment. Research by Goolsbee and Guryan (2006) find no real positive effect of the use of ICT on educational results, once other factors, such as school characteristics or socio-economic background, are considered. These are mixed conclusions from different researchers; the researcher still believes that whether devices are well-used or abused, results are bound to come.

In the case of South Africa, Williamson (2004) and Carnoy (2004) averred that designers of curriculum must ensure that teachers are also part of the process, because they are the actual driving force for this

ICT campaign. This shortage of skills issue was getting into the nerves of teacher because they were being excluded from the process yet expected to drive it through, “learning in schools by whatever means without improving teachers’ knowledge of subject matter including ICT skills”.

Teachers themselves need to have well-developed higher order thinking skills acquired during their training, before they venture into developing learners’ thinking skills. He states that teachers are unable to develop higher-order thinking skills in learners, when they themselves have not acquired these skills. Link this statement with this disconcerting observation by Williamson (2004) that most educational design practices, from usability through to co-operative inquiry, are conducted in the absence of teachers. Moreover, he laments the fact that this behavior is improper, as it is the teachers who have to incorporate computer technology into their teaching plans. By precluding teachers from the designing of educational technology, there is a chance of developing computer innovations that will fall outside any pedagogical requirements.

The researcher has mentioned this several times in this writing that teachers should be part of the pedagogical content for their specific subjects so that ICT addresses the relevant content. Koc (2005) found that the lack of pedagogy in computer training renders teachers inefficient regarding any initial educator training. While ICT in education is trending, there are still challenges in the South African education schooling system. Naicker (2010) concurred with those who fought for the inclusion of teachers in ICT related matters. He averred that education in South Africa, especially in black communities, is inadequately provided with resources and any relevant pedagogy, and some teachers are still imparting knowledge through an outdated method of ‘chalk and talk’ mode. There is a suggestion that when teachers empower learners to use computers, the emphasis moves away from the idea of rote memorization of facts towards learning as a process of knowledge creation (Vekiri, 2010).

According to Karunaratne, Peiris, Hansson, and ICT (2018), the lack of resources is a potential negative contextual factor hindering ICT usage in some classrooms. Furthermore, Khan (2020) contended that using ICT in teaching and learning has the potential to improve learner achievement, especially in areas with low socio-economic status, with learner achievement more likely below expectations. The researcher agrees with these scholars in that many other writers in this chapter are unanimous that since the 21st century is characterized by technological devices, learners are bound to adopt the usage of such gadgets to their benefit. Padayachee (2017) argued that lack of ICT resources can potentially hamper the kind of education learners receive, with implications for their performance. This is self-explanatory in that indeed ICTs, to a larger degree, enhance learner academic performance which is the main focus of this study. In the same vein, Hodgson (2018) argued that the availability of computers positively influences the way learners learn. This is corroborated by Pohjolainen, Nykänen, Venho, Kangas, and Education

(2018) who opine that ICT in the classroom has positive effects on learners' learning. Computers assist learners' research assignments and school projects and can potentially change the way they see and learn critical subjects like Mathematics, Hegedus and Moreno-Armella (2020). All these observations point to one thing which is the basis for this study: that ICT contributes immensely to positive learner academic performance.

2.16 SUMMARY

The literature reviewed above has caused the researcher to arrive at solid conclusions about the influence of 21st century technology which, depending on the circumstantial use by learners, may yield positive or negative effects. There has been great concern among concerned individuals in education and parents about the growing abuse of devices by learners, which in this chapter, the researcher has repeatedly expressed boils down to proper guidance by either teachers or parents.

Facebook with its effect on pedagogy specifically among learners, according to Ossiannilsson and Creelman (2011) has major influence on learner academic performance. On this basis, curriculum developers have been examining the learning environments and different activities with the aim of internationalizing learning and teaching in the way that will recognize and respect and also usefully engage the ethnic and cultural diversity of students.

Social media communication and collaborative technologies' capabilities, such as threaded bulletin boards are used to support internationalized teaching and learning and have been found to be effective in this case, Leask (2011).The value of interactive social media technologies in high institutions of learning is now recognized in the way that teaching and learning strategies is in an increasingly globalized process, Gray, Annabell, and Kennedy (2010). One of the most commonly cited benefits of social media by scholars is their ability to facilitate collaborative learning and communication among peers and with people outside academia, Collins, Shiffman, and Rock (2016). Another frequently reported advantage of social networking is its remarkable ability to facilitate information distribution. Among the examples are blogging tools which are used by many students to disseminate information within their area, amongst their peers and also to everyone globally (Bukvova, 2010).

The primary advantage of choosing social networking to aid learning and teaching can only be fully achieved with the existence of a clear awareness that stipulates the dos and don'ts so as to ensure that whatever students engage in are aimed at gaining the educational pros of the social media, Rutherford (2010). In most cases the prospective benefits have been achieved where institutions of higher learning regulate, to a certain level, the use of social media, Kear (2011). However, due to the rapid growth of the usage of social media, many institutions of learning have not created strategies for using social media;

this is dangerous and should be revisited, Fenwick (2016). Interestingly, this study is all about using social media with caution as Fenwick suggests, hence the researcher agrees with this view.

Basically, this study and particularly this chapter were about the relationship between learner academic performance, interactivity with peers and interactivity with the teacher. Integrating social media for both entertainment and learning is common among students in higher levels of education. College students use various social media applications to an extent that it is now an indispensable part of their everyday life for personal and learning purposes, Gikas and Grant (2013). Mobile technologies and smart phones interweave social media in their palms and at their simple and customized command, Halkier, James, Dahlström, and Manniche (2012). The following chapters will test the hypothesis of the researcher by physically engaging the respondents (teachers) via questionnaires. Without pre-empting the outcomes, it would be interesting to know what respondents say in the questionnaire in relation to literature review collection done in this chapter thus far; hence this study adopted a quantitative approach of data collection.

In conclusion, even though this study does not focus on COVID 19 per se, it is important to recognize the role of technology in ensuring that life continues in spite of the pandemic, especially in education. The emergence of the Corona Virus disease (COVID-19) has led the world to an unprecedented public health crisis. Emergency protocols were implemented to control the spread of the virus which resulted in restrictions on all non-essential public movements, Saha, Barman, and Chouhan (2020). With the closure of educational institutions, the need for a rapid transition from physical learning to the digital sphere of learning emerged, Kapasia et al. (2020). Online learning has been observed as a possible alternative to conventional learning, Adnan and Anwar (2020). However, according to a meta-analysis on e-learning, it is reported that online learning is better than nothing and similar to conventional learning. To improve the e-learning experience, the education institutions are required to comply with the guidelines and recommendations by government agencies, while keeping students encouraged to continue learning remotely in this tough era of pandemic.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. INTRODUCTION

The previous chapter dealt with the literature review where the researcher was curious to know what other scholars have to say about the influence of 21st century technology, in whatever institution or sector. However, the main focus was on education, as the underlying objective of this study is learner performance as it may have been influenced by good or bad use of the gadgets. This chapter focused on the actual methodology used in conducting the research.

The purpose of this quantitative study was to investigate the influence online communication in both rural and urban areas had on learner academic performance. This chapter dealt with research design, delimitation of the study, population and sample, sampling procedure, research instrument, administration of the instrument, data collection and analysis. In a nutshell this chapter showed the practical nature of the study in a bid to address the projected research problems. For a study of this nature, the researcher felt that questionnaires would be the most ideal instrument. The research methodology adopted was a quantitative approach which facilitated a survey to investigate the impact to which learners use these mobile technologies in the classroom environments. To achieve this, a self-designed questionnaire was used for the respondents. Why a quantitative method for this study? Creswell (2014) opined that in quantitative methods the researcher poses specific questions or hypotheses, measures variables to facilitate the finding of answers, and uses statistical analysis to obtain information in order to answer questions, hence the quantitative method.

3.2 RESEARCH PARADIGM

For this study the positivism paradigm was adopted since it entails quantitative data collection. Questionnaires were designed for the respondents to fill in and subsequent data analysis followed.

3.3 RESEARCH DESIGN

For purposes of this study, the quantitative research design will be used which will have questionnaire filled in by respondents. The aim of this design is to discover how many people (in numbers) think alike and those who do not think like them and make a quantitative analysis.

This entailed a framework of methods and techniques by the researcher to combine various components of research in a reasonably logical manner to resolve a research problem. It is a basic plan of how the research will be conducted, how the collected information will be analyzed and how findings will be communicated. The study considered the explanation by Keller, Aaker, Jones and Creswell which was suitable. Keller and Aaker (1998) explain a research design as a detailed plant used to guide a research study towards its objectives. Polit and Beck (2008), Gratton and Jones (2014) and Creswell (2012) state

that a research design is a general plan for enhancing the researcher's holistic plan in order to improve the research's internal and external validity. So, this study, in line with what these scholars posit, adopted a quantitative approach. The reason is that data were collected in the form of numbers and were used in statistical types of data analysis. Data were to be collected from 20 selected secondary schools within King Cetshwayo district. Those 20 secondary schools comprised 10 from rural, and 10 from urban areas, in order to find out the real impact of online communication on learner academic performance. Teachers were respondents in this research; teachers included 3 Head of Departments (HODs) and 6 PL1 teachers from each school.

3.4 DELIMITATION OF THE STUDY

The study was limited to teachers at the secondary school level (as respondents) and as per the Revised National Curriculum and Assessment Statement Grade R-9 and the National Curriculum Statement Grades 10-12 (2002) (CAPS) of South Africa. The study focused on learner performance in Grades 10-12. This delimitation enabled the researcher to keep focus on the intended objectives of the study. The research study aimed to investigate the influence of online technology on Grade 12 learners' academic performance in King Cetshwayo district. The sample population was teachers of High schools and the selected circuits within the targeted district were Ngwelezane and Esikhalenisenkosi. The schools were 10 from urban and 10 from rural location. Those teachers comprised of 2 School Management Teams (SMTs) from each selected school (3X20 = 60) and 6 Post Level 1 (PL1) from each school 6X20 = 120 respondents for the study. So, in all, 180 questionnaires were dispatched to selected respondents. The two circuits were selected because Ngwelezane circuit has schools in Empangeni town, where the study also intended to investigate the performance of urban situated schools.

3.5 POPULATION AND SAMPLE

3.5.1 POPULATION

The population for this study was 20 rural and urban school teachers within King Cetshwayo district. From this population the actual target population was the school management teams (SMTs) and posts level 1 teacher (PL1) because they are the ones with hands-on information on how learners utilize their devices during teaching and learning. This was in line with what Kumar (2011) asserts: that target population includes the entire population from which the participants (in this study respondent) of the study are drawn and used for generalization.

3.5.2 SAMPLING

Cohen, Manion, and Morrison (2017) opine that researchers need to obtain data from smaller groups or subset of the population in such a way that the knowledge acquired is representative of the total population. In this study, samples were drawn from 20 secondary schools from King Cetshwayo district in

this fashion: Quantitative design approach was used. Data was collected from the selected 20 secondary schools in King Cetshwayo district which comprises 10 urban and 10 rural based respectively.

The respondents were SMT teachers and PLI teachers. The design was as follows: on the side of SMT it was 3 Heads of Department (HOD) from each of the 10 secondary schools on the rural and urban schools, in total, 20 secondary schools and 180 respondents. The total respondents from quantitative data were 180 teachers considering that there were 6 PL1 teachers and 3 heads of department sampled from each of the selected secondary schools. There was no specific criterion to select schools for this study, but the geographic allocation would determine whether the school is rural or urban for this study.

This ensured representativeness of population demographics. Furthermore, it is important to mention that random sampling is a core principle of probability sampling, so using this sampling enabled the researcher to estimate how closely the sample represents the larger population from which it was drawn.

This ensured the validity and reliability of the research. To conduct this sampling type, a list of schools was requested from the circuit office which showed their urban or rural geographical location. Subsequently, schools were allocated numbers; those situated in rural areas were allocated numbers like 1-20 and the same occurred with urban located schools, then systemic sampling came out with 10 urban and 10 rural to make 20 selected schools as mentioned in the research design of this writing.

Also, the quintile level of the school was taken into cognizance because the researcher wanted to investigate the influence that well-developed schools (quintile 5) have on learner academic performance as against poorly developed schools (quintile 1).

The sampling structure looked as shown below:

URBAN SCHOOLS	**RURAL SCHOOLS**	**TOTALS**
SMTs **10**	**PL1** **10**	 **20**
Number of urban schools	Number of rural schools	Total number of schools
3X10 Number of SMTs in urban areas	**3X10** Number of SMTs in rural areas	**60** Total number SMT Respondents

PL1 **6X10** Number of PL 1 teachers in urban areas	**PL1** **6X1O** Number of PL 1 teachers in rural areas	**120** Total number of PL 1 teachers
		180 Total number of respondent excluding number of schools

3.5.3 SAMPLING PROCESS

The sampling process used in this study was intended to ensure that each element in the sampling frame has an equal and independent chance of being selected for the sample through random selection. The process required that a random number is generated which systematically picked up elements eligible for sample selection. The system used was close to probability sampling because the intention was to ascertain that each unit in a population had a chance of being selected. This was without any bias on behalf of the researcher as members were randomly selected.

There is also systemic sampling which is a quick and convenient way of selecting individuals from a sample frame, but which can result in a Blanche, Blanche, Durrheim, and Painter (2006). We calculate a fixed distance between elements and then systematically select every n-th on the list to be included in our sample. For the study to be systematic in sampling, a list of schools in Esikhalenisenkosi circuit, which falls within King Cetshwayo district, was obtained from the circuit office. Another list from Ngwelezane circuit was obtained to work on rural and urban schools from both circuits. These two circuits were ideal for this study because Ngwelezane circuit has more schools that are in town, compared to Esikhalenisenkosi, which was a good sample for urban schools for this particular study. The fixed distance is called the sampling interval and it makes calculation easy. The good thing about this process is that every element of the population stands an equal chance of being selected, Cocks and Torgerson (2013). So, through a simple random sample, the researcher developed an accurate sampling frame. Systematic sampling ensured that there was a random selection of elements using sampling intervals (every nth element was selected).

3.6 PILOT STUDY

This was undertaken before the actual research commenced as it serves as a preliminary trial for the research. This was taken from what O'Brien, Mortimer, Singleton, and Meltzer (2003) opine: that pilot study is a trying out on a small number of persons having characteristics similar to those of the target group of respondents. Likewise, in this study a pilot study was adopted in a small-scale version of the anticipated study, with a restricted sample of subjects as opined by Vogel and Draper-Rodi (2017): if the researcher adopts a questionnaire, a pilot study is very necessary. Through it, the researcher can detect ambiguity, poor instructions and responses that are not in line with the projected objectives of the study before they reach the targeted respondents.

The pilot project was treated with all the formalities it deserved, because it served as a springboard for the major study, so the responses of the respondents received the seriousness and attention as deserved by the actual questionnaires of the study. Moreover, assistants were used so that they could act as co-researchers for the study. This is a very crucial stage of the research as Kumar (2014) opined that it is a trial of the investigation, but conducted on a small-scale to determine whether the research design and methodology are effective.

3.7 RESEARCH INSTRUMENT

This study used hand-delivered questionnaires to gather data from sampled respondents. Arrangements were made with targeted schools for delivery and collection of questionnaires. The questionnaire was an ideal instrument to get quantitative data which was aligned to research questions. Also, questionnaires were found to be efficient tools for surveying large samples of respondents within a short period of time. The instrument comprised a variety of questions which ranged from closed to open-ended questions, with a view to get into the gist of the problem concern of this study.

As mentioned above, this study adopted questionnaires because they enabled the researcher to collect a larger amount of information from a large number of people in a short period of time. Questionnaires are the most cost-effective way of collecting information. The validity and reliability of questionnaires is not easily affected. The questionnaires were an ideal method because the results of the questionnaires can usually be quickly and easily quantified by either a researcher, or through the use of a software package.

