

USE OF TABLETS TO PROMOTE EFFECTIVE TEACHING AND LEARNING: A CASE STUDY OF A HIGH SCHOOL IN GAUTENG PROVINCE, SOUTH AFRICA

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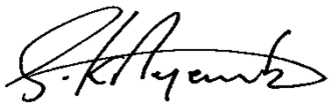
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Declaration

I, Stanley Khumbulani Nyembe, Student Number: 0303603A declare that this is my own unaided work. It is submitted for the Doctor of Philosophy in Education at the University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted before for any degree or examination at any other university.

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List of Acronyms

CK	Content Knowledge
DBE	Department of Basic Education
DDES	District Director of Ekurhuleni South
GDE	Gauteng Department of Basic Education
ICT	Information and Communication Technology
IT	Information Technology
MEC	Member of Executive Committee
PCK	Pedagogical Content Knowledge
PIRLS	Progress in International Reading Literature Study
PK	Pedagogical Knowledge
SAMR	Substitution, Augmentation, Modification, and Redefinition
TCK	Technological Content Knowledge
TIMSS	Trends in International Mathematics and Science Studies
TK	Technology Knowledge
TPACK	Technological Pedagogical Content Knowledge
TPK	Technological Pedagogical Knowledge

Abstract

The South African school system faces challenges due to limited access to educational resources including technology, leading to learners struggling with reading for understanding, knowledge application, and achievement in science subjects. International benchmark tests have revealed that the South African education system has produced a number of learners who cannot read for meaning, write and count effectively. One of the interventions initiated by the Gauteng Department of Basic Education was to introduce tablets as a tool for teaching and learning in and outside the classroom settings. This study employed a mixed methods research approach in which 146 Grade 8 learners and 34 Grade 8 teachers completed questionnaires intended to ascertain their experiences, feelings, conceptions and perceptions about the educational value of using tablets for teaching and learning in and outside the classroom. Classroom observation was also employed to investigate how teachers teach and learners learn when tablets were used in the classroom for reading, activities, research, video clips, and educational games. The analysis for classroom observation used a Likert scale to evaluate teaching effectiveness and the impact of tablets on learning. Phenomenographic interviews were conducted whereby learners answered 22 pre-determined questions, while teacher interviews focused on training, comfort with technology, and adaptation in teaching. Interviews were audio-recorded, transcribed and analysed through six key themes, namely, teaching techniques, meaning, promoting effective learning, seven practices for effective learning, promoting effective critical thinking, and seven components in the Technological, Pedagogical and Content Knowledge (TPACK) framework. Department of Education officials were interviewed to establish the rationale behind the introduction of tablets. The analysis of phenomenographic interviews employed Marton's framework as well to evaluate teaching and learning with tablets. Although conducted prior to COVID-19, the study's findings remain relevant, as the pandemic and recurring power outages forced schools to adopt hybrid or blended learning models. The results revealed that teachers and learners had mixed feelings regarding the educational value of using tablets in schools. Some teachers supported the notion that their use creates opportunities for learning, especially if the user knows how to teach with technology. Others were concerned about time lost, as learners tended to focus on non-academic content, and felt that some learners lack discipline when tablets are used in the classroom. Learners also had mixed feelings about the use of tablets in the classroom,

with some stating they cause distraction and others stating they enhance learning. Classroom observations were viewed through the TPACK lens to ascertain teachers' pedagogical knowledge. Teachers noted that tablets facilitate interactive, multimedia instruction, boosting learner participation through digital quizzes, video tutorials, and interactive applications. Tablets also provide learners with easy access to online resources, enhancing their knowledge acquisition and comprehension of complex science subjects. Additionally, they accommodate personalised learning experiences, enabling learners to learn at their own pace and learning level. However, the development of teacher and learner resources in schools needs to go hand in hand with appropriate teacher professional development in order to maximise learner engagement in classroom settings. The findings indicate that the use of tablets improves teaching and learning, which aligns with universal theories of learning such as social constructivism. While the educational value of tablets could not be quantifiably measured, their potential to foster self-directed learning, stimulate curiosity and provide better learner autonomy was evident. Overall, the study supports the incorporation of tablets in classrooms for facilitating internet-based knowledge access and improving instructional effectiveness.

CHAPTER 1: INTRODUCTION

1.1 Overview of Chapter 1

The major challenges encountered in education today are the low-quality human capital and the need to adjust to the fast-paced digital world. In the South African context, the major challenges faced in the education system include inequality, unfair distribution of resources, inadequate learning environment, teachers' lack of confidence in subject content, poor teaching skills, the inability to access educational resources to stimulate learning, and inadequate understanding of the use of technology to enhance the education process (Puspitarini & Hanif, 2019). This study explores the rationale for, and educational value of, using tablets to enhance learning in South African schools.

The outline of the sub-topics for Chapter 1, shown in Figure 1.1, lays a foundation for the study. Chapter 1 is broken down into eight sub-topics, namely, the preview of Chapter 1, problem context, aim and purpose, rationale, statement of the problem, research questions and sub-questions, significance of the study, an outline of all chapters, and chapter summary.

Chapter 1: Introduction								
Overview of Chapter 1	introduction	Problem context	Problem statement	Aim, objectives and purpose	Research question and sub-questions	Rationale of the study	Arrangement of the thesis	Chapter summary

Figure 1.1: Outline of sub-topics in Chapter 1

1.2 Introduction

This study sought to ascertain the educational value of integrating tablets into South African classrooms to enhance teaching and learning, using a small sample of Gauteng schools as a prototype. Integration of Information and Communication Technology (ICT) in education is taking place globally. ICT integration in educational activities can potentially have a positive impact on teaching and learning (Lisene et al., 2018). Tablets are among the devices used in and outside the classroom for teachers and learners to access internet-based resources and multimedia. Such technology can

be used synchronously and asynchronously to enhance learning in and outside the classroom. For this study, synchronous learning means that although learning is from a distance, pupils will virtually attend firmly scheduled class sessions each week, at the same time as their instructor and fellow pupils. With asynchronous learning, participants can engage with educational materials and activities at their own pace and time, without the need for real-time interaction or a scheduled setting (Hung, 2024). Ominowa (2022) notes that teachers need to recognise the importance of using technology in their professional settings and should focus on the synergy between pedagogy and how technology can be implemented within specific content areas. This study investigated the rationale behind introducing tablets in South African schools, focusing on their role in enhancing learning by replacing traditional hard-copy textbooks with e-textbooks. It was anticipated that using tablets would enhance students' learning and growth by fostering internet and global connectedness and enabling them to access resources outside of the classroom, especially in township schools. Tablet use in classrooms is believed to enhance cognitive skills, increase learner engagement, and promote deep learning among learners.

Globally, access to the internet has enhanced learners' independence, making tablet use in the classroom more relevant for the Fourth Industrial Revolution. Teaching in the Fourth Industrial Revolution necessitates a shift in teaching practices to encourage students to apply, evaluate, and create knowledge beyond mere comprehension. The COVID-19 outbreak emerged as a global problem that imposed barriers on the educational sector including at the school and curriculum level, as well as technological, financial, and individual barriers. All these barriers needed research-based solutions to facilitate the rapid integration of technology into schools (Christopoulos & Sprangers, 2021; Adov & Maeots, 2021; Ferdig et al., 2020; Rasmitadila et al., 2020; Kaharuddin et al., 2020). South Africa is among many countries whose education sector was caught unprepared by the effects of the COVID-19 pandemic. Due to the resulting 2020 total lockdowns, the education sector experienced a complete closedown of all schools in the country and, consequently, face-to-face teaching and learning in classroom settings were totally compromised. Teachers were forced to promptly re-think and consider the use of technology, especially internet-based technology, to reach learners in their homes. In line with the perceived enhancement of learning through the use of tablets in classroom settings, the Gauteng Department of Basic Education (GDE) embarked on an initiative to

provide learners with technological devices as a means of refining the level of education in South African schools (Mosehlana & Sebola, 2020).

Teachers can also use ICT to access a variety of educational resources (Zungu, 2022). In this study, teachers and learners were observed utilising tablets in the classroom to determine the role tablets play in the progression of critical thinking, learner engagement, learning, and teaching. According to Vygotsky's social constructivist theory of learning, children learn best through active listening and response to others' ideas, enhancing their comprehension of the subject matter (Vygotsky, 1978). The internet in classrooms assists learners to comprehend concepts through various learning methods, including videos, diagrams, and images. To add value in teaching and learning, teachers and learners utilise the internet to download e-textbooks, videos, and other teaching resources onto their tablets, thereby enhancing their access to study material. In so doing, tablets have revolutionised learning, enabling access to information anytime, anywhere, reducing the need to carry books, and making learning more accessible. Zungu (2022) reported that ICT can enhance learner collaboration and communication, offer flexibility, and help learners better understand their teachers.

Learners use tablets for assignments, projects, and to research independently. Through the promotion of diverse teaching methods and the exploration of novel ideas, this study aimed to explore how using tablets in the classroom could enhance personalised learning and improve effective learning through access to multiple sources of information, and using search engines such as Google for further information. Utilising tablets enhances learners' involvement in learning, promoting a learner-centred approach crucial for knowledge retention (Zungu, 2022). Learners who utilise tablets are keen to use search engines such as Google to learn more about the subject. Tablets enhance classroom teaching and learning by improving communication between teachers and learners, enhancing information access, and adding educational value to both teachers and learners. Moreover, virtual classrooms allow motivated learners to learn without direct teacher involvement (Maja, 2023). Technology encourages both teachers and learners to independently explore, research, and discover knowledge. However, previous research also indicates a lack of evidence on the impact of educational apps and technology on learning (Naidoo, 2017; Winter et al., 2021). Conversely, Albiladi and Alshareef (2018) suggested that

tablets enhance creativity, innovation, and collaboration in learning by providing opportunities for interaction and exploration among learners.

1.2 Problem Context

The South African education system produces learners who cannot read, write, and count effectively (Dempster et al., 2022; Fishbein et al., 2021; Foy et al., 2019; Thompson et al., 2017; Reddy et al., 2015; Reddy, 2017; Mullis & Martin, 2017). This information is documented in reports from different international studies such as the Trends in International Mathematics and Science Study (TIMSS) 2019 (Fishbein et al., 2021; Foy et al., 2019), the Progress in International Reading Literature Study report (2013), the Global Information Technology (GIT) report (2013), the Item Diagnostic (ID) report (2017) and the TIMSS report (2015) (Foy et al., 2019; Thompson et al., 2017; Reddy et al., 2015; Reddy, 2017; Mullis et al., 2017). Furthermore, it has been reported that Natural Sciences learners in South Africa do not meet the benchmark when compared to the rest of the world. Table 1.1 indicates South Africans' poor achievement when compared with other countries. The TIMSS report of 2017 (Mullis & Martin, 2017) revealed that in all strands of Natural Sciences, South African learner achievement on all test items was approximately half as strong as the international standard; that is, 24% for South African learners compared to 43% for the international standard.