Questionnaires can also be analyzed more scientifically and objectively than other forms of research, Schreuder and Coetzee (2011). The quantitative approach employed by the researcher will help enhance obtaining appropriate statistical results which will paint a vivid picture of learners' and teachers` perceptions of the use of the 21st century gadgets.

3.7.1 Questionnaires

The researcher's questionnaires comprised three sections, each with a different set of questions, but all aimed at the projected objectives of the study. Section A comprised background information of the respondents. Section B comprised of statements with Strongly Agree (SA), Agree (A), Strongly Disagree (SD), Disagree (D) and Undecided (U). Section C comprised open-ended questions to enable respondents to freely express themselves.

Some advantages of using questionnaires as research instruments have been alluded to in this study. Some scholars have also concurred that indeed questionnaires are relevant instruments for research of this nature. Creswell et al., (2011); Cohen, Manion & Morrison, (2000) have tabulated some more advantages of using questionnaires in a quantitative research study:

- A questionnaire is economical as hundreds can be administered at one time by a single person.
- A questionnaire is impersonal and anonymous, thus authentic.
- There is no halo effect in a questionnaire.
- The presence of the investigator is not necessary, which promotes more honest responses and freedom.
- A questionnaire is more suited to gathering reliable data involving people's feelings, attitudes and opinions.
- A questionnaire may be easily summarized and analyzed when using the relevant instrument.

The advantages of using a questionnaire in a research study cannot be over-exaggerated because it also has its own drawbacks as observed by (Ngulube, 2013):

- Low response rates can occur, especially when less educated respondents and older people are involved.
- There may be no assurance that the addressee was actually the one who responded to the questions.
- There is no assurance that the respondents understood the questions.
- It does not give room to clarify uncertainties.
- There is a high risk of the loss of questionnaires in transit.

3.7.2 Administration of the questionnaires

Permission to conduct the study was obtained from Circuit offices of King Cetshwayo district officials and some district officials were respondents of the research who showed great dedication. The questionnaires were administered with the assistance of research assistants to ascertain speedy management of the whole task. The questionnaires comprised three sections, namely, Section A, with background enquiring questions. Section B with statement questions comprising Strongly Agree (SA), Agree (A), Strongly Disagree (SD), Disagree (D) and Undecided (U). Section C comprised open-ended questions where respondents objectively aired their views. In sections A and B respondents were instructed to make a cross on their chosen options, and in section C they responded in full sentences.

The research assistants helped administer the questionnaires to the respondents. The research assistants served as the second helping hand where some explanations and the rationale of the study were needed. The respondents were assured that the data collected would be treated with confidentiality. To encourage honesty in the survey responses, the respondents were instructed not to write their names on the questionnaire. Respondents were allowed to take the questionnaires home so that they had ample time to offer genuine responses, especially the open-ended questions. Questionnaires were collected from the same venues where they were delivered and counted, as they were being collected to ascertain that they all returned.

3.8 DATA COLLECTION

Data was collected using the questionnaires, selected schools were visited, and sampled teachers were addressed on what would be expected of them as respondents. The researcher had visited all 20 selected schools on days of appointments to distribute and also to collect questionnaires with those who were assisting. Honest responses were stressed; they were allowed to take questionnaires with them so that they could get sufficient time to respond to questions. A date for the collection was unanimously agreed with all teachers selected. Subsequent analysis followed after the questionnaires had been collected to thoroughly check responses as will be seen in Chapter 4.

3.9 VALIDITY AND RELIABILITY

3.9.1 Validity

This is the degree to which a measurer does what it is intended to do. Carmines and Zeller (1979) opine that the instrument should be usable for the particular purpose for which it was designed. In other words, that the instrument has measured one item correctly does not mean it can then be used for another item, because the latter item is not what it was intended for. Heale and Twycross (2015) hold that in research; consideration must be given not only to the results of the study but also the rigor of the research. This is the extent to which the researcher(s) worked to enhance the quality of the study.

This study was aligned to Heale and Twycross types of validity, namely, content validity (the extent to which a research instrument accurately measures all aspects of a construct). Construct validity (the extent to which a research instrument measures the intended construct) and criterion validity which is the extent to which a research instrument is related to other instruments that measure the same variables. The researcher found these types of validity to be relevant for this study.

3.9.2 Reliability

This refers to the dependability of a measurement instrument; that is, the extent to which the instrument yields the same results on repeated trials. This calls for the consistency of the instrument. Heale and Twycross posit that although it may not get the exact calculation of reliability, an estimate of reliability can be achieved through different measures. They hold that in reliability, stability is tested using test-retest method where an instrument is given to the same participants more than once under similar circumstances. This study strived to yield higher reliability in order to be credible.

3.9.3 Ethical considerations

Israel and Hay (2006) state that in South Africa most leading universities require that all social science research involving human participants be reviewed by an independent research ethics committee (REC). This is for credibility and authenticity purposes of the study. Likewise, the researcher in this study respected the rights of others who are directly or indirectly affected by the research. Rights to privacy and confidentiality, right to anonymity, protection from harm, dignity, safety and well-being of others were all considered. The study considered and was sensitive to different cultures, languages, beliefs, perceptions and customs of persons who participate in or are affected by the research.

The researcher ensured that the research study was relevant to the board of legal and developmental needs of the country and to the individual needs of those who may be affected by his research. The study complied with the copyright requirements and necessary permission was sought, where required.

Information given by respondents was treated with utmost anonymity and confidentiality. The respondents were assured that information would be used for the purpose of the study only. No other person will have access to the information except the intended recipients.

3.9.4 The Right to Human Dignity

The respondents were not compelled to be part of the study in any form, the purpose of the research was clearly explained to them and they were not compelled to fill in the questionnaire in front of the researcher and assistants. Respondents were given the opportunity to express their feelings and none expressed any ill-feelings.

The right to human dignity in this research study was characterized by, among other things, the protection of individual and institutional confidentiality such that no participant is wronged in any way during their engagement with questionnaires as alluded to by Israel and Hay (2006). The sampling method adopted for this study ascertained that its respondents received fair justice in the selection procedure.

The right to human dignity in this study embodied ethical considerations in that it strived for transparency in all respects and for respondents to be aware that their being part of the study is purely voluntary and their input will be kept confidential while contributing immensely to the success of the study. The University of Zululand's ethical guidelines and policies regarding plagiarism and confidentiality were adhered to in this study.

3.9.5 Data analysis

The research methodology which was used to analyze data was Statistical Package for Social Sciences (SPSS). Demographic data was analyzed and continued to open-ended questions. The system proved to be very reliable.

3.10 CONCLUSION

Based on what this chapter endeavored to accomplish as alluded to in the introduction through this research, the researcher is confident that the research was well-designed, and the methodology adopted was relevant to the study. It was proven beyond any reasonable doubt that online technology does influence learners' academic performance as the research objectives of the study showed.

It was also interesting and encouraging working with school supervisors who were very co-operative and that ensured that the study was a huge success and the conclusion of the research would contribute to positive learner academic performance in the midst of these modern technologies. The quantitative method proved to be ideal for the study because it involved statistical analysis to obtain information which proved to be valid, reliable and credible for the study and for general consumption by the educational fraternity.

CHAPTER 4

PRESENTATION AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

In Chapter 3 the focus was methodology as was adopted in preparation for the actual research activity. In this chapter the results of this quantitative method study are presented. This chapter focuses on reporting, interpreting and discussing the results in line with the research objectives. In this mixed methods study, the quantitative results will be presented first, and then the qualitative results, last.

The Statistical Package for Social Sciences (SPSS) version 26 was used to analyse quantitative data. The chapter begins with the analysis of demographic data, and then goes to the actual questions in section B and lastly an analysis of the open-ended questions. The researcher wishes to clarify to the reader that the open-ended section analysis does not categorize this study to be based on a mixed method but is aimed at getting respondents' views on the influence of 21st century technology in learner academic performance as people who interact daily with learners.

4.2 Demographic information

In this study, demographics of the respondents are very important as it gives the reader a clear picture of the teachers who participated. The distribution of these demographic characteristics will be analysed first. A total of 180 questionnaires was distributed to respondents. Out of the 180 questionnaires distributed, 144 were collected and valid, representing an impressive 80% return rate.

4.2.1 Gender

In this study, the majority of the respondents who participated were males. The distribution of participants' gender in this study is shown in Figure 4.1. It can be seen that 51% of the respondents was male while 49% was female.

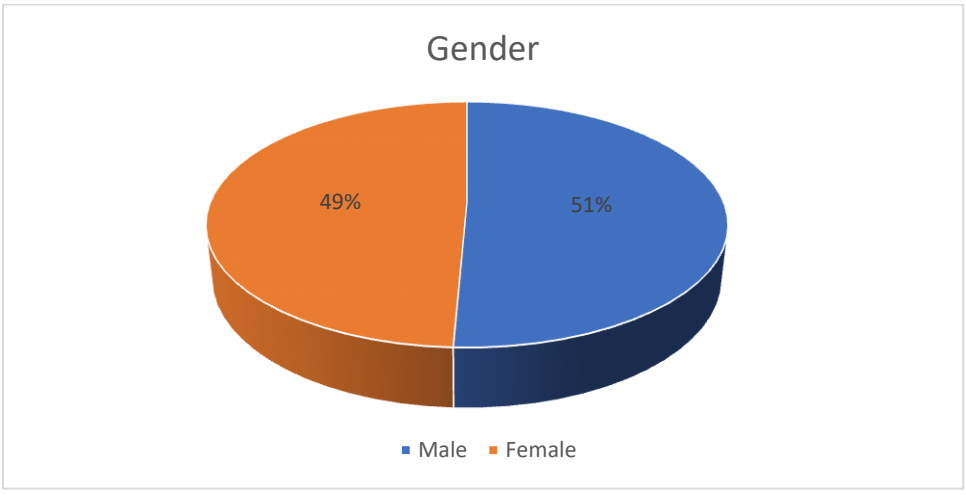


Figure 4.1: Gender

4.2.2 Age

The ages of respondents were categorised into nine categories. The age distribution of participants is shown in Figure 4.2. The smallest group were 20 to 25 years of age and the oldest being over 60 years of age. Nine respondents were between 20 to 25 years of age. The respondents who were between 26 and 30 years old were 10. Of the 144 respondents, 13 were between 31 and 35 years old. Respondents who were between 36 and 40 years old were 19. The age categories which had the highest respondents of 32 were 41 to 45 years old. About 30 respondents were between 46 and 50 years old. It can be seen that 20 respondents were between 51 and 55 years of age. Eight respondents were between 56 to 60 years old. The number of respondents who were above 60 years of age were three.

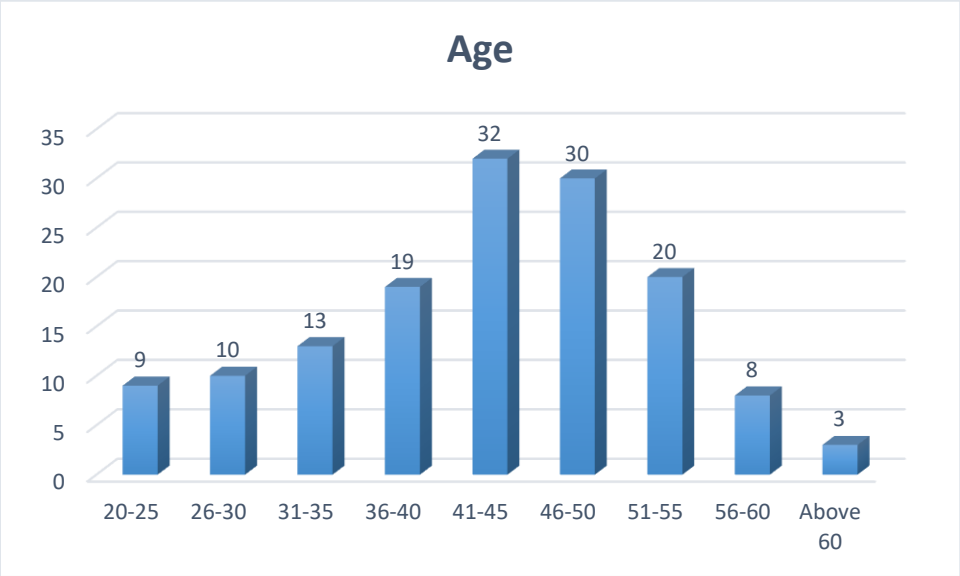


Figure 4.2: Age

4.2.3 Academic qualifications

Academic qualification has a lot of significance when it comes to learners' academic performance. In this study the participants were asked to indicate their highest qualification attained. The results were captured in Table 4.1.

Table 4.1 Academic qualification (N=144)

Academic qualification	Frequency	Percent	Cumulative Percent
Matric	5	3.5	3.5
Diploma	14	9.7	13.2
Bachelor's Degree	47	32.6	45.8

Professional Degree	9	6.3	52.1
Degree and teacher`s certificate (PGCE)	17	11.8	63.9
Honors	49	34	97.9
Masters and above	3	2.1	100

The results showed that five (3.5%) respondents had a Matriculation certificate only. It can be seen that 14 (9.7%) respondents had a Diploma, while 47 (32.6%) had a Bachelor's Degree. The results in Table 4.1 show that 9 (6.3%) respondents had a Professional degree. A total of 17 (11.8%) respondents had a Degree and teacher's certificate (PGCE). The number of respondents with an Honours degree was 49 (34%). Only 3 respondents had at least a Master's degree.

4.2.4 Years of Experience

The respondents' years of experience plays a vital role in learners' performance. The results of respondents' years of experiences are presented in Table 4.2. The years of experience of participants are grouped into seven categories. The first category with 18 respondents, is 1 to 5 years of experience. The respondents with 6 to 10 years of experience were 21. Those with between 11 and 15 years of experience were 19. Most respondents (37) had between 16 to 20 years of experience. Twenty-four respondents had 21 to 25 years of experience. The number of respondents who had 26 to 30 years of experience were 16. Nine respondents reported that they had more than 30 years of experience.

Table 4.2: Years of experience (N=144)

Years of Experience	Frequency	Percent	Cumulative Percent
1-5	18	12.5	12.5
6-10	21	14.6	27.1
11-15	19	13.2	40.3
16-20	37	25.7	66
21-25	24	16.7	82.6
26-30	16	11.1	93.7
Above	9	6.3	100

4.2.5 Status

The respondents were asked to provide their status. There were asked to choose from educator, head of department (HOD), deputy principal, and principal. The results of respondents' status are shown in Figure 4.3.

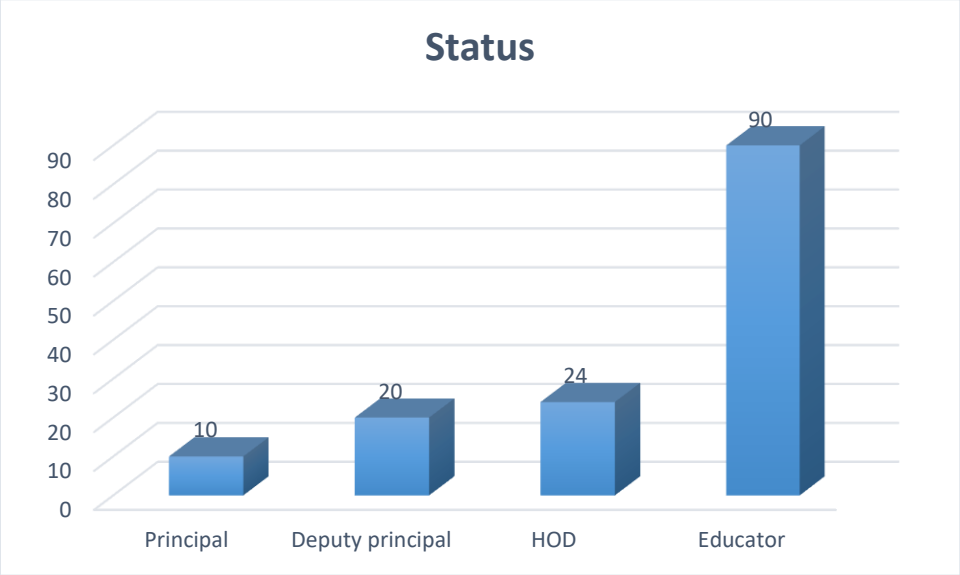


Figure 4.3: Status

It can be seen from Figure 4.3 that the majority (62%) of the respondents were teachers. The results also revealed that 17% of the respondents were HODs. Deputy Principals who took part in this study accounted for 14% of the total respondents. Only 7% of the respondents were principals.