Table 1.1: Natural Sciences achievements of South African and international learners (percentage of correct answers)

	Life and Living	Matter and Materials	Earth and Beyond	Energy and Change
South Africa	25	22	25	25
International	44	41	45	42

Source: Dempster et al. (2022)

Various reasons contribute to the lower than benchmark performance observed in South African schools. The reported challenges learners experience in South Africa include understanding the subject jargon, reading for meaning, writing, and counting effectively (Dempster et al., 2022). Mathematics is also a language, and learners need to understand the language of Mathematics to know how to work out the sums (Dempster et al., 2022). When a learner can read for meaning, they can read instructions with an understanding of the subject's jargon and content and understand questions asked in subjects including Natural Sciences (Dempster et al., 2022).

Language diversity can also create language barriers that could hamper learning and learner performance (Anspoka, 2016), especially when using technology. Using technology requires good communication skills from both teachers and learners (Al-Qahtani, 2019). South Africa, as a rainbow nation with 12 official languages, including sign language, has a diverse population. Teachers and learners are from different backgrounds and speak different languages. It is very rare to find an individual capable of speaking and writing more than three languages. This means that teachers in the classroom environment have to teach learners from different backgrounds. Often, however, learners are taught in English, a language they do not understand well. They struggle to understand the new language used for teaching and learning at school before they understand the content.

Over and above the language issues, tools and resources have been identified as factors that contribute to learners' poor performance in South African schools. In the conventional approach to teaching and learning in the context where learning happens in a synchronous environment, teaching is teacher-dominant, textbook-centred, exam-oriented and the conventional learning resources include textbooks and a calculator that learners can carry home. These educational resources increase the learners' focus and motivation, and improve the learning methods and process. Traditional educational material including maps, models, and textbooks are less valued in the technological era of the internet and contemporary communication technologies, whereas technological tools such as computers, tablets, projectors, and other transportable compacted systems are of growing importance. Poor educational approaches and resources have been associated with poor learning outcomes where learners underperform and sometimes drop out of the education system without a qualification. Therefore, using technology in the classroom as an avenue to potentially enhance the outcomes of learner performance in South African schools has become a necessity. Devices such as tablets and desktop computers have internet-based technology, which enhances learning and increases learner interaction. Educational resources develop and expand human knowledge in the psychomotor and cognitive fields of learning (Hoque, 2016). However, many South African schools are not equipped with technology. The gap between first-world and third-world nations regarding access to technology is large and notable. When compared with third-world countries, which lack such resources, it is the norm to have a network and a strong

internet signal in first-world nations. Fuchs and Horak (2006: 99) maintain that the digital divide concerns the unequal access to and usage of technologies.

Institutions and organisations such as the TIMSS roll out standardised tests in Science and Mathematics to help countries make informed decisions about how to improve teaching and learning in these subjects. The TIMSS measures the learner's achievement in Mathematics and Science in a way that does justice to these subjects as they are taught in the participating countries which include South Africa. This means that TIMSS monitors countries' improvement or decline by tracking trends in learner performance from one assessment cycle to the next (Mullis & Martin, 2017). The TIMSS 2019 report states that children should talk in their home language if it encourages free expression, but if the language of teaching and learning at the school is English or Afrikaans, children need to speak English and Afrikaans (Dempster et al., 2022), which seem to denote that language could be a barrier as well.

While there have been efforts to improve education systems worldwide, research studies are constantly conducted to seek reasons and solutions for underperforming learners (McLeod et al., 2020). The importance of enhancing the educational environment and resources was motivated further by the COVID-19 pandemic in 2020. Globally, the COVID-19 pandemic sparked continued concerns about ways to continue education in a nonconventional way without being in a classroom and not having a face-to-face platform (Dobrila, 2020). At the onset of the severe lockdown restrictions where everyone stayed at home, teachers and learners in many third-world nations including South Africa were caught unprepared. Education institutions realised the need to embrace technology in the education space, and technology therefore gained momentum as a tool to enhance teaching and learning. Hence, using technology in the classroom has become necessary. However, although the importance of using technology in the classroom has been acknowledged, the existing socioeconomic inequalities and barriers are still a challenge in South African schools. These challenges include unaffordable costs of devices, lack of connectivity or network, the necessary knowledge and skills to use educational technology, and reluctance of teachers to change their mindsets.

South Africa as country consists of nine provinces, which are diverse in terms of population, allocation of funds, culture, administration, and school resources (Steyn et

al., 2007). While the people enjoy unity in diversity in these provinces and in South Africa at large, the inequality in schools creates notable gaps in management, teaching, resource allocations and infrastructure. Moreover, some schools are identified as fee-paying schools and others as non-fee-paying schools. Geographically, some schools are located in townships and rural areas while others are located in suburbs (Blake & Mestry, 2021). The disparity in geographical location creates imbalances in resource allocations, thereby deterring education in townships and rural schools. Hence, there is a need to redistribute available resources equitably.

South Africa has made notable developments in increasing educational opportunities and redressing the inequalities of apartheid (Ndimande, 2016). While teachers lack the knowledge to use technology as a teaching tool, learners tend to regard this in a positive light when they realise the tool's ability to make learning more accessible to them. The tool affords them access to internet-based technology, online lessons, video clips, educational games, quizzes, previous examination papers, and graded study materials to learn beyond classroom settings. Cohen et al. (2003: 129) argue that "The differences depend on the use of resources; access creates opportunities for resource use, but resources are only used by those who work in instruction". This means that teachers' input in technology-supported learning is important in facilitating effective learning. Vygotsky's Zone of Proximal Development (ZPD) is seen as key in emphasising the role of the teacher more clearly. Vygotsky noted that there were things that a learner could do as an individual (without the help of a teacher or capable peers) and those that they could not do without the help of the teacher or capable peers (Vygotsky, 1978).