4.3 Instrument Reliability

Reliability is the degree to which a test consistently measures whatever it is measuring, Hayes (1998). Initial internal consistency reliability was assessed using Cronbach's alpha, Cronbach (1984). This statistic provides an indication of the average correlation among all of the items that make up the scale, Pillant (2010). The value ranges from 0 to 1, the higher the value, the greater the reliability. Minimum acceptable reliability coefficients range from 0.70 to 0.80, Nunnally (1978), De Vellis (1991). Table 4.3 shows the results of Cronbach's alpha tests. The results show Cronbach's alpha value of the first section (The influence that 21st century technology has on learner academic performance) was 0.634, which is approximately 0.7. The results also showed that Cronbach's alpha test for the second (The roles that school stakeholders can play in improving learner academic performance) and third section (The strategies that DBE can use to control abuse of online gadgets by learners) were 0.7 and 0.8 respectively, indicating acceptable reliability.

Table 4.3: Cronbach's alpha test (N=144)

Section	Number of items	Cronbach's Alpha
The influence that 21st century technology has on learner academic performance	10	0.6
The roles that school stakeholders can play in improving learner academic performance.	10	0.7
The strategies that DBE can use to control abuse of online gadgets by learners.	10	0.8

4.4 Validity

Validity is the extent to which a scale is measuring what it is supposed to be measuring, Pallant (2010). In this study the Kaiser-Meyer-Olkin (KMO) measure and the Bartlett's Test of Sphericity were used to assess the validity of the scale. For a scale to have an acceptable validity, the KMO value should be 0.5 or above and Bartlett's Test of Sphericity value should be significant at 0.05 level or less. The results in Table 4.4 show that all the KMO values were greater than 0.5 and the Bartlett's Test of Sphericity value, significant (p = 0.000), indicating acceptable scale validity.

Table 4.4: Validity (N=144)

Section	Kaiser-Meyer-Olkin Measure	Bartlett's Test of Sphericity		
		Approx. Chi-Square	df	Sig.
The influence that 21st century technology has on learner academic performance	0.697	285.152	45	0.000
The roles that school stakeholders can play in improving learner academic performance.	0.704	277.131	45	0.000
The strategies that DBE can use to control abuse of	0.784	485.757	45	0.000

online gadgets by learners.				

4.5 TO DETERMINE FACTORS ON THE INFLUENCE OF 21ST CENTURY TECHNOLOGY ON GRADE 12 LEARNERS' ACADEMIC PERFORMANCES IN KING CETSHWAYO DISTRICT

In order to determine the influence of the 21st century technology on grade 12 learners' academic performances in King Cetshwayo district, respondents were asked to provide answers to ten questions. SPPS was used to analyse the data of these ten questions. The following subsection presents the results.

4.5.1 Modern technologies yield positive influence on learners' academic performance

The respondents were asked if they believe that modern technologies yield positive influence on learners' academic performance. The results are presented in Table 4.5. The majority of the respondents agreed that modern technologies yield positive influence on learner academic performance. It can be seen from Table 4.5 that 95.1% of respondents agreed that modern technologies yield positive influence on learner academic performance. The results in Table 4.5 also revealed that only 2.1% of the respondents were undecided. Only 2.8% of the respondents disagreed that modern technologies yield positive influence on learner academic performance.

Table 4.5: Modern technologies yield positive influence on learner academic performance (N=144)

	Frequency	Percent	Cumulative Percent
Strongly agree	89	61.8	61.8
Agree	48	33.3	95.1
Undecided	3	2.1	97.2
Disagree	1	0.7	97.9
Strongly disagree	3	2.1	100.0

4.5.2 Schools with sound technological infrastructure produce learners with better academic performance

The respondents were also asked if they believe that schools with sound technological infrastructure produce learners with better academic performance. The results are tabulated in Table 4.6.

Table 4.6: Schools with sound technological infrastructure produce learners with better academic performance (N=144)

	Frequency	Percent	Cumulative Percent
Strongly agree	73	50.7	50.7

Agree	63	43.8	94.4
Undecided	5	3.5	97.9
Disagree	3	2.1	100.0
Strongly disagree	0	0	100.0

The results revealed that most respondents (94.4%) believed schools with sound technological infrastructure produce learners with better academic performance. Five (3.5%) of the respondents were undecided. Only 2.1% of the respondents disagreed that schools with sound technological infrastructure produce learners with better academic performance.

4.5.3 Schools should encourage the use of modern technologies during lesson presentation for improved learner performance

The results of respondents' views on schools using modern technologies during lesson presentation for improved learner performance are shown in Table 4.7.

Table 4.7 Schools should encourage use of modern technologies during lesson presentation for improved learner performance (N=144)

	Frequency	Percent	Cumulative Percent
Strongly agree	97	67.4	67.4
Agree	45	31.3	98.6
Undecided	1	0.7	99.3
Disagree	1	0.7	100.0
Strongly disagree	0	0	100.0

It can be seen that 98.6% of the respondents agreed that schools should encourage the use of modern technologies during lesson presentation for improved learner performance. The results showed that almost all of the respondents who participated in this study believe that the use of technology during lesson presentation results in improved learners' performance. Only one respondent was undecided and another one disagreed that Schools should encourage the use of modern technologies during lesson presentation for improved learner performance.

4.5.4 Teachers must have access to gadgets of learners' gadgets to ensure they monitor academic content

The respondents were also asked if teachers should have access to gadgets of learners to ensure they contain academic content. The results are shown in Table 4.8. It can be seen in Table 4.8 that 84.7% of the respondents agreed that teachers should have access to learners' devices to ensure they contain academic content. However, 8.3% of the respondents were undecided and 7% disagreed. The results revealed that even though the majority of the respondents believe that teachers should have access to learners' devices, about 15.3% of the respondents did not agree.

Table 4.8: Teachers must have access to gadgets of learners to ensure they contain academic content (N=144)

	Frequency	Percent	Cumulative Percent
Strongly agree	64	44.4	44.4
Agree	58	40.3	84.7
Undecided	12	8.3	93.1
Disagree	9	6.3	99.3
Strongly disagree	1	0.7	100.0

4.5.5 Overuse of cell phones may result in learners becoming gadget slaves and yield poor academic performance

The respondents were also asked if they think that learners' overuse of cell phones may result in learners becoming gadget slaves and yield poor academic performance. The results are shown in Table 4.9.

Table 4.9: Over use of cell phones may result in learners becoming gadget slaves and yield poor academic performance (N=144)

	Frequency	Percent	Cumulative Percent
Strongly agree	58	40.3	40.3
Agree	60	41.7	81.9
Undecided	13	9.0	91.0
Disagree	11	7.6	98.6
Strongly disagree	2	1.4	100.0

The results in Table 4.9 indicate that 81.9% of the respondents agreed that overuse of cell phones may result in learners becoming gadget slaves and yield poor academic performance. Only 9% of the

respondents were undecided and other 9% disagreed. The results imply that the majority of respondents feel that overuse of cell phones may result in learners becoming gadget slaves and yield poor academic performance.

4.5.6 Some learners suffer from sleeplessness out of overuse of modern technological gadgets and this results in poor academic performance

The questionnaire required respondents to indicate if they believed that some learners suffer from sleeplessness out of overuse of modern technological gadgets and that this resulted in poor academic performance. The results of respondents' responses are tabulated in Table 4.10. The results revealed that 79.2% of the respondents agreed that some learners suffer from sleeplessness out of overuse of modern technological gadgets and this resulted in poor academic performance. About 13.9% of respondents were undecided, yet 7% disagreed that some learners suffer from sleeplessness out of overuse of modern technological gadgets and this resulted in poor academic performance. The results imply that most respondents believed that some learners suffer from sleeplessness out of overuse of modern technological gadgets and this resulted in poor academic performance. However, there is also a significant percentage of about 20.8% of the respondents who do not agree that some learners suffer from sleeplessness out of overuse of modern technological gadgets and this resulted in poor academic performance.

Table 4.10: Some learners suffer from sleeplessness out of overuse of modern technological gadgets (N=144)

	Frequency	Percent	Cumulative Percent
Strongly agree	51	35.4	35.4
Agree	63	43.6	79.2
Undecided	20	13.9	93.1
Disagree	9	6.3	99.3
Strongly disagree	1	0.7	100.0

4.5.7 Sound home technological background is essential for learners to perform well academically

The participants were also asked if they think that sound home technological background is essential for learners to perform well academically. The results of respondents' responses are shown in Table 4.11. It can be seen that 84.7 respondents agreed that a sound home technological background is essential for learners to perform well academically. About 6.3% were undecided and 9% of the respondents disagreed that a sound home technological background is essential for learners to perform well academically. The

results imply that the majority of respondents believed that a sound home technological background is essential for learners to perform well academically.

Table 4.11: Sound home technological background is essential for learners to perform well academically

	Frequency	Percent	Cumulative Percent
Strongly agree	70	48.6	48.6
Agree	52	36.1	84.7
Undecided	9	6.3	91.0
Disagree	12	8.3	99.3
Strongly disagree	1	0.7	100.0

4.5.8 The extent to which learners' academic performance depends largely on learners' use of online technology

The respondents were also asked to express their views on the extent to which learners' academic performance depends largely on learners' use of online technology. The results are shown in Table 4.12. It can be seen in Table 4.12 that 68.8% of the respondents agreed that learners' academic performance depends largely on learners' use of online technology. However, 10.4% were undecided and 20.9% of the respondents disagree that learners' performance depends on their use of online technology. The results imply, even though the majority of learners did not agree, that learners' performance depends on their use of online technology. A significant percentage of 31.2% did not agree.

Table 4.12: The extent to which learners' academic performance depends largely on learners' use of online technology (N = 144)

	Frequency	Percent	Cumulative Percent
Strongly agree	38	26.4	26.4
Agree	61	42.4	68.8
Undecided	15	10.4	79.2
Disagree	24	18.1	97.2
Strongly disagree	4	2.8	100

4.5.9 Learner`s academic performance is higher in urban schools because most learners use modern online technology

The respondents were asked if they believe that learners' academic performance is higher in urban schools because most learners use modern online technology. The results are shown in Table 4.13.

Table 4.13 Learners' academic performance is higher in urban schools because most learners use modern online technology (N = 144)

	Frequency	Percent	Cumulative Percent
Strongly agree	72.0	50.0	50.0
Agree	55.0	38.2	88.2
Undecided	6.0	4.2	92.4
Disagree	11.0	7.6	100.0
Strongly disagree	0.0	0.0	100.0

The results in Table 4.13 show that 88.2% of the respondents agreed learners' academic performance is higher in urban schools because most learners use modern online technology. About 4.2% of the respondents were undecided. The results also show that 7.6% of the respondents disagreed that learners' academic performance is higher in urban schools because most learners use modern online technology. The results imply that the majority of respondents believe that learners' academic performance is higher in urban schools because most learners use modern online technology.

4.5.10 Learners who spend less time on their gadgets, perform better academically because they dedicate their time to school-related activities

The questionnaire required respondents to provide their views on the statement that learners who spend less time on their gadgets perform better academically because they dedicate their time to school-related activities. The results in Table 4.14 show that 80.6% of the respondents agreed that learners who spend less time on their gadgets perform better academically because they dedicate their time to school-related activities. About 8.3% of the respondents were undecided while, 11.1% disagreed. The results imply that most of the respondents believe that learners who spend less time on their gadgets perform better academically because they dedicate their time to school-related activities.

Table 4.14: Learners who spend less time on their gadgets perform better academically because they dedicate their time to school-related activities (N = 144)

	Frequency	Percent	Cumulative Percent
Strongly agree	45.0	31.3	31.3
Agree	71.0	49.3	80.6
Undecided	12.0	8.3	88.9
Disagree	13.0	9.0	97.9
Strongly disagree	3.0	2.1	100.0

4.6 THE ROLES THAT SCHOOL STAKEHOLDERS CAN PLAY IN IMPROVING LEARNER ACADEMIC PERFORMANCE

To find the roles that school stakeholders can play in improving learners' academic performance, this research asked respondents to respond to 10 questions. The results of respondents are presented in the following subsections.

4.6.1 School authorities should take the lead in controlling the use of online gadgets by learners in schools

The respondents were asked if they think that the school authorities should take the lead in controlling the use of online gadgets by learners in schools. The results are presented in Figure 4.4.

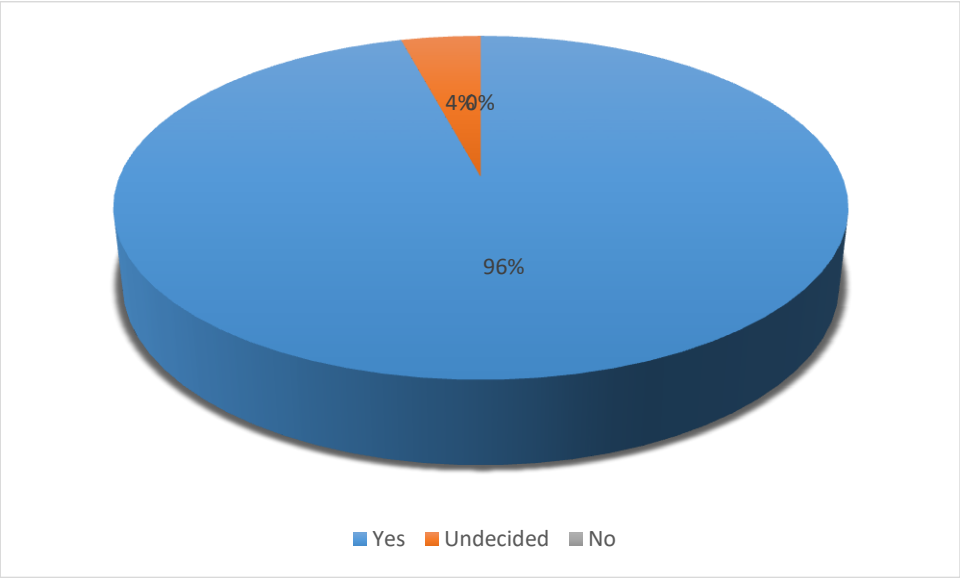


Figure 4.4: Role of school authorities

The results in Figure 4.4 show that 96% of the participants agreed that school authorities should take the lead in controlling the use of online gadgets by learners in schools. The results also show that 4% of the respondents were undecided and none disagreed. The results imply that the majority of the respondents agreed that school authorities should take the lead in controlling the use of online gadgets by learners in schools.

4.6.2 Parents need to know the contents of gadgets their children use

The also responded to the question that parents need to know the contents of gadgets their children use. The results are depicted in Figure 4.5. It can be seen from Figure 4.5 that 123 (85.4%) of the respondents agreed that parents need to know the contents of their children's gadgets. The number of undecided respondents was 12 (8.3%). Nine (6.3%) of the respondents disagreed that parents need to know the

contents of gadgets their children use. The results imply that most the respondents agreed that parents need to know the contents of gadgets their children use.