In light of addressing equity for learning resources for learners, the Gauteng provincial government purchased 88,000 tablets in 2014, to replace Gauteng Online Services. Gauteng Online Services was a central facility previously in place, which was run on a set timetable, with slots allocated for learners to access computers and learn basic computer skills such as typing, downloading, and searching for information. "The Classroom of the Future" initiative, which involved the provision of electronic tablets for each learner to improve learner engagement and critical thinking in the classroom setting, was piloted in 2013 in seven schools in Gauteng Province, South Africa. This initiative suggested that the provision of technology in schools was a means of attaining better educational standards and performance to achieve equity between the schools.

In 2015, Panyaza Lesufi, the Premier of the Gauteng province, also responded to the need to enhance education by setting up systems that supported education equitability for the township and high-end schools in the province (Lesufi, 2015: 1). This was the case for distribution and access to technology for educational purposes. However, researchers such as Cohen et al. (2003: 119) argue that "the differences in a school's aggregate achievement are not much related to differences in the aggregate resources". Learner performance might be influenced by other factors such as the language of teaching and learning, teachers' subject knowledge, as well as their skills in using technology for teaching purposes. To address the education gap, the GDE responded to the TIMSS by investing in "The Classroom of the Future" to improve the quality of teaching and learning in classroom settings.

Learners in South Africa are failing to meet the international benchmark of learner performance in critical subjects such as Natural Sciences and Mathematics, which is a concern to the learner, parents, and the government. Therefore, there is a need to develop an effective education system with strategies that can embrace every child and enhance learning in a classroom. This study selected the Technological Pedagogical Content Knowledge (TPACK) framework for understanding how teachers and learners use technology in the classroom to improve learning. Glowatz and O'Brien (2018: 15) maintain that access to quality education requires a "pedagogic tool which utilises technology to teach content and knowledge which present concepts to learners as tangible". For this reason, the researcher in this study has drawn on the TPACK framework, as it is a unique type of knowledge that strengthens effectiveness.

The tablet device was identified at the onset of attempts to incorporate technological tools in high schools. This study argues that the provision of technological tools does not guarantee enhanced learner engagement or improve critical thinking and learner performance. Consequently, the learning process is still dependent on the way that resources such as tablets are used. Furthermore, this study argues that international organisations such as TIMSS, which use the universal English language to set standardised tests and determine the level of learner performance in Science and Mathematics, marginalise learners and label them as underperformers. While it is clear that the teacher plays a crucial role in the advancement of learning, this study aimed to establish teachers' experiences when teaching with tablets in the classroom. It was important to investigate how learners used tablets to remove barriers to learning.

Therefore, this study focuses on establishing the academic value of using tablets to enhance teaching and learning in South African schools.

1.3 Problem Statement

The South African education system is challenged by learners' inability to access educational resources that stimulate their minds. Consequently, the system produces learners who struggle to read for meaning, apply the knowledge learned, and achieve in critical subjects. Centurino and Jones (2019) indicated that the image of South African education is of a system that is not in a good state (Centurino and Jones, 2019). Learner performance in South Africa does not meet the global benchmark. Reports on learner performance such as the Progress in International Reading Literature Study (PIRLS) report (2013), TIMSS 2019 Science Framework Report (Centurino & Jones, 2019), the ID report (2017), TIMSS (2015), and the GIT report (2013) confirm that South Africa was at the lowest standard when compared with other countries in the world. Therefore, there is a need enhance the education system with interventions that can improve the standard of education in the country.

Therefore, this study aimed to investigate the effectiveness of using tablets to improve the standard of education while uncovering potential consequences that could arise from the use of tablets in the classroom. Furthermore, the study aimed to ascertain teachers' and learners' experiences when using tablets in the classroom to provide information that could then enable educators and the Department of Basic Education (DBE) to decide whether the expenditure had been worthwhile and could be used to inform attempts at the digital transformation of teaching and learning in schools.

1.4 Aim, Objectives and Purpose

1.4.1 Aim of the study

This study aimed to establish the rationale for, and educational value of, using tablets in schools in Gauteng province, South Africa.

1.4.2 Objectives

The main objective of this study was to:

- Establish the effectiveness of using tablets as tools to enhance teaching and learning in the classroom.

This main objective was broken down into the following five sub-objectives which also guided the investigation processes:

- To establish the rationale for the introduction of tablets in selected Gauteng schools by the GDE.
- To determine how teachers experience teaching with technology and how they use technology in the classroom.
- To determine learners' abilities to use tablets as a resource that can remove barriers to their learning.
- To ascertain teachers' proficiency in using tablets to enhance teaching and learning.

1.4.3 Purpose of the study

The purpose of this study was to establish whether tablets enhance learner performance and improve the outcomes of learner performance in South African schools.

1.5 Research Question and Sub-questions

To respond to the problem statement, the main research question was:

- What is the educational value of introducing tablets in schools?

This main question was broken down into five sub-questions for empirical investigation. The following five categories of sub-questions were considered:

- What was the rationale for tablet use in teaching and learning?
- What are the teacher perceptions of the value of tablets for educational purposes?
- What are the learner perceptions regarding the value of tablets for learning?
- How do teachers and learners use tablets for teaching and learning in and outside the classroom?
- How are tablets used to enhance teaching and learning?

1.6 Rationale of the Study

It is important to note that this investigation was administered before, during, and post the COVID-19 pandemic. COVID-19 posed a threat to the education system, as teachers and learners were forced by circumstances to teach and learn from home,

outside the face-to-face environment. In the absence of a physical classroom environment during the period of pandemic lockdown, learners were expected to rely on technological tools and resources such as tablets, smartphones, the internet, connectivity, and group chat platforms to ensure that learning took place. Learners were forced to work independently, and teachers were forced to be innovative to remotely guide and give direction to the learners. In such circumstances, pre-existing challenges related to infrastructure and lack of technology may have been exacerbated.

In South Africa, the country experienced a hard lockdown whereby all teachers and learners were forced to teach and learn from home, respectively. This, in turn, prompted calls to use technology as a tool for teaching and learning. However, some teachers and learners were not prepared to incorporate technology into their teaching and learning strategies, as they lacked the skills to operate the tablets for teaching and learning. Intensive teacher development and training on how to teach with technology became an urgent need. Teachers and learners were effectively forced to embrace technology in learning. However, it is difficult to establish the learning that takes place in the classroom with the use of devices and how these devices influence the teaching and learning processes. Hackathorn et al. (2011: 40) argue that "current research advocates for teaching techniques that encourage learners to actively engage in educational materials because classroom engagement had been found to promote deeper levels of thinking and better facilitate encoding, storage, and retrieval of information taught in classrooms".

Base on the outlined rationale, this study focuses on establishing the effectiveness of the teachers' and learners' use of tablets in the classroom to enhance effective teaching and learning to develop and advance learners' engagement and critical thinking, among others. Particularly, it was deemed important to investigate the use of technology to facilitate the development of learning skills and to encourage critical thinkers, problem solvers, academics, creators and constructors of knowledge, and good decision-makers (Hurd, 2004; Willingham, 2013), and thereby improve local standards in an attempt to meet the international benchmark standards for the future. Furthermore, the study examined the role of the teacher in "The Classroom of the Future" in facilitating learning and subsequently critical thinking when tablets are used for learning. However, there is a drawback to using tablets in the classroom, which also

needs to be acknowledged. Learners should be educated on the dangers of accessing the internet, as they can be at risk of being exposed to non-academic content that can deviate their focus on academic content. This means that learners could arrive at school with irrelevant information and sometimes misconceptions obtained from their communities or the internet that need to be explored critically, and perhaps corrected by the teacher. According to Brodie (1996: 12), teachers are obliged to direct and guide learners during the course of learning.

The findings of this study are intended to establish the pedagogical effectiveness of using tablets to enhance learner engagement and critical thinking in a classroom setting. The findings will offer suggestions on the alignment of pedagogy and technology to improve teaching and learning in a classroom while providing insight into what enhances learning and, consequently, inform teachers on effective pedagogy. Furthermore, the findings may contribute to the understanding of the potential and pitfalls of using tablets in teaching and learning in a classroom, with lessons for further attempts at integrating technology in South African classrooms, given the various contextual constraints. The findings of this study may thus contribute to guidelines that could potentially be used by the government and school management teams (SMT) in making decisions about moving forward with implementing the introduction of tablets in the classroom to improve learner engagement and critical thinking in all schools in South Africa.

1.7 Arrangement of the Thesis

The thesis has been arranged into seven chapters, as described below.

Chapter 1: Overall Introduction

This chapter describes the state of learner engagement and critical thinking, which has resulted in South African learners achieving below the international benchmark. The chapter also explores the GDE's intervention in "The Classroom of the Future" in which tablets are used to overcome the concerns and problems faced by the South African education system. The chapter overview, introduction, problem context, problem statement, aim, objectives, purpose, research question and sub-questions, rationale of the study, arrangements of the thesis and chapter summary are also included.

Chapter 2: Literature Review

This chapter establishes the educational value of using technological tools such as tablets to stimulate learner engagement and subsequently improve critical thinking. To ascertain that effective teaching and learning are enhanced in the classroom settings, various aspects of knowledge were selected for discussion in this chapter, namely: 1) recent factors that spurred the use of technology in classrooms, 2) using digital tools and resources to enhance teaching and learning, 3) learning with technology, 4) thinking skills in learning, 5) learner engagement and 6) summary.

Chapter 3: Theoretical Framework

This chapter explores the significance of using technology for learner engagement to attain effective teaching and learning in a classroom setting. The TPACK framework is used as a theoretical framework to investigate the skills required by teachers to integrating technology into their teaching pedagogy.

Chapter 4: Methodology

The use of phenomenography to map teachers' and learners' variations in terms of feelings, lived experience, conceptions, and perceptions of using tablets in the classroom and the rationale for the GDE to introduce "The Classroom of the Future" are explored in this chapter. The chapter also describes the three methods of data collection used in the study, namely: Part A, which deals only with interviews, Part B, which deals only with classroom observations, and Part C, which deals with variation in the use of tablets in the classroom. The results and discussion of Part C, which comprises questionnaires, are fused with Part A and B. Furthermore, the significance, location, limitations, and ethical considerations of the study are also included in this chapter.

Chapter 5: Part A: Results and Discussion

The results and discussion of the data obtained in phenomenographic interviews are presented in this chapter, including any qualitative differences that were captured. Data collected was analysed to assist in understanding the effect of teachers on learning by responding to the "what" and the "how" of using tablets in a classroom. Marton's framework was used to analyse and respond to questions posed in this study. This chapter also presents the findings of this study.