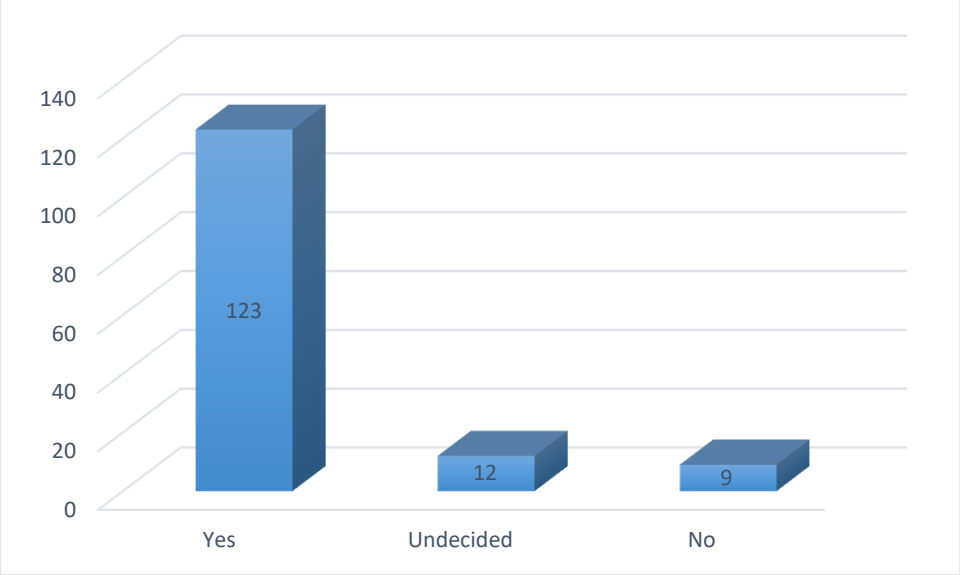


Figure 4.5: Parents need to know the contents of gadgets

4.6.3 Schools should adopt a more technological approach to teaching to enhance improved learner academic performance

The results in Figure 4.6 show the results of the respondents on the question that schools should adopt a more technological approach to teaching to enhance improved learner academic performance. The results revealed that 94% of the respondents agreed that schools should adopt a more technological approach to teaching to enhance improved learner academic performance. The other 6% of the respondents were undecided and none disagreed. The results mean that the majority of respondents believed that schools should adopt a more technological approach to teaching to enhance improved learner academic performance.

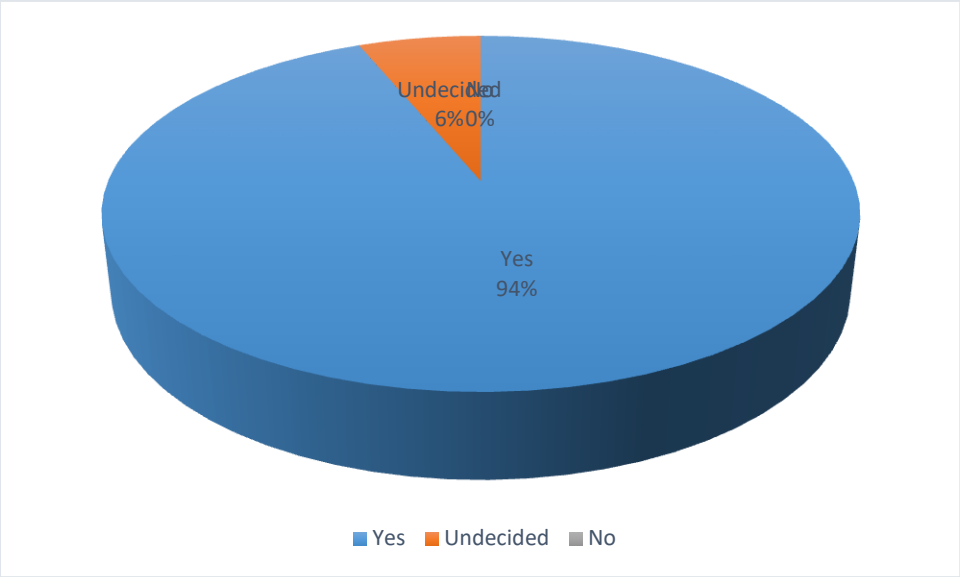


Figure 4.6: Schools should adopt technology

4.6.4 DBE should ensure that curriculum-related content is downloaded to learners' gadgets for easy access at their leisure time

The respondents were also asked if they think that the DBE should ensure that curriculum-related content is downloaded to learners' gadgets for easy access at their leisure time. The results of respondents' responses are presented in Figure 4.6.

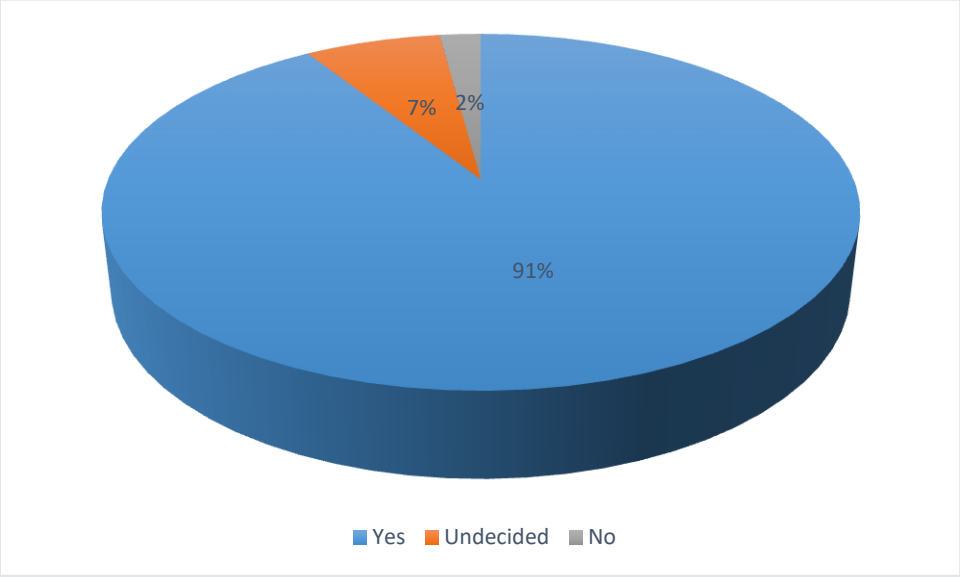


Figure 4.7: DBE should ensure that learning material is downloaded

The results in Figure 4.7 shows that 91% of the respondents agreed that the DBE should ensure that curriculum-related content is downloaded to learners' gadgets for easy access at their leisure time. About 7% of the respondents were undecided and only 2% disagreed that the DBE should ensure that

curriculum- related content is downloaded to learners' gadgets for easy access at their leisure time. The results mean that most of the respondents believed that the DBE should ensure that curriculum-related content is downloaded to learners' gadgets for easy access at their leisure time.

4.6.5 SGBs should be involved in content selection of learner's gadgets to ensure curriculum-related content

The respondents were also required to respond to the question that 'SGBs should be involved in content selection of learners' gadgets to ensure curriculum-related content.' The results are depicted in Figure 4.7. The results in Figure 4.7 revealed that 74 (51.4%) respondents agreed that the SGBs should be involved in content selection of learners' gadgets to ensure curriculum-related content. The number of respondents who were undecided was 51 (35.4%) and 19 13.2% of the respondents disagreed. The results imply that respondents have mixed feeling about the involvement of the SGBs in content selection. Even though the majority (51.4%) agreed, there is a significant percentage of respondents who were undecided and did not agree (48.6%).

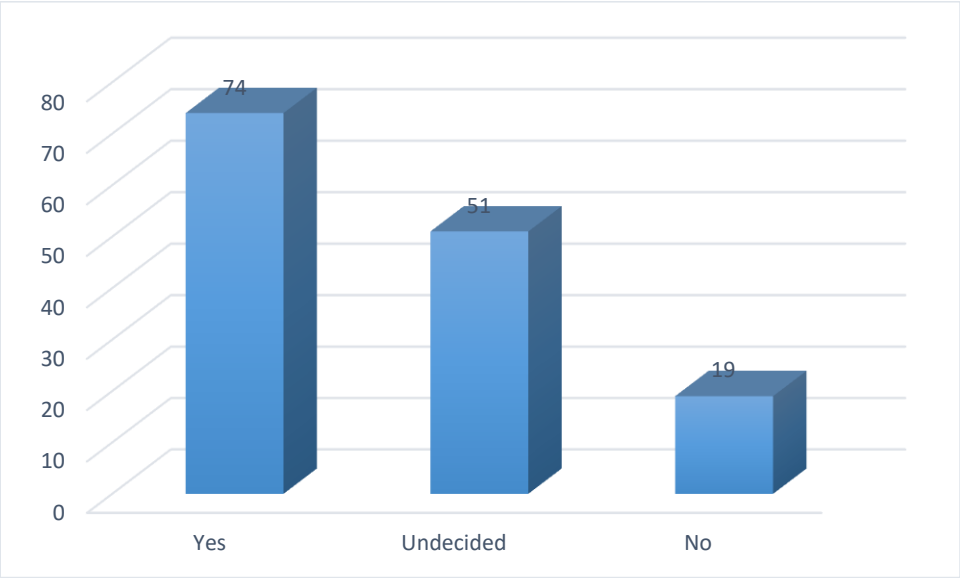


Figure 4.8: Involvement of the SGBs in content selection

4.6.6 District officials should monitor relevance of academic content of learners' gadgets as professionals

The questionnaire also requested respondents to respond to the question 'Local district officials should monitor relevance of academic content of learners' gadgets as professionals.' The results of participants' responses are shown in Figure 4.8.

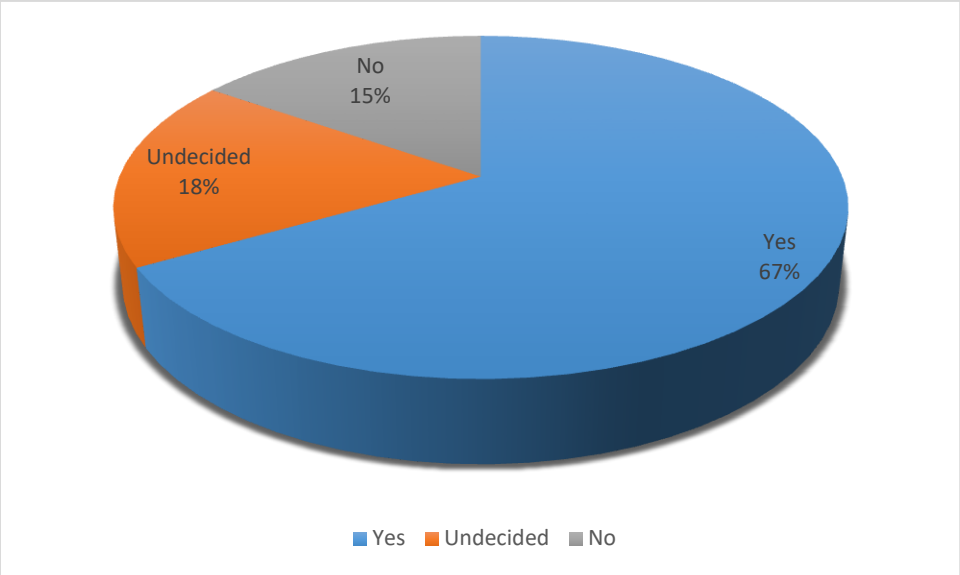


Figure 4.9 Local district officials should monitor learners' gadgets

The results in Figure 4.8 indicated that 67% of the respondents agreed that the local district officials should monitor relevance of academic content of learners' gadgets as professionals. About 18% of the respondents were undecided and 15% did not agree that the local district officials should monitor relevance of academic content of learners' gadgets as professionals. The results imply that even though the majority of the respondents agreed that local district officials should monitor relevance of academic content of learners' gadgets as professionals, there is also a big percentage (33%) of respondents who were undecided and did not agree.

4.6.7 Department officials should physically visit local schools for the sole purpose of random checking of contents learners' gadgets

When respondents were asked if they think that the Departmental officials should physically visit local schools for the sole purpose of random checking of contents learners' gadgets, the results of their responses are shown in Figure 4.9.

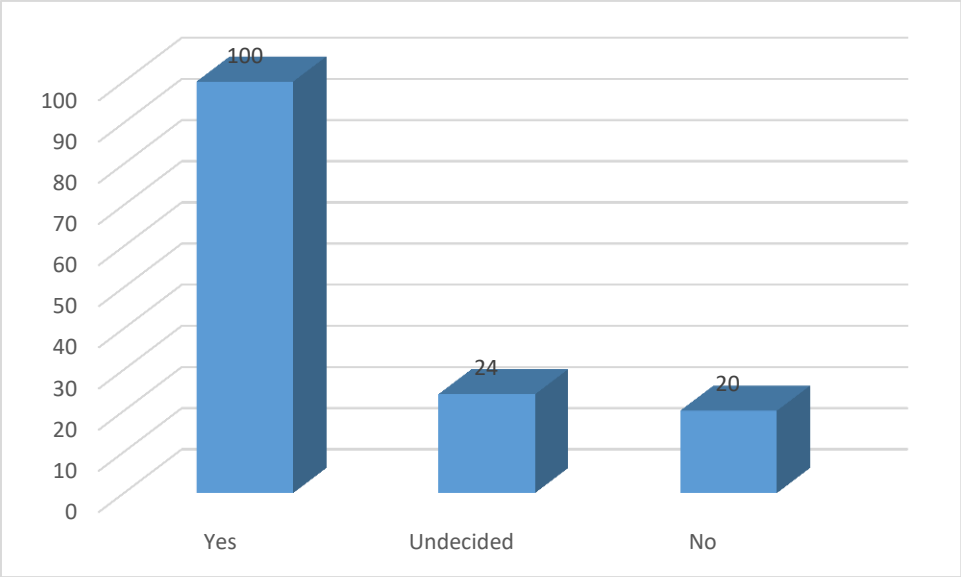


Figure 4.10: Departmental officials should physically visit local schools

The results revealed that 100 (69.4%) of the respondents agreed that the Departmental officials should physically visit local schools for the sole purpose of random checking of contents learners' gadgets. The number of undecided respondents was 24 (16.7%). Twenty (13.9%) of the respondents did not agree that the Departmental officials should physically visit local schools for the sole purpose of random checking of contents learners' gadgets. The results imply that the majority of respondents believe that the Departmental officials should physically visit local schools for the sole purpose of random checking of contents learners' gadgets. However, there is also a significant percentage of respondents who did not agree and who were undecided.

4.6.8 DBE should support schools with gadgets so that even those from poor family backgrounds can access modern information

The respondents were asked if they think that the DBE should support schools with gadgets so that even those from poor family backgrounds can access modern information. The results are shown in Figure 4.10. The results in Figure 4.10 show that 96% of the respondents agreed that the DBE should support schools with gadgets so that even those from poor family backgrounds can access modern information. Only 3% were undecided and 1% of the respondents disagreed. The results imply that that the majority of the respondents in this study believed that the DBE should support schools with gadgets so that even those from poor family backgrounds can access modern information.

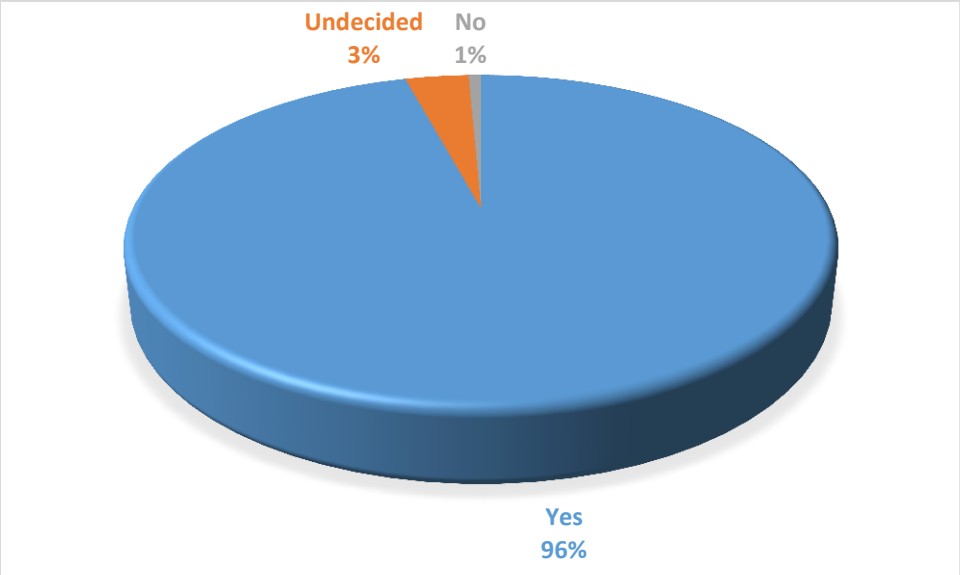


Figure 4.11: DBE should support schools with gadgets

4.6.9 Parents must monitor times their children spend on their gadgets to alleviate evil habits through online communication

The questionnaire also required the respondents to give their opinion on parents monitoring times their children spend on their gadgets to alleviate evil habits through online communication. The results are shown in Figure 4.11. The results showed that 118 (81.9%) of the respondents agreed that parents must monitor times their children spend on their gadgets to alleviate evil habits through online communication. The number of undecided respondents was 21 (14.6%). Five (3.5%) respondents did not agree that parents must monitor times their children spend on their gadgets to alleviate evil habits through online communication.