Chapter 6: Part B: Results and Discussion

This chapter presents Part B of the results and discussion derived from classroom observations. In this chapter, data are coded and categorised, and a Likert scale was used to evaluate teaching effectiveness and the impact of tablets on learning. Classroom observations were viewed through the TPACK lens to ascertain teachers' knowledge of teaching with technology in the classroom. Both teachers and learners were observed in class using tablets for their daily activities. This chapter reveals the findings in this regard.

Chapter 7: Implication of Using Tablets in South African Classrooms

This chapter discusses the present and future uses of tablets in South African classrooms. Recommendations are made to highlight the educational value of using technology in the classroom setting. The chapter also discusses the varied advantages and disadvantages of using technology to engage learners and enhance their critical thinking, and suggests alternatives and possible ways forward to use tablets for educational purposes. The uniqueness of a study of this nature lies in the use of phenomenographic methods to collect data.

Finally, references and appendices are included in chapters 8 and 9, respectively.

1.8 Chapter Summary

This chapter introduced the scope of the research by developing an outline of the study, which comprises the problem context, problem statement, research question and sub-questions, the aim, objectives and purpose, and the rationale of the study. Based on the problem context, the main research question was developed as: "What is the rationale for, and the educational value of, using tablets in schools?"

In addition, this chapter established the need for improvement in the quality of education in South African schools. An overview of the poor academic status of learner performance in South African schools, highlighting some of the underlying causes, including language issues, geographic locations of schools and their categorisation, the notable gaps in management, inequality in schools, the pedagogy, resource allocations, infrastructure, and lack of technology, was presented.

This chapter also was reported that the GDE has invested in "The Classroom of the Future" to improve the quality of teaching and learning in a classroom setting; moreover, that the GDE opted to introduce tablets to high schools to improve both teaching and learner engagement and, subsequently improve the engagement and critical thinking skills of learners. The chapter also reported on the investigation undertaken to first, understand the GDE's reason and the rationale behind the introduction of tablets in Gauteng schools and establish the effectiveness of teachers' and learners' use of tablets to enhance teaching and learning in a classroom. Secondly, the investigation aimed to determine how teachers experienced teaching with technology and how they used the tablet in the classroom. Thirdly, the investigation aimed to establish how learners used tablets to remove barriers to learning by accessing knowledge and grasping skills that could assist them in achieving their best potential. Fourthly, any potential consequences that could arise from the use of tablets in the classroom, particularly those that could negatively affect the advancement of effective teaching and learning were explored. Finally, the outline of the other study chapters was presented. The next chapter contains details of the literature review corresponding to the research question and sub-questions.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview of Literature Review

This literature review is subdivided into seven sequential sections: 1) Overview of literature review, 2) Recent factors that spurred the use of technology in classrooms, 3) Using digital tools and resources to enhance teaching and learning, 4) Learning with technology, 5) Conception of learning, 6) Thinking skills in learning, and 7) Learner engagement. Figure 2.1 below outlines the sub-sections for Chapter 2, the details of which will subsequently be discussed. The seven sections focus on exploring literature on the experiences and significance of using technology in the classroom to enhance teaching and learning, especially in the South African context. Furthermore, literature to support the GDE's rationale for introducing "The Classroom of the Future" as an intervention strategy to enhance learner engagement and improve their critical thinking in and outside the classroom is explored.

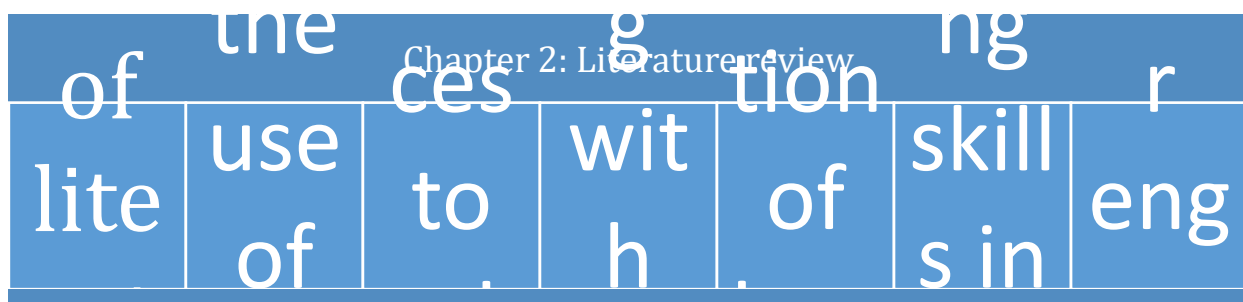


Figure 2.1: Outline of sub-topics for Chapter 2

The literature denotes that technology and the use of digital devices have become an essential aspect of society. Many countries have adopted technology in the classroom as a solution to support learners even beyond classroom boundaries. Technology enables people worldwide to access information and resources instantly. In the same light, technology has become significant in the education sector and its application as an educational resource is constantly increasing. Globally, teachers and learners embrace varied types of technology to promote efficient learning (Naidoo, 2017). Technology is resourced for educational drives such as information and communication technologies (ICT). The internet, laptops, tablets, cloud-based learning, blogs, apps, software, digital whiteboards, and discussion boards are examples of educational ICT used by teachers and learners in classrooms. Educational ICT has become an integral part of the classroom and has revolutionised learning in the 21st century, as it allows

students to instantly conduct research and access educational information that may not easily be obtainable in traditional textbooks. The use of tablets in the classroom to encourage learners to learn actively through enhancement of learner engagement has been recognised by many researchers including McDougall et al. (2018), Ciampa (2013: 82), Neumann and Neumann (2018: 12), Harry et al. (2012: 1) and Hourcade et al. (2014: 3). In addition to what learners learn in classrooms, technology enhances learners' understanding of content in the context of the bigger picture (Pun, 2013: 29).

The incorporation of technology in the education sector and the utilisation of varied technology in the classroom have enhanced active learning where learners engage with the content. When used appropriately, tablets, laptops, computers, and iPads can increase learners' motivation and focus to make schoolwork more interactive and fun. Tablets create classroom and virtual environments that can stimulate students' learning and promote efficient learning.

Taking into account what has been discussed about the use of tablets as a teaching and learning tool, it is important to ascertain the rationale for, and educational value of, using tablets in schools. Furthermore, there is a need to build on the argument of Cohen et al. (2003: 129), who stated that "The differences depend on the use of resources; access creates opportunities for resource use, but resources are only used by those who work in instruction". This argument implies that it is vital to find meaningful ways of integrating with and implementing technology into education where teachers and learners take responsibility for using tablets effectively in a classroom setting. Accordingly, teachers are required to have competencies in designing learning processes appropriate to the technology used in learning, for learner engagement, and for improvement of critical thinking (Rahmawati et al., 2019).

Educators and researchers point out that technology has the potential to increase the motivation and engagement of learners, cater to different learning styles, and improve learning outcomes (Serrano et al., 2019). Therefore, tablets for learning purposes are now a popular classroom tool whereby digital resources can be accessed. Education is gradually shifting from the traditional way of teaching and traditional classrooms towards digitalised classrooms (Mosehlana & Sebola, 2020). Similarly, the South African government is continually upgrading classrooms to address challenges contributing to poor performance of learners in schools. Consequently, the GDE

decided to embark on an initiative to provide learners with tablets to improve the standard of education in South African schools. An example of such an endeavour was the introduction of "The Classroom of the Future" project, where technology was introduced as an intervention strategy to enhance effective learning and teaching, and learner engagement (Hennessy et al., 2010). "The Classroom of the Future" was intended as an intervention strategy to provide solutions aimed at turning around "lifeless classrooms" (whereby learners are not fully engaged) into interactive and engaging classrooms, and subsequently improve learner engagement and innovative learning (Hughes, 2005; Govender, 2016). In 2013, the GDE piloted the project (Mosehlana & Sebola, 2020), with tablets being rolled out to seven schools, albeit that research had indicated that providing such resources does not guarantee any improvement with regard to learning (Hourcade et al., 2014).

In terms of tablet use, teachers use these devices for learning purposes to reach learners even beyond the classroom. Teachers can upload necessary activities such as video clips, online lessons, diagrams, and pictures for learners to access educational learning materials including e-textbooks, videos, and audios at their convenience. Tablets are believed to support learner engagement, and subsequently help them to learn independently (Marie et al, 2021). Independent learning, through the completion of activities installed on learners' tablets, develops the learners' critical thinking skills. As tablets are more interesting and convenient than textbooks, they keep learners busy with their schoolwork while enabling them to work at a time of their convenience. Learners' participation in and outside the classroom becomes fun and peer learning is encouraged and made possible. Learners can send messages to each other, thereby promoting diverse participation and increasing engagement (Ciampa, 2013; Harry et al., 2012). Even shy learners, who otherwise tend to keep to themselves, can post messages or share their views with others using their tablets. In this way, tablets encourage and promote learner participation and engagement (Zhang et al., 2018).

Despite the potential benefits of using tablets in the classroom for teaching and learning purposes in South Africa, technical and non-technical challenges need to be taken into consideration. Technical challenges include device breakages, lag time, being unreliable, and the operator's lack of device operation and digital skills. The non-technical challenges include users who do not realise the potential of teaching and

learning with tablets, the misuse of tablets for non-educational purposes, not having a network signal and lack of internet access, and not being able to afford a device. However, it is important to note that South Africa's government has committed to a vision of enhancing the way teachers teach and the way learners learn using "The Classroom of the Future" intervention strategy. Using tablets can help learners to realise their potential in a contemporary digital world. Therefore, this chapter explores the literature on using tablets as educational tools in a classroom setting. The next section highlights literature findings of the effects of recent occurrences of the use of technology in a classroom setting.

2.2 Using Digital Tools and Resources to Enhance Teaching and Learning

Technological developments have impacted almost every area of human existence, including the education sector (Cakir, 2012: 273). The digital age has embraced technology such as computers and tablets to enhance learner engagement, interaction, collaboration, and discussion in and outside the classroom. It is anticipated that the use of tablets for educational purposes will lead to the enhancement of learning and thus enable South African learners to improve their performance (Naidoo, 2017). The most common device used by teachers and learners in the classroom is the tablet. Tablets create opportunities for teachers to apply different methods to deliver content and develop the cognitive level of a learner.

Koehler and Mishra (2009) agree that technology is an essential component of teaching, but express concerns about teachers' level of expertise when using tablets as a teaching device. In line with this, according to Chaipidech et al. (2018), teachers' lack of skills, experience, and guidance on the pedagogical use of technology and its integration into teaching and learning in the classroom is still a challenge. Some teachers are ill-equipped to use technology such as tablets and computers as teaching tools. Ominowa (2022) notes that teachers need to recognise the importance of using technology in their professional settings, and should focus on the synergy between pedagogy and teaching and how technology can be implemented within specific content areas. Some of the barriers to ICT integration in education, as identified by teachers, include lack of confidence, insufficient time, too much information about technological innovations in teaching, inappropriate software, inaccessibility of ICT resources, limitations of the curriculum, and insufficient support (Ditzler et al., 2016). Teachers can also use ICT to access a variety of educational resources (Zungu, 2022).