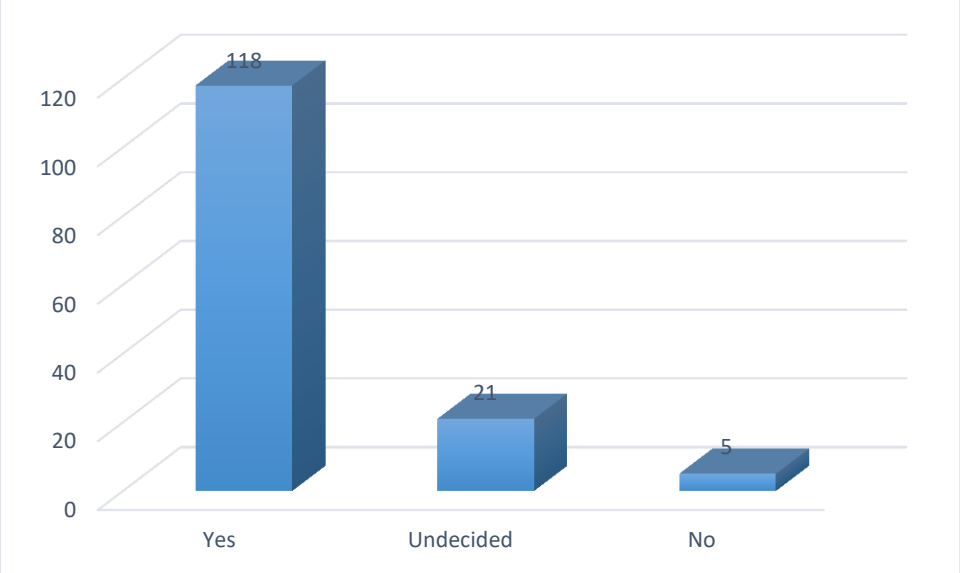


Figure 4.12: Parents should monitor their children's use of gadgets

4.6.10 School authorities should encourage online learning to make teaching and learning easily accessible

Respondents were asked if they think that school authorities should encourage online learning to make teaching and learning easily accessible. The results are shown in Figure 4.12. Figure 4.12 shows that 132 (91.7%) respondents agree that school authorities should encourage online learning to make teaching and learning easily accessible. Nine (6.3%) respondents indicated that they were undecided and only three did not agree that school authorities should encourage online learning to make teaching and learning easily accessible. The results indicated that the majority of the respondents agreed that school authorities should encourage online learning to make teaching and learning easily accessible.

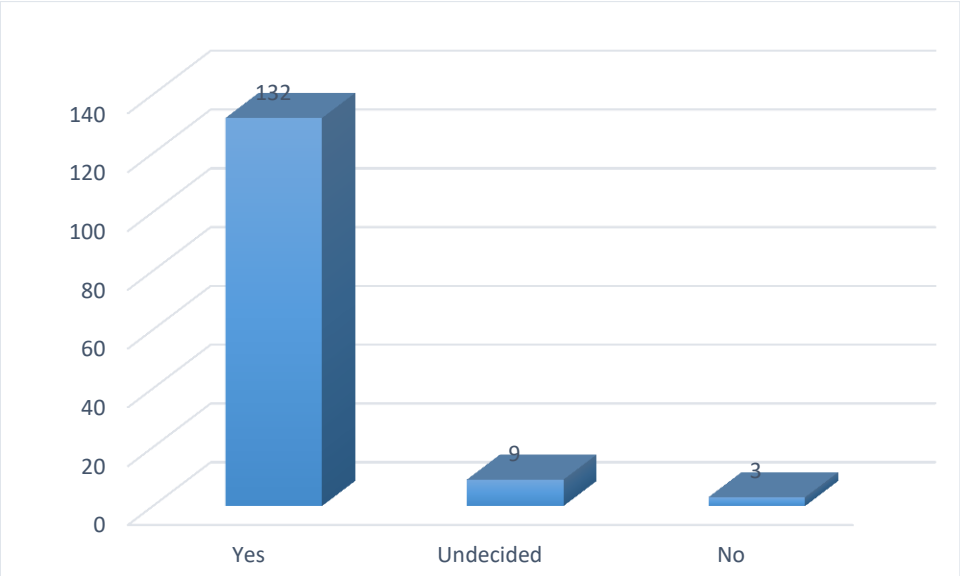


Figure 4.13: School authorities should encourage online learning to make teaching and learning easily accessible.

4.7 THE STRATEGIES THAT DBE CAN USE TO CONTROL ABUSE OF ONLINE GADGETS BY LEARNERS

To find the strategies that DBE can use to control abuse of online gadgets by learners, this research requested respondents to answer to 10 questions. The results of respondents are presented in the following subsections.

4.7.1 DBE should legalise the use of technological gadgets in schools but under strict terms and conditions

The respondents were asked to highlight their views on whether the DBE should legalize the use of technological gadgets in schools, but under strict terms and conditions. The results are shown in Table 4.15.

Table 4.15: DBE should legalise technological gadgets (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	4.0	2.8	2.8
Undesirable	0.0	0.0	2.8
Uncertain	10.0	6.9	9.7
Desirable	15.0	10.4	20.1
Most desirable	115.0	79.9	100.0

The results in Table 4.15 show that only 2.8% of the respondents did not agree that the DBE should legalize the use of technological gadgets in schools, but under strict terms and conditions. About 6.9% of the respondents were uncertain and 90.3% of the respondents agreed that the DBE should legalize the use of technological gadgets in schools, but under strict terms and conditions. The results mean that the majority of the respondents believe that the DBE should legalize the use of technological gadgets in schools, but under strict terms and conditions.

4.7.2 Parents, according to DBE, need to keep the gadgets during school hours and return them after school and week-ends

Another question for which the target population has been surveyed is how they would regard the idea that parents, according to DBE, need to keep the gadgets during school hours and return them after school and week-ends. The results are tabulated in Table 4.16. The results showed that about 13.2% of the respondents view the idea that parents need to keep the gadgets during school hours and return them after school and week-ends as undesirable. About 22.2% of the respondents were uncertain and 64.6% of the respondents view it as desirable for parents need to keep the gadgets during school hours and return them after school and week-ends as undesirable. The results imply that even though the majority of the respondents believe that parents need to keep the gadgets during school hours and return them after school and week-ends as undesirable, there is also a big percentage of 35.4% of respondents who were uncertain and some perceive it as undesirable.

Table 4.16: Parents should keep the gadgets during school hours (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	7.0	4.9	4.9
Undesirable	12.0	8.3	13.2
Uncertain	32.0	22.2	35.4
Desirable	41.0	28.5	63.9

Most desirable	52.0	36.1	100.0

4.7.3 District officials should regularly monitor the use of learners' gadgets to ensure their academic compliance

The respondents were also asked to give their perceptions on the idea that the District officials should regularly monitor the use of learners' gadgets to ensure their academic compliance. The results are tabulated in Table 4.17.

Table 4.17: District officials should regularly monitor the use of gadgets (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	5.0	3.5	3.5
Undesirable	6.0	4.2	7.6
Uncertain	40.0	27.8	35.4
Desirable	50.0	34.7	70.1
Most desirable	43.0	29.9	100.0

The results showed that only 7.6% of the respondents perceive the idea that District officials should regularly monitor the use of gadgets to ensure their academic compliance as undesirable. Around 27.8% of respondents were uncertain and 64.6% perceive the idea that District officials should regularly monitor the gadgets to ensure their academic compliance as desirable. The results mean that most respondents believe that it is a good idea for the District officials to regularly monitor the gadgets to ensure their academic compliance.

4.7.4 DBE should enforce online curriculum content for easy access to learners

The respondents were asked if they think that the DBE should enforce online curriculum content for easy access to learners. The results in Table 4.18 shows that only 9% of the respondents perceive the idea that DBE should enforce online curriculum content for easy access to learners as undesirable while, 8.3% were uncertain. The majority (82.6%) of the respondents perceive the idea that DBE should enforce online curriculum content for easy access to learners as desirable.

Table 4.18: DBE should enforce online curriculum content (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	4.0	2.8	2.8
Undesirable	9.0	6.3	9.0

Uncertain	12.0	8.3	17.4
Desirable	25.0	17.4	34.7
Most desirable	94.0	65.3	100.0

4.7.5 Gadgets to be confiscated during teaching and learning times and be returned after school

There respondents were also asked if they think that gadgets ought to be confiscated during teaching and learning times and be returned after school. The results are shown in Table 4.19.

Table 4.19: Gadgets to be confiscated during teaching and learning times (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	12.0	8.3	8.3
Undesirable	18.0	12.5	20.8
Uncertain	41.0	28.5	49.3
Desirable	38.0	26.4	75.7
Most desirable	35.0	24.3	100.0

The results in Table 4.19 shows that 20.8% of the respondents think that it is undesirable for gadgets to be confiscated during teaching and learning times and be returned after school. About 28.5% of the respondents were uncertain and 50.7% were thinking that it is desirable for the gadgets to be confiscated during teaching and learning times and be returned after school. The results show mixed perception from the respondents. Even though the results are showing that the majority (50.7%) of the respondents believe that gadgets ought to be confiscated during teaching and learning times and be returned after school, there was also about 49.3% who were uncertain or perceive the idea as undesirable.

4.7.6 ICT should be compulsory in all schools to enhance teaching and learning for improved learner academic performance

The questionnaire also requested the respondents to respond to the idea that ICT should be compulsory in all schools to enhance teaching and learning for improved learner academic performance. The results in Table 4.20 shows that only 4.2% perceive the idea that ICT should be compulsory in all schools to enhance teaching and learning for improved learner academic performance. About 11.1% of the respondents were uncertain while 84.7% perceive the idea that ICT should be compulsory in all schools to enhance teaching and learning for improved learner academic performance as desirable. The results

mean the majority of the respondents supported the idea that ICT should be compulsory in all schools to enhance teaching and learning for improved learner academic performance.

Table 4.20: ICT should be compulsory (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	4.0	2.8	2.8
Undesirable	2.0	1.4	4.2
Uncertain	16.0	11.1	15.3
Desirable	27.0	18.8	34.0
Most desirable	95.0	66.0	100.0

4.7.7 A control register for learners possessing gadgets should be enforced by schools for easy control

The respondents were asked to share their views on the idea that a control register for learners possessing gadgets should be enforced by schools for easy control. The results are tabulated in Table 4.21. The results showed that 16% of the respondents think that it is undesirable that a control register for learners possessing gadgets should be enforced by schools for easy control. A total of 30 (20.8%) respondents indicated that they were uncertain. The results also show that 63.2% perceive the idea that a control register for learners possessing gadgets should be enforced by schools for easy control as desirable. These results imply that even though the majority of the respondents believe that a control register for learners possessing gadgets should be enforced by schools for easy control, there is also a large number of respondents who does not support the idea.

Table 4.21: Control register for learners possessing gadgets (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	7.0	4.9	4.9
Undesirable	16.0	11.1	16.0
Uncertain	30.0	20.8	36.8
Desirable	35.0	24.3	61.1
Most desirable	56.0	38.9	100.0

4.7.8 DBE should ensure that Wi-Fi infrastructure is adequately available for learners to access information easily

The respondents were also asked if they think that the DBE should ensure that Wi-Fi infrastructure is adequately available for learners to access information easily. The results are shown in Table 4.22.

Table 4.22: DBE should ensure that Wi-Fi infrastructure is adequately available for learners (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	4.0	2.8	2.8
Undesirable	1.0	0.7	3.5
Uncertain	14.0	9.7	13.2
Desirable	13.0	9.0	22.2
Most desirable	112.0	77.8	100.0

The results in Table 4.22 show that only 3.5% of the respondents thinks that DBE should not ensure that Wi-Fi infrastructure is adequately available for learners to access information easily. The results also show that 9.7% of the respondents were uncertain while, 86.8% thinks that the DBE should ensure that Wi-Fi infrastructure is adequately available for learners to access information easily. The majority of the respondents supported the idea that the DBE should ensure that Wi-Fi infrastructure is adequately available for learners to access information easily.

4.7.9 DBE should ensure parents allow teachers to monitor and control gadget usage by learners in schools

The respondents were asked if they believe that the DBE should ensure parents allow teachers to monitor and control gadget usage by learners in schools. The results in Table 4.23 show that that only 4.2% of respondents think that parents should not allow teachers to monitor and control gadget usage by learners in schools. The number of respondents who were uncertain was 21(14.6%). The majority (81.2%) of the respondents believed that the DBE should ensure parents allow teachers to monitor and control gadget usage by learners in schools.

Table 4.23: Parents should allow teachers to monitor gadget usage (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	6.0	4.2	4.2
Undesirable	0.0	0.0	4.2
Uncertain	21.0	14.6	18.8
Desirable	57.0	39.6	58.3
Most desirable	60.0	41.7	100.0

4.7.10 All DBE structures (including circuit offices) should ensure that learners' gadgets are downloaded with curriculum-related content for every learner to access information

The respondents were also asked if they believe that all the DBE structures should ensure that curriculum-p related content is downloaded on to learners' gadgets, for easy access. The results are tabulated in Table 4.24.

Table 4.24: DBE structures should ensure that curriculum-related material is downloaded (N = 144)

	Frequency	Percent	Cumulative percent
Most undesirable	3.0	2.1	2.1
Undesirable	4.0	2.8	4.9
Uncertain	2.0	1.4	6.3
Desirable	25.0	17.4	23.6
Most desirable	110.0	76.4	100.0

The results in Table 4.24 show that only 4.9% of the respondents perceive the idea that all DBE structures (including circuit offices) should ensure that learner' gadgets are downloaded with curriculum-related content for every learner to access information as undesirable. About 1.4% of the respondents were uncertain and 93.3% believed that all DBE structures (including circuit offices) should ensure that learners' gadgets are downloaded with curriculum-related content for every learner to access information. These results imply that the majority of the respondents support the idea that all DBE structures (including circuit offices) should ensure that learner' gadgets are downloaded with curriculum related content for every learner to access information.

4 .5 RESPONSES OF RESPONDENTS

This section shows the expressed feelings of respondents, their suggestions whether for or against what the researcher has opined in Chapter 1 and what other writers have said in Chapter 2. There were eight (8) open-ended questions which were responded to:

4.5.1 *How do you think online technological devices can positively affect learner academic performance?*

On this question, the majority of the respondents feel that online technological devices help learners acquire information from a wide range of sources through Google. There are those who feel that they enhance self-dependency on the side of learners because they can work on their own and at their own pace; in other words online technology puts learners on a global stage and that helps improve their academic performance.

4.5.2 What role can stakeholders play to help learners improve their academic performance using these gadgets?

Many respondents feel that educational stakeholders (Circuit Office, Districts, Provincial and Department of Basic Education - DBE) should take the lead in providing schools with the gadgets, training of teaching personnel and also devising means for learners to easily access online information.