For example, the utilisation of multimedia technology can create a context, where learner engagement is emphasised, for the exchange of information among learners and between teachers and learners.

In the learning environment, it is expected that learners use technology to take responsibility for their learning (Annan et al., 2019). However, learners also struggle to change their mindsets about investing time in learning with tablets (Ominowa, 2022). Being stakeholders in their children's learning, some parents are concerned about learners' access to the internet, as they fear that their children might deviate from learning and focus on other apps or content inappropriate for learning. Accordingly, Oliemat et al. (2018: 596) argue that "connecting tablets to the internet needs parents' supervision at all times. This may require parents to ensure that they have secure filters", to limit access to inappropriate apps and websites. Studies show that the integration of new technological developments into education could enable learners to use new technology in their learning as easily as they use other educational tools such as books, maps, and pencils (Cakir, 2012). The integration of technology into the curriculum plays an important role in creating a rich educational environment that can enhance the learning processes and critical thinking skills (Cakir, 2012). Arguably, learners can use technology to take ownership of their surroundings and share their thoughts, meaning, findings, frustrations, wisdom, and knowledge about the topic at hand (Taylor & Parsons, 2011; Ratheeswari, 2018). When compared to traditional teaching in a classroom where learners receive information passively from teachers, using technology such as tablets in classrooms will encourage learners to engage in learning processes. Such technological teaching and learning approaches improve upon the traditional classroom-teaching model (Pun, 2013).

Using appropriate apps, learners can conveniently receive feedback from teachers within and outside a classroom setting. To improve learner engagement and critical thinking skills, software developers have developed a toolbox of simple, mistake-free, and open-ended applications that can be used as a platform to support face-to-face learning activities (Hourcade et al., 2014). Peer learners can use tablets to access resources such as track changes in Microsoft Word, which can be used to discuss, review, and edit each other's work. When learners engage in learning using technology, they get to interact with each other through their participation in activities that promote thought, creativity, and discovery. Active interaction in learning is

supported by some educationalists who hold the view that learning is a social act, which should embrace fun and sharing (Vygotsky, 1986). Hence, the idea of using technology to engage learners in a fun way can evoke a learning process that enhances critical thinking and subsequent interrogation of content and its application. Developing learners' knowledge and skills related to the use of tablets during their school years provides an important grounding experience, which becomes a good foundation for future learning in tertiary institutions.

To support the rationale for this study, the problem statement, the aim, significance, and structure of the research questions, the TPACK theoretic framework was considered as appropriate for ascertaining teachers' understanding of teaching with technology (Koehler et al., 2013). In their work, Koehler et al. (2013: 16) highlight that teaching and learning with technology is "an emergent form of knowledge that goes beyond all three 'core' components (content, pedagogy, and technology). It is an understanding that emerges from interactions among content, pedagogy, and technology knowledge" that teachers effectively teach with technological tools, such as tablets. Researchers including Eady and Lockyer (2013), Alrwaished et al. (2017), Cakir (2012) and Ratheeswari (2018) all recognise technology as one of the critical aspects of the teaching and learning environment. Teachers also play video clips to correct learners' misconceptions or advance learner engagement (Pun, 2013: 9). Rahmawati et al. (2019: 1) suggested four main aspects to consider when integrating and implementing education technology in the classroom, namely, the aspects of knowledge, content, pedagogy, and technology. Furthermore, there is a need to investigate the rationale for, and educational value of, using tablets in schools to promote effective teaching and learning. The core argument about using tablets in classroom settings is that there is no single technological solution applicable to every teacher, every course, and every view of teaching, learning and thinking (Kalogiannakis et al., 2018).

Accordingly, the notion of Mishra and Koehler (2006: 1029) is that "quality teaching requires developing an understanding of the complex relationship between technology, content, and pedagogy, and using this understanding to develop appropriate content-specific strategies and representations" of what needs to be taught and learned in classroom settings. Therefore, it is important to ascertain the teacher's capability to teach with technology and create exciting and effective learning opportunities for the

learners. Consequently, this investigation was conducted to ascertain how teachers use technology to teach and subsequently improve learner engagement in classroom settings. Furthermore, this study aimed to understand the motive and rationale behind the introduction of tablets in Gauteng schools and to determine whether teachers and learners use their tablets to enhance the development of critical thinking skills and learner engagement. The next section discusses the types and impact of technological devices used in the classroom.

2.2.1 Types and impact of technological devices used in the classroom

The types of technological devices that can be used in classroom settings include smart phones, tablets, computers and televisions. These devices can be used to access technological resources using internet-based technology. To use these devices effectively, teachers need to acquire TPACK knowledge that will enable them to select ICT tools relevant to their subjects' content and that enhance what they teach, how they teach it, and how learners learn (Hu & Fyfe, 2010). To develop their TPACK competency, teachers not only need to know how to use a computer and software, but also need to be aware of the strategies needed to incorporate ICT tools that can enhance student understanding of a particular subject's content (Hu & Fyfe, 2010: 184). For example, if one is collaborating with other classes online, adding all the learners' email addresses to a mailing list allows anyone on the list to send out one email that is automatically delivered to everyone on the list.

Moreover, internet-based technology can be used synchronously and asynchronously to enhance learning in and outside the classroom. In this study, the term 'internet' refers to a variety of online technologies