4.5.3 How can teachers help learners use the gadgets to improve their academic performance?

There is a general feeling that teachers must ensure that learners use gadgets to enhance their academic performance. Most feel that teachers need to refrain from the traditional method of teaching which was teacher-centred and rather opt for a modern technological approach which is where the 21st century is basically based. They also feel that even for assignments and homework, referrals to certain educational websites can be made so that learners get used to them.

4.5.4 According to your observation, what are the challenges of using these online devices?

Respondents were unanimous in that major challenges revolve around devices being expensive for the majority of the rural population, with the aspect of affordability coming to the fore. Others mentioned technological infrastructure, expensive data, unavailability of Wi-Fi and illiteracy on the use of the devices by teachers which affects learners.

4.5.5 How do you think teachers and parents should control the use of these 21st century devices by learners to yield positive learner academic performance?

The responses on this question ranged from parents and teachers having to constantly monitor how leaners use their devices, ensuring that the content of the devices is academically aligned to blocking the content that may lead learners astray. So, in a nutshell, respondents are of the view that devices may only be used for the intended purpose to yield positive learner academic performance.

4.5.6 What are the factors that can hinder the implementation of these 21st century devices in teaching and learning?

Most of the hindrances mentioned by respondents were shortage of workshops on the use of these devices by both teachers and learners. This has made learners understand the devices as tools for socialising and not for schoolwork purposes. Others have observed that there is high level of competition on the most recent modern gadget with advanced content information which are obviously expensive for parents to afford; this results in some stealing from others and so implementing the full use of the devices in schools is greatly hindered.

4.5.7 Which strategies can DBE employ to ensure that the use of these 21st century gadgets is promoted in schools?

Respondents feel that since DBE is the custodian of basic education and therefore has a responsibility to ensure that schools are provided with the gadgets. Others liken the supply of Personal Protective Equipment (PPEs) during the spread of the COVID-19 pandemic and feel that the same can be done with the supply of gadgets to schools.

There is also a section which feels that the DBE can seek sponsorships from private companies so that eventually every school and learner has a smart gadget for improved learner academic performance.

4.5.8 What is the influence of these 21st century technological devices on learners' academic performance?

Most responded that the 21st century technological devices contribute immensely towards improved learner academic performance. What is glaring in their response is that most mention that the successful use of the device depends on the individual; for others the devices serve as instruments of distraction in their schoolwork. For others, it enhances improved academic performance; they further allude that misuse of the devices may result in cyber bullying and many other unintended consequences.

4.6. REPRESENTATION OF RESPONSES IN NUMBERS AND PERCENTAGES

As mentioned in the introductory part of this chapter, the above responses were collected from 144 respondents. We now look at the percentages of each respondent to each question and what that implies.

4.6.1 How do you think online technological devices can positively affect learner academic performance?

- 133 feels that online technological devices do have positive effects on learner academic performance and that proper use of the devices results in improved learner academic performance – 92.3%

4.6.2 What role can stakeholders play to help learners improve their academic performance using these gadgets?

- 127 feels that stakeholders (SGBs, Circuits, Districts, Provincial and the DBE) have a major role to play in a bid to improve learner academic performance like legislating the online teaching and learning, and provision of gadgets and training sessions – 88%

4.6.3 How can teachers help learners use gadgets to improve their academic performance?

- 118 of the respondents feel that teachers are the ones who can instil the desire for learners to use the gadgets fruitfully towards improved learner academic performance. They site referrals to some educational websites, research and homework through these gadgets – 82%

4.6.4 According to your observation, what are the challenges of using these online devices?

- 132 responded that challenges vary; others mentioned expensive data, Wi-Fi problems and financial constraints on some parents. At the end they all feel that indeed there are some challenges facing the use of these devices - 92%.

4.6.5 How do you think teachers and parents should control the use of these 21st century devices by learners to yield positive learner academic performance?

- 126 responded that teachers and parents should try to exercise some control measures over the use of these devices by learners. Measures ranged from checking the content of the devices (academic nature of the content) to blocking the unwanted misleading content – 88%.

4.6.6 What are the factors that can hinder the implementation of these 21st century devices in teaching and learning?

- 133 feel that there is no proper infrastructure from which these online technologies can be erected not only in rural areas but also in urban areas where Wi-Fi is still located in certain areas – 92.3%.

4.6.7 Which strategies can DBE employ to ensure that the use of these 21st century gadgets is promoted in schools?

- 133 of the respondents suggest that DBE should supply gadgets to schools and outsource sponsors to provide learners with them so that online teaching and learning can be effected immediately. Also, the point of eradicating technological illiteracy is mentioned by many of them calling for Information Technology (IT) skilling workshops -92.3%.

4.6.8 What is the influence of these 21st century technological devices on learners' academic performance?

- 126 respondents are of the view that the influence may either be positive or negative depending on how the individual uses the device. This calls for proper guidance on the side of the learners by either teachers or parents (refer to 6.5 above) – 88%

4.7. SUMMARY

The analysis that is projected in this chapter is testimony to what has been said in Chapters 1 and 2 of this study in that the emergence of these 21st century technological devices is very good as the whole world is trending on technology in all sectors with education included. However, in some corners, there are those individuals (learners) who will abuse the gadgets and perform undesirable activities which may result in poor learner academic performance.

It is worth noting that respondents were on the side of the researcher in that educational stakeholders must bear the responsibility of ensuring that teaching and learning is not left behind in this technological era.

Notwithstanding the fact that there is a global technological boom in every sector, this study warns for caution that adoption of online teaching and learning may yield unintended consequences. To avoid that, there needs to be thorough planning for the implementation of this online teaching and learning. As mentioned even in the questionnaires, sound technological infrastructure must be provided through the training of teaching personnel, provision of Wi-Fi and data and compulsory Information Technology (IT) departments in schools.

It is pleasing to note that more than 80% of the respondents feel that the 21st century technology influences learner academic performance in schools and specifically in King Cetshwayo District.
This study therefore sends a clear message to the DBE that the provision and supply of online gadgets can also receive the same attention that was given to schools and learners during the outbreak of the Corona virus. This is a message of urgency, in terms of online technology. South Africa has been caught napping because it cannot cope with the global technological standards and this jeopardises individual technological learner development.

In most households, members do possess cell phones which are good for social communication. The current situation is such that there is now a need to have smart phones for virtual meetings and online teaching and learning because that is the trend the whole world is moving towards. Testimony to that is the outbreak of the Corona virus which, while stressing social distancing calls for online communication. So, as for this study, it is upon the DBE to level the ground for proper technological infrastructure by roping in all relevant stakeholders towards sound and productive online teaching and learning.
The researcher finds it very fascinating that the analysis of that the analysis was aligned to the Theoretical Framework that underpins this study. UTUATA posit that institution should be

encouraged to adopt technology in any institution; it enhances positive teaching and learning and influences behaviour of an individual. This does not contrast with Section B of the questionnaire where respondents alluded to the framework.

CHAPTER 5

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

In Chapter 4 there was the presentation of analyzed data and responses were analyzed. In this chapter the influence of 21st century technology on learner academic performance will be revealed, based on what the impressions of the respondents were. This chapter will further scrutinize in detail what responses were given for each question and the implications thereof. The conclusions and recommendations are based on the research questions and objectives as stated in Chapter 1 of this study.

The recommendations are made with the sole intention to contribute to the education fraternity and future researchers in the related field. Also, this topic is crucial as it impacts on learner academic performance in the current midst of these online teaching and learning technologies. These recommendations may serve as an eye-opener to education stakeholders on the fruitful use of the gadgets by learners without hindering their academic performance.

Since the study was quantitative in nature, it put the researcher in good stead to quantify the responses (refer to Chapter 4) so that everybody can interpret the numbers which explicitly show how many have responded in which fashion.

5.2 REVIEW OF RESEARCH OBJECTIVES AND RESPONSES

OBJECTIVES

5.2.1 To *determine the influence of 21st century technology on Grade 12 learners' academic performances in King Cetshwayo district.*

Respondents were of the view that there is a great deal of influence that the 21st century technology has on learner academic performance whether the positive enhancing influence or the negative distracting influence.

5.2.2 *To explore the role of stakeholders in improving learners` academic performances in King Cetshwayo district.*

The feeling of the respondents was that education stakeholders (Circuits, Districts, Province and Basic Education) as custodians of the education system should ensure that schools are supplied with these 21st century technological gadgets so that even learners who are financially constrained, can access them to cope with the 21st century era.

5.2.3 *To investigate strategies to be used by the Department of Basic Education (DBE) on effective use the 21st century technologies in teaching and learning*

Respondents felt that, other than free supply of the gadgets, DBE should also ensure that the software content is academically aligned so that they serve the purpose they are intended for.

5.3 IMPLICATION OF THE RESPONSES

The responses to these objectives imply that respondents acknowledge that this century is dominated and characterized by technological boom. The DBE should likewise join the band-wagon of complying with the century's needs in terms of supplying schools with gadgets and relevant software just like it was done during the peak time of COVID 19 pandemic with Personal Protective Equipment (PPEs).

5.3.1 Review to research questions and responses

Research questions

5.3.1.1 ***How does the 21st century influence Grade 12 learners' academic performance in King Cetshwayo district?***

It was unanimous that these 21st technological devices have a particular influence, either positive or negative depending on how the individual uses the gadgets. Others cited freedom to search and global networking using these gadgets as benefiting the learners by exposing them to an abundance of information.

5.3.1.2 ***How can stakeholders help to improve learners' academic performance in King Cetshwayo district amid these 21st century technology?***

They felt that stakeholders can help exercise some control over the use of these gadgets by learners so that they yield the intended results. The stakeholders in this regard would mean the education authorities involved.

5.3.1.3 ***What are the strategies to be employed by DBE in the proper use of these 21st century technologies in King Cetshwayo district?***

Respondents felt that the supply of the gadgets may not be sufficient if the content is not academically aligned, so the general response was that academic software should also be installed by the DBE. This would enable learners to interact with their devices even in their own leisure time.

5.4 IMPLICATIONS OF THE RESPONSES

The responses clearly show that all stakeholders agree that these 21st century technology gadgets exert a certain influence on learner'` academic performance which may impact positively or negatively on learner academic performance.

The researcher has in many instances alluded to this fact in this study that as beneficial as these 21st century gadgets may be in terms of information search through internet, if not properly guided, they may serve as gadgets of distraction towards the intended objectives. This then calls for parents, teachers and all involved to be very vigilant that gadgets are utilized fruitfully so that they yield good learner academic performance.

5.4.1 Discussion of findings

This is a review of Chapter 4 findings in a nutshell. The researcher intends to sum up the responses and align them to what has already been stated in Chapter 2.

5.4.1.1 To determine the influence of the 21st century technology on Grade 12 learners' academic performances in King Cetshwayo district.

To address this objective, respondents had to respond to the following sub-sections, this was the first objective as stated in Chapter 1 from 5.3.1.2 are responses to this objective.

5.4.1.2 Modern technologies yield positive influence on learners' academic performance.

For this question, the majority of the respondents strongly agreed and very few were undecided, disagreed and strongly disagreed (refer to Chapter 4 on statistical analysis). Statistically, 95.1% was of the view that indeed modern technologies yield positive learner academic performance.

5.4.1.3 Schools with sound technological infrastructure produce learners with better academic performance.

The frequency was 73 strongly agree and 63 agree, 5 undecided and 3 disagree with nil strongly agree. So, 94.4% is of the view that schools with sound technological infrastructure produce learners with better academic performance.

5.4.1.4 Schools should encourage the use of modern technologies during lesson presentation for improved learner performance.

On this one, 98.6% agreed that schools should encourage the use of modern technologies during lesson presentation for improved learner performance and zero strongly disagree.

5.4.1.5 Teachers must have access to gadgets of learners to ensure they contain academic content.

84.7% agree that teachers need to access learners' gadgets to ensure the academic nature of the content.

5.4.1.6 Overuse of cell phones may result in learners becoming gadget slaves and yield poor academic performance.

This analysis shows that 81.9% agreed that overuse of cell phones by learners may yield gadget slaves.

5.4.1.7 Some learners suffer from sleeplessness out of overuse of modern technological gadgets which results in poor academic performance.

The results of the respondents reveal that 79.2% agree that there are learners who eventually become victims of sleeplessness out of overuse of these modern technological devices.

5.4.1.8 Sound home technological background is essential for learners to perform well academically.

Again, one can see that 84.7% of respondents agree that a sound technological home background assists learners to enhance their academic performance.

5.4.1.9 The extent to which learners` academic performance depends largely to learners` use of online technology.

The responses show that 68.8% agree that learners' academic performance depends largely on the extent to which that interacts with his/her gadgets.

5.4.1.10 Learners' academic performance is higher in urban schools because most learners use modern online technology.

The responses show that 88.2% believe that learners who attend school in urban areas are at an advantage of being exposed to these modern technologies thus enhancing their academic performance.

5.4.1.11 Learners who spend less time on their gadgets perform better academically because they dedicate their time to school-related activities.

The overall responses of 80.6% agree that maybe some learners spend their time socializing with friends and focus less on educational matters and that negatively affects their school academic performance.

5.4.1.12 Implication of responses

In Chapter 2 of this study, the researcher mentioned that the 21st century is characterized by the emergence of technology in all spheres of work operation including schools. In schools there has been an emergence of online teaching and learning, which has become a new norm of life. Looking closely to the responses above and referring to Chapter 4, one observes that there is a glaring distinction between the strongly agree, agree on the one hand, and strongly disagree, disagree on the other.

The analysis confirms that people who are hands-on with education are unanimous that 21st century technology has `engulfed' the world, and whilst every learner in every household is overwhelmed with these online gadgets, caution needs to be exercised by parents, teachers and all stakeholders involved,

that learners are not distracted by these gadgets. So, the picture of the respondents per question stands thus:

QUESTION	RESPONSES	
	AGREE	**DISAGREE**
5.4.1.2	95.1%	2.8%
5.4.1.3	94.4%	2.1%
5.4.1.4	98.6%	1%
5.4.1.5	84.7%	7%
5.4.1.6	81.9%	9%
5.4.1.7	79.2%	7%
5.4.1.8	87.7%	9%
5.4.1.9	68.8%	20%
5.4.1.10	88.2%	7.6%
5.4.1.11	80.6%	11%

Table 5.1: Respondents' responses

These responses show that the researcher is on the right path to ring alarm bells about the dangers of modern technology, if no proper guidance is given to learners about the positive and negative effects of the gadgets.

5.5 THE ROLE THAT STAKEHOLDERS CAN PLAY IN IMPROVING LEARNER ACADEMIC PERFORMANCE

This was another set of questions that sought to find out what school authorities ought to do to ensure improved learner academic performance. In this category of questions, respondents had to respond with Yes, No or Undecided and the responses were as follows:

5.5.1 School authorities should take the lead in controlling the use of online gadgets by learners in schools.

Respondents agree that school authorities should indeed take the lead in controlling the use of online gadgets by learners. 96% agreed. Just as it was done during the COVID 19 pandemic where the

Government took a leading role in the provision of PPEs, the same can be done with provision of gadgets in schools.

5.5.2 Parents need to know the contents of gadgets their children use.

This was also agreed upon by the majority of the respondents, making 85.4%. It is for that reason that some believe that the DBE should devise some control measures so that parents know what is contained in their gadgets.

5.5.3 Schools should adopt a more technological approach to teaching to enhance improved learner academic performance.

The 21st century context compels schools to be more technological in whatever approach. This is what 94% of the respondents said to this question.

5.5.4 DBE should ensure that curriculum-related content is downloaded to learners' gadgets for easy access at their leisure time.

These online gadgets allow learners leisurely to search for information at any time, so if their gadgets are downloaded with academic content, it is up to them to search for information in their available time. This is also how 91% of the respondents viewed it.

5.5.5 SGBs should be involved in content selection of learners' gadgets to ensure curriculum-related content.

The SGBs are an important pillar of the school management; hence 51.4% felt that they should be involved in content selection.

5.5.6 Local district officials should monitor relevance of academic content of learners' gadgets as professionals.

On this question, 67% of the respondents trust that local district officials can ensure the academic nature of learners' gadgets because they know the curriculum.

5.5.7 Departmental officials (from DBE) should physically visit local schools for the sole purpose of random checking of contents of learners' gadgets.

The analysis on this question revealed that 69.4% of the respondents are in favor of departmental officials physically visiting schools to check the contents of the gadgets.

5.5.8 DBE should support schools with gadgets so that even those from poor backgrounds can access modern information.

A whopping 96% of the respondents felt that DBE has an obligation to support schools with gadgets. This would also assist those learners from families who are financially constrained.

5.5.9 Parents must monitor times their children spend on their gadgets to alleviate evil habits through online communication.

Since these gadgets are at the disposal of learners all the time, there is a possibility they may be busy with them for purposes that are not academically related, so 81.9% of the respondents felt parents have a responsibility to monitor what their children spend their time with. This may avoid things like cyber bullying and many other evil practices.

5.5.10 School authorities should encourage online learning to make teaching and learning easily accessible.

Times demand that everything is done online; same applies to teaching and learning and that is what 91.7% of respondents have said on this question, lest some learners are deprived of learning opportunities.

The table below sums up the exact percentages of all those who responded **YES** or **NO**

QUESTIONS	**RESPONSES**	
	YES	**NO**
5.5.1	85.4%	0%
5.5.2	94%	6.3%
5.5.3	91%	0%
5.5.4	51%	2%
5.5.5	67%	15%
5.5.7	69.4%	13.9
5.5.8	96%	1%
5.5.9	81.9%	3.5%
5.5.10	91.7%	3%

Table 5.2 Responses of the learners

The implications of the responses above are very clear: there is a strong feeling that school authorities, including the DBE should lead the education sector to full online technology and should ensure that every learner possesses a gadget and that the gadget is installed with appropriate academic content.

5.5.11 The strategies that DBE can use to control abuse of online gadgets by learners

On this part of the questionnaire, respondents were required to circle the chosen option and their options ranged from 1-5 where 1 means less desirable and 5 most desirable. In this analysis we will be looking at options 1 and 5. This part of the questionnaire focuses on what role the DBE is expected to play to ensure a smooth transition to online technology in schools.

5.5.12 The DBE should legalize the use of technological gadgets but under strict terms and conditions.

At one stage, cell phones were barred at schools as it was felt they were distracting learners. The truth is, time and space compel cell phones to be allowed and be used for class activities in the form of homework and assignments. For this reason, 90.3 % of respondents agree with this question.

5.5.13 Parents, according to the DBE, need to keep the gadgets during school hours and return them after school.

From what we get in this question, some still believe that gadgets may disturb during teaching time and so they need to be removed from classrooms until later; 64.6% of the respondents shared that view.

5.5.14 District officials should regularly monitor the use of learners' gadgets to ensure their academic compliance.

Most respondents were of the view that district officials should constantly check the academic compliance of learners' gadgets. District officials are local managers on behalf of the Province and so 64.6% respondents feel that they should monitor the gadgets.

5.5.15 The DBE should enforce online curriculum content for easy access to learners.

The majority (82.6%) of the respondents perceive the idea that the DBE should enforce online curriculum content for easy access to learners, bearing in mind those whose parents cannot afford to purchase the gadgets.

5.5.16 Gadgets to be confiscated during teaching and learning and returned be after school.

Though there was no glaring distinction between the most undesirable and most undesirable, 50.7% of respondents did agree with the idea of confiscating gadgets during teaching and learning. This closeness

in responses is interesting in that it shows that respondents were not just paying lip-service, but were voicing what they feel and experience daily, considering that these are teachers.

5.5.17 ICT should be compulsory in all schools to enhance teaching and learning for improved learner academic performance.

From what we get from the respondents, it looks like technology determines improved learner academic performance if 84.7% of them feel that ICT should be made compulsory in schools. This further shows our destination in terms of online teaching and learning.

5.5.18 A control register for learners possessing gadgets should be enforced by schools for easy control.

This was a question with rather mixed responses where 68.2% agreed and a bigger chunk was undecided (20.8%), with the rest falling on the most undesirable.

5.5.19 The DBE should ensure that WI-FI infrastructure is adequately available for learners to access information.

WI-FI is a buzz word these days, in every work environment, eateries and malls, and should be the case in schools too, so that information can be accessed easily. So, 86.8% felt the same thing when responding to this question.

5.5.20 The DBE should ensure parents allow teachers to monitor and control gadget usage by learners in schools.

To ease the burden of the DBE of controlling everything, 81.2% of the respondents felt that teachers should be authorized by parents to check what is contained in their gadgets; this is in the spirit of transparency and not infringing on learner rights to their gadgets.

5.5.21 All DBE structures should ensure that learners' gadgets are downloaded with curriculum related content for every learner to access information.

This was the most desirable for most respondents; 93.3% of them were unanimous that Provincial and Circuit offices should ascertain that learners' gadgets are installed with academic content. The researcher is aware that the DBE is already providing Annual Teaching Plans (ATPs) in schools which is very much appreciated; if this could be extended to software of learners' devices, they would be in a position to access previous examination questions and memoranda, do their assignments and work in their small groups in their own time.

These responses can be demonstrated and simplified using the table below:

QUESTIONS	RESPONSES	
	MOST DESIRABLE	MOST UNDESIRABLE
5.5.12	90.3%	2.8%
5. 5.13	64.6%	13.2%
5.5.14	64.6%	7.6%
5.5.15	82.6%	9%
5.5.16	50.7%	49.3%
5.5.17	84.7%	4.2%
5.5.18	63.2%	16%
5.5.19	86.8%	3.5%
5.5.20	81.2%	4.2%
5.5.21	93.3%	4.9%

Again, there is a glaring display of what the most desirable and most undesirable expectations are, on the side of the DBE. All responses confirm that one cannot remove online technology from schools.

5.6 DISCUSSION OF FINDINGS AND RECOMMENDATIONS

The quantitative findings and analysis of this study confirm that the 21st century era has had a profound influence on learner academic performance. In Chapter 2 of this study there is mention that the use of these gadgets is not by choice of an individual, but that circumstances demand it. As South Africa is still a developing country technologically, there are numerous hindrances that she is facing in implementing full-scale online teaching and learning.

The ultimate aim of teaching and learning in a classroom environment is to produce an academically successful candidate. A successful candidate, for the purposes of this study, is the one who can make fruitful use of the gadgets at his disposal to benefit him academically. However, along the way, there are hindrances which present themselves in various forms. Socially, there are financial imbalances which cost some families dearly, such that they cannot afford to purchase smart gadgets for their children. It is for

that reason that one of the questions (and one of the objectives and research questions) is: *what role should stakeholders play to help promote positive learner academic performance?* The response was unanimous in that the DBE should sponsor schools with smart gadgets so that financially struggling families can be relieved, and their children enabled to access academic information.

The reason the researcher opted for the quantitative study in this research, is that he intended to reveal in numbers, what teachers feel ought to be done by the DBE in a bid to rescue them from fully implementing the online teaching and learning. Among other things mentioned as hindrances towards full-scale implementation is a lack of technological training of the teaching personnel. The researcher wishes to draw the attention of the reader to immediate developments after the unprecedented emergence of the COVID-19 pandemic. The government unhesitatingly undertook to provide PPEs in all social gatherings including schools.

The researcher, including respondents in this study, are of the view that the same can be done with provision of smart gadgets to schools since as already mentioned, online teaching and learning is not a matter of choice, but rather a demand of the 21st century. In the section on the Theoretical Framework in Chapter 2, Venkatesh et al is mentioned, where they wrote about performance expectancy, effort expectancy and social expectancy. The researcher wishes to alert the reader that as good as the smart gadgets may be, they also have a negative influence on social behavior of individuals. One of the questions among those in the questionnaires of this study, refers to some learners becoming gadget slaves and suffering from sleeplessness as a result of overuse of the gadgets. There is also a question wanting to find out how parents and the DBE can contribute to prevent abuse of gadgets by learners. The responses were unanimous in that control should be exercised to prevent that eventuality.

This study has proven beyond doubt that the manner in which learners use their gadgets, influences their academic performance. It is also obvious from this study that the DBE has a pivotal role to play towards capacitating the teaching personnel regarding the use of the smart gadgets and free supply thereafter, as it happened with PPEs for COVID-19.

The researcher is aware of the fact that the current situation is that almost every child in every household has a cell phone, which is good considering the times we are living in. The researcher however wishes to warn that if those cell phones were to be used for academic purposes, they would benefit from them more in terms of improved academic performance. There are numerous reports of online abuse reported worldwide like cyber bullying, which could have been avoided through proper guidance and constant monitoring, as suggested in one of the questions in the questionnaire. This brings back the question of social influence, as mentioned in the Theoretical Framework of this study, which could be a direct result of misguided use of the gadgets.

One may look at what the COVID-19 pandemic has done to teaching and learning within a short space of time. It forced the government to be proactive in facilitating active distance teaching and learning, as well as virtual gatherings, online assessment and online monitoring. This then puts the provision of online gadgets into perspective, because such developments may prejudice learners in rural and under-developed areas, with poor WI-FI infrastructure or low or no-income earners. Chapter 4 of this study looks specifically into that and respondents have aired their views on the intervention that the DBE should make to save the situation and yield improved learner academic performance.

The researcher is pleased to observe that the responses were in line with both the research objectives and research questions as stated earlier in this study. They were unanimous in that 21st century technology has a profound influence on learner academic performance (research objective 1). They agreed that stakeholders have a responsibility to ensure that schools are provided with the devices (research objective 2). They also felt that the DBE must come with strategies to alleviate hindrances to the implementation of online teaching and learning (research objective 3). The objectives when translated into research questions were also in line with responses given.

5.7 RECOMMENDATIONS

The recommendations that will be given in this study are based on the findings and analysis of the questionnaires by respondents. To level the ground further, one needs to reiterate the main objectives of this study. The study purports to investigate the influence that 21st century technology has on learner academic performance. Also, in the statement of the problem of this study, it is stated that these devices are intended to enhance learners' academic performance. One has to hasten to mention that the positive influence that may be yielded depends on how each learner uses the device which may otherwise be sources of distraction and so yield unintended outcomes. In the open-ended section of the questionnaire, respondents were unanimous that all parties involved (parents, teachers and education officials) need to ensure devices are used for academic purposes (see Chapter 4).

The COVID-19 pandemic has stressed the urgency of online teaching and learning even to the developing and under-developed countries to save education from being compromised. So, the recommendations made in this section, are based on the fact that if such changes could be made during the Corona virus outbreak, more can be done to make online teaching a standard norm.

5.7.1 Department of Basic Education (DBE) to legislate online teaching and learning

One of the open-ended questions was: *What role can stakeholders play to help learners improve their academic performance using these gadgets?* In response to this question, 82.6% were of the view that online teaching and learning should be legislated and as the custodian of education, the DBE should

ascertain that every learner in each school is provided with a technological device. This was possible with face masks which were mandatory for all learners and teaching personnel in schools, so, likewise, some means can be devised to provide gadgets for learners. A precedent has already been set in South African tertiary institutions, whereby students are provided with laptops. This could be extended to schools to facilitate the transition.

5.7.2 Information and Communication Technology (ICT) should be compulsory in teacher-training institutions.

In some of the responses that were given to the questionnaires, (bearing in mind that respondents in this study were teachers) teachers felt they were alien to ICT integration in the classroom, not out of sabotage, but because ICT is new to their teaching activities. This is an authentic impression by teachers who were not introduced to ICT during their training and only came across these devices as mere communication devices, unrelated to teaching and learning. Such teachers develop a negative attitude towards ICT in schools. Although it (ICT) is slowly being introduced in schools, it is either late in their teaching careers or it is the responsibility of the non-teaching personnel who are termed laboratory assistants and so teachers do not feel being part of the exercise.

5.7.3 Dire need for sound technological infrastructure in schools.

This recommendation calls for the DBE to work cooperatively with government structures. It would be futile expenditure to provide devices when there is no infrastructure to activate them into normal functioning. This calls for an adequate supply of Wi-Fi to connect the devices into full operation and also data supply. In South Africa, even urban areas have problems with connectivity, and it hinders smooth network operation. One of the open-ended questions posed to respondents was: *What are the factors that hinder the implementation of these 21st century devices in teaching and learning?* In responding to this question, there was mention of the major problem with connectivity, expensive data and inconsistent Wi-Fi which the DBE needs to give a close look into, as it serves as a hindrance.

5.7.4 ICT subjects to be compulsory in all subject streams in schools.

Just as there has been compulsory inclusion of Mathematics Literacy in schools to promote counting, even for those who are not doing the Science stream, the same can be done to capacitate learners in computer literacy. The fact is, learners already are well-accustomed to smartphones from an early age, but just for socializing purposes. In some schools, cell phones are confiscated from learners because they are deemed as sources of distractions. Indeed, they are sources of distractions, but that can be changed and rather converted into sources of academic information for assignments and homework. If the DBE can regulate that every learner be equipped with technological skills (as in China), online learning will

improve tremendously. Currently, most households have compromised landlines and have replaced that with cellphones This implies that some parents can afford to purchase the devices for their children. This may help schools if parents meet them in a way, because most learners will be in possession of the devices.

5.7.5 Virtual meetings to be the norm in schools.

The current status quo globally is that the world is engulfed by the COVID-19 pandemic and the World Health Organization (WHO) has legislated social distancing to prevent infection. In all institutions there is a need for meetings, whist observing social distancing. This has inevitably necessitated the need to strengthen virtual meetings which requires basic knowledge of ICT. So intensive training is essential for the teaching personnel to be technologically equipped so that they can be part of these types of meetings, which are gradually becoming a norm in most work institutions. This calls for active infrastructure to install Wi-Fi systems, availability of gadgets and trained IT personnel to run the programs smoothly. More importantly, it calls for a vibrant economic status which the DBE is advised to provide, without fail, so that education is not compromised in terms of its constitutional right.

5.7.6 Strengthen the functioning of national ICT department.

The researcher is aware there is a wing of Science and Technology which falls under the auspices of the Department of Higher Education. This is highly appreciated; however, one is of the view that the DBE also requires this department. Where it is currently located, it carries a misconception that the Science and Technology belongs to those who have reached tertiary level. The best way to accommodate all levels is to have a vibrant ICT department responsible for schools; such an arrangement will allow for a smooth transition from DBE to Higher Education and ensure some form of synergy. Once this arrangement is in place, teachers and learners can find it easy to do assignments, homework and any form of research; it will also enable learners to work at their own pace and at their leisure. This will also facilitate the integration of ICT in the classroom with both teachers and learners ready for the exercise. The rate at which ICT dominates the world in this century, one is skeptical that in South Africa, ICT seems to be rather neglected, hence a recommendation that a well-functioning ICT department be established to ensure that from early schooling days, ICT skills are imparted to learners.

5.7.7 Less paper work, more online activities.

The era of paper work is diminishing day by day due to the expansion of online IT activities. This is not by choice, but is determined by the rate at which technology has developed. Although this may not be an

overnight transformation, it is already being practiced; it is only that it has not yet been enforced through legislation, hence this recommendation.

5.7.8 Online applications

This is now the new norm where school institutions advertise their vacancies online and applicants apply online which will culminate in online registration and interviews. This saves time and reduces human effort, as every correspondence is done online.

5.7.9 Online assessments.

This has taken center stage with institutions of higher learning and was exacerbated by the emergence of the Corona virus. The recommendation is that online assessment be extended to basic education structures. This will include assignments, learning tasks, research and general progress records. Again, this will ensure non-contact as per WHO regulations and hasten the proliferation of ICT activities.

5.7.10 The DBE to provide academically aligned software for schools.

Once the DBE has provided online gadgets to schools and learners, in whatever form, they should endeavor to install software that is academically aligned to the Grade and Phase, in the form of Annual Teaching Plans (ATPs). This will relieve teachers handling huge class loads of learners and afford individual learners and parents the chance to peruse the ATPs in their own time and to acquaint themselves with these documents. Learners enjoy interacting with their cell phones, so if they have something that is school-related in their phones, all the better. Currently, the DBE exam section is preparing matric learners with previous exam question papers for reference and revision. This is a good gesture, but it is available to the few that can afford the gadgets. In one of the open-ended questions in this study, respondents responded that smart phones are expensive and so some parents cannot afford them for their children. It is therefore recommended that the DBE try some means to meet parents or schools to ensure that all learners have the devices as happened with masks and sanitizers for the Corona virus.

5.7.11 Schools to be persuaded to adopt Blended Learning.

This is one of the recommendations made in this study that the DBE should consider persuading schools to adopt blended learning. Blended learning involves face to face and distance learning. In a situation like ours in South Africa, the researcher feels that teaching and learning could be transformed such that it does not completely discard face to face learning, but gradually adopts blended, e-learning or remote learning. Blended learning was tried during the fees-must-fall campaign in South African universities during 2014/5 period. Physical contact had come to a complete halt due to students' uprisings. To keep

the ball rolling, universities opted for blended learning as the best substitute. One should hasten to mention that at universities who adopted blended learning, it was not all smooth sailing though; there were a lot of disagreements and unhappiness about the implementation, even among the lecturers. At the end, for learning to proceed, blended learning was the option, bearing in mind that this was long before the Corona virus pandemic. At the present time, blended learning seems to be the only option, as it will make schools comply with social distancing.

To bring the focus of the study back to its original perspective, which is the focus on Grade 12 learner academic performance, the DBE can legislate blended learning for schools. What does blended-learning entail? If adopted, it means:

- Lessons integrate online with face-to-face activities.
- Subjects are taught both in the classroom face-to-face and at a distance.
- Mixing or combining instructional technology with actual job tasks, in order to create a harmonious effect of learning and working.
- Combining computers with traditional teaching.

As alluded to earlier on, these recommendations cannot be implemented overnight; the onus is on the DBE to see what worked with the universities and what did not work in the implementation of blended learning. The bottom line though, is, the emergence of 21st century technology which means less contact and more distance learning.

The pre-requisite for the adoption of blended learning on a full-scale, is the provision of the devices to schools or learners, whichever comes first. Bullet 3 above mentions combining instructional technology with actual tasks. This implies adequate time to interact with the gadgets to enhance performing a task. Blended learning will introduce online technology in a staggered fashion, because it will not suddenly do away with face-to-face learning. As mentioned in bullet 4 above, it will combine computers with traditional teaching.

5.7.12 Formation of ICT committees.

This recommendation means that the DBE could propose that wards (former Circuits) form their own mini-ICT committees, which will operate under the auspices of District and Provincial ICT committees. This suggestion emanates from the outcry that at school level, teachers feel forgotten in terms of having ICT workshops. The Provincial committees will plan workshops, which will be cascaded to Districts and wards. This will ensure that such workshops reach every teacher throughout the Province, and eventually nationally. In 5.7.6 above, there is a recommendation put forward to strengthen national ICT committees. A structure such as the one suggested will ascertain that the integration of ICT in the classroom is done

with aplomb and all relevant parties will be involved. Definitely such measures will alleviate ICT illiteracy, and will inspire teachers to be more active in ICT-related activities and will yield positive learner academic performance. These committees will have to compile a comprehensive report to whoever is responsible for ICT at the DBE structures, to keep record of the number of workshops conducted and to trace progress to effect positive changes and discard negative incidents during the course of the implementation.

5.8 CONCLUSION

The influence of 21st century technology on learner academic performance in King Cetshwayo District has been unpacked, using structures that are hands-on with the day-to-day happenings in the classroom. Teachers were the respondents in this study. The fact of the matter is that as we approach the Fourth Industrial Revolution, it is technology in its entirety. We are presently in the 5G era, which comes with its own technological developments and those innovations have an impact on education and so we must not be found technologically wanting. This study, among other things, intends to warn the government, especially the DBE, that technological innovations are not a phase, but a process. As technology is evident in every work situation, schools should likewise not be left out.

The recommendations that have been proposed are based on the findings of Chapter 4 of the research questions. Respondents (teachers) were unanimous that indeed 21st century technology does exert influence on learner academic performance. The researcher still maintains that whatever academic outcome is evidenced from the use of the devices depends on how the individual was using the gadget, which (Chapter 2 of this study) requires parental and teachers' guidance. Teachers have expressed in the questionnaires, that they feel technologically neglected, either because in their training there was no ICT education, or because they teach in rural areas, which are technologically disadvantaged.

It is for this reason that the researcher, through this study, sends caution to the DBE not to be oblivious to teachers' discontentment about their trying technological situations. If the DBE could take note of the recommendations made in this study, ICT integration would be done with teachers' support and a high degree of enthusiasm. This will not only be to the benefit of teachers and learners, but will translate to the general community and the country at large. The researcher is also aware of the financial implications if all these recommendations were to be heeded to. The COVID-19 pandemic has set a precedent that the government has the potential to respond to emergencies. This study treats the technological situation as requiring emergency attention by the government and the DBE. This study has afforded the school authorities an opportunity to undergo introspection and provide technological education through ICT committees (proposed above), bring everybody on board (including parents), thus putting South Africa at a global level in terms of 21st century technology.

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Appendices

Appendix A: Editing Certificate

Certificate of editing

This is to certify that the following document has been language edited:

INFLUENCE OF 21st CENTURY TECHNOLOGY IN LEARNER PERFORMANCE IN THE KING CETSHWAYO DISTRICT SECONDARY SCHOOLS

Nature of document: Dissertation

Author: J.P. Seme

Date of statement: 17 November 2021

Dr J.F Magwaza

.....

BA: English and Linguistics

BA Hons, MA: African Languages and Linguistics (Wits), PhD (Unizulu)

Tel: 035 9026877

Cell: 0712061565

Appendix B: QUESTIONNAIRES TO EDUCATORS

INFLUENCE OF 21ST CENTURY TECHNOLOGY IN LEARNER ACADEMIC PERFORMANCE IN KING CETSHWAYO DISTRICT.

This questionnaire purports to acquire data on the Influence that modern technology has on learner academic performance in Secondary school learners of King Cetshwayo District. This is a voluntary exercise by respondents; the results will be used only for educational purposes towards improving academic learner performance.

The information collected will be treated with utmost confidentiality for the individual respondent and the school. The researcher appreciates your time given to this questionnaire and your authentic responses.

Please use a cross (X) in the space provided to answer the following questions.

SECTION A

Background Information

1. **Gender**

Male	
Female	

2. **Age**

20 – 25	
26 - 30	
31 - 35	
36 - 40	
41 - 45	
46 - 50	
51 - 55	
56 - 60	
60 – and above	

3. **Academic Qualification**

Matric	
Diploma	
Bachelor's Degree	
Professional Degree	
Degree and teacher`s certificate (PGCE)	
Honors	
Masters and above	
Doctoral Degree	

4. Years of Experience

1-5	
6-10	
11 -- 15	
16 - 20	
21 - 25	
26 -- 30	
30 and above	

5. Status

Principal	
Deputy Principal	
Head of Department (HOD)	
Educator	

SECTION B

In this section you are required to answer questions by a tick on a five-point scale using the following categories: **Strongly Agree (SA), Agree (A), Undecided U Strongly Disagree (SD), and Disagree (D).** The following statements are based on:

1. The influence that 21st century technology has on learner academic performance.

NO	STATEMENT	SA	A	U	D	SD
1.	Modern technologies yield positive influence on learner academic performance.					
2.	Schools with sound technological infrastructure produce learners with better academic performance.					
3.	Schools should encourage use of modern technologies during lesson presentation for improved learner performance.					
4.	Teachers must have access to gadgets of learners to ensure they contain academic content.					
5.	Over use of cell phones may result in learners becoming gadget slaves and yield poor academic performance.					
6.	Some learners suffer from sleeplessness out of over use of modern technological gadgets and poor academic performance results.					
7.	Sound home technological background is essential for learners to perform well academically.					
8.	The extent to which learners perform academically depends largely to learners` use of online technology.					
9.	Learner`s academic performance is higher in urban schools because most learners use modern online technology.					
10.	Learners who spend less time on their gadgets perform better academically because they dedicate their time on school related activities.					

Now respond by putting **Y (Yes), U (Unsure/ undecided) and N (No)** in the appropriate box chosen**.** The following statements are based on:

2. The roles that school stakeholders can play in improving learner academic performance.

NO	STATEMENT	Y	U	N
1.	School authorities should take the lead in controlling the use of online gadgets by learners in schools.			
2.	Parents need to know the contents of gadgets their children use.			
3.	Schools should adopt a more technological approach to teaching to enhance improved learner academic performance.			
4.	DBE should ensure that curriculum related content is downloaded to learner`s gadgets for easy access at their leisure time.			
5.	SGBs should be involved in content selection of learner`s gadgets to ensure curriculum related content.			
6.	Local district officials should monitor relevance of academic content of learner`s gadgets as professionals.			
7.	Departmental officials should physically visit local schools for the sole purpose of random checking of contents learner`s gadgets.			
8.	DBE should support schools with gadgets so that even those from poor family backgrounds can access modern information.			
9.	Parents must monitor times their children spend on their gadgets to alleviate evil habits through online communication.			
10.	School authorities should encourage online learning to make teaching and learning easily accessible.			

Respond to the following statements by circling the scales of 1-5 where 1 means undesirable and 5 most desirable:

3. The strategies that DBE can use to control abuse of online gadgets by learners.

NO	STATEMENT	1	2	3	4	5
1.	DBE should legalize the use of technological gadgets in schools but under strict terms and conditions.					
2.	Parents, according to DBE, need to keep the gadgets during school hours and return them after school and week-ends.					
3.	District officials should regularly monitor the of gadgets to ensure their academic compliance.					
4.	DBE should enforce on-line curriculum content for easy access to learners.					
5.	Gadgets to be confiscated during teaching and learning times and be returned after school.					
6.	ICT should be compulsory in all schools to enhance teaching and learning for improved learner academic performance.					
7.	A control register for learners possessing gadgets should be enforced by schools for easy control.					
8.	DBE should ensure that Wi-Fi infrastructure is adequately available for learners to access information easily.					
9.	DBE should ensure parents allow teachers to monitor and control gadget usage by learners in schools.					
10.	All DBE structures (including circuit offices) should ensure that learner`s gadgets are downloaded with curriculum related content for every learner to access information.					

SECTION C

In this section you are requested to give your own objective opinion based on your experience and observations regarding the influence of these 21st technological devices and their impact on learner academic performance.

1. How do you think online technological devices can positively affect learner academic performance?
   ……
   ……
   ……
   ……..
2. What role can stakeholders play to help learners improve their academic performance using gadgets?
   ……
   ……
   ……
   ……
3. How can teachers help learners use the gadgets to improve their academic improvement?
   ……
   ……
   ……
   ……..
4. According to your observation, what are the challenges of using these online devices?
   ……
   ……
   ……
   ……
5. How do you think teachers and parents should control the use of these 21st century devices by learners to yield positive learner academic performance?

   ……
   ……
   ……
   ……

6. What are the factors that can hinder the implementation of these 21st century in teaching and learning?

   ……
   ……
   ……
   ……..

7. Which strategies can DBE employ to ensure that the use of these 21st century gadgets are promoted in schools?

……
……
……
……

8. What is the influence of these 21st century technological devices on learner's academic performance?

……
……
……

THANK YOU VERY MUCH FOR ALL YOUR RESPONSES!!!!!

Dissertation

ORIGINALITY REPORT

10%	11%	4%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.education.gov.za Internet Source	1%
2	ccsenet.org Internet Source	1%
3	www.afrrevjo.net Internet Source	1%
4	journals.sfu.ca Internet Source	1%
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7	www.scielo.org.za Internet Source	1%
8	www.tandfonline.com Internet Source	1%
9	aisel.aisnet.org Internet Source	1%

Appendix D: Ethical clearance certificate

UNIVERSITY OF ZULULAND
RESEARCH ETHICS COMMITTEE
(Reg No: UZREC 171110-030)

RESEARCH & INNOVATION
Website: http://www.unizulu.ac.za
Private Bag X1001
KwaDlangezwa 3886
Tel: 035 902 6731
Fax: 035 902 6222
Email: LundallN@unizulu.ac.za

ETHICAL CLEARANCE CERTIFICATE

Certificate Number	**UZREC 171110-030 PGM 2020/50**							
Project Title	**Influence of the 21st century technology in learner academic performance in King Cetshwayo District Secondary schools**							
Principal Researcher/ Investigator	J.P Seme							
Supervisor and Co-supervisor	Dr B.T Gamede		Dr C Uleanya					
Department	Social Sciences							
Faculty	Education							
Type of Risk	Medium Risk – Data collection from people							
Nature of Project	Honours/4th Year		**Master's**	x	Doctoral		Departmental	

The University of Zululand's Research Ethics Committee (UZREC) hereby gives ethical approval in respect of the undertakings contained in the above-mentioned project. The Researcher may therefore commence with data collection as from the date of this Certificate, using the certificate number indicated above.

Special conditions:

(1) This certificate is valid for 1 year from the date of issue.
(2) Principal researcher must provide an annual report to the UZREC in the prescribed format [due date-01 October 2021]
(3) Principal researcher must submit a report at the end of project in respect of ethical compliance.
(4) The UZREC must be informed immediately of any material change in the conditions or undertakings mentioned in the documents that were presented to the meeting.

The UZREC wishes the researcher well in conducting research.

Professor Mashupye R. Kgaphola
University Research Ethics Committee
Deputy Vice-Chancellor: Research & Innovation

01 October 2020

CHAIRPERSON
UNIVERSITY OF ZULULAND RESEARCH
ETHICS COMMITTEE (UZREC)
REG NO: UZREC 171110-30

01 Oct 2020

RESEARCH & INNOVATION OFFICE

Appendix E: Request for permission to conduct research

P.O. Box 2405
Esikhawini
3887
02 April 2019

The District Manager

King Cetshwayo District

P.O.Box 20104

Empangeni

3880

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

I am currently conducting a study aimed at investigating the influence of 21st century technological devices in academic learner performance in King Cetshwayo District Schools. Permission is therefore requested to conduct such a study in the schools under your jurisdiction. This research is towards completion of my M Ed degree in **Social Science Education** and is being carried under the supervision of Dr Gamede, B.T at the University of Zululand Campus.

The topic of my dissertation **is "The Influence of 21st century in learner academic in King Cetshwayo District: A case of Grade 12 learners"**. For the purpose of this study, schedules of questionnaires will be designed which will be administered to District Officials, Principals, SMT's and PLI educators of selected schools located in King Cetshwayo District.

All the information elicited in the research will be treated in confidentiality and anonymity. Information gathered in this research will provide invaluable assistance to the headmasters and their School Management teams (SMT's) as well as the Department of Education in South Africa.

Thanking you in Anticipation.

Yours Faithfully

JP Seme

Appendix F: Permission to conduct research from the KZN DoE

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201
Tel: 033 3921062 / 033-3921051
Email: Phindile.duma@kzndoe.gov.za
Buyi.ntuli@kzndoe.gov.za

Enquiries: Phindile Duma/Buyi Ntuli **Ref.**:2/4/8/7012

Mr Justice Phila Seme
P.O. Box 2405
ESIKHAWINI
3887

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"INVESTIGATING THE INFLUENCE OF ONLINE TECHNOLOGY ON SECONDARY SCHOOL LEARNER'S ACADEMIC PERFORMANCE IN KING CETSHWAYO DISTRICT:**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 23RD September 2020 to 10TH March 2023.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma/Mrs Buyi Ntuli at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

Dr. EV Nzama
Head of Department: Education
Date: 23 September 2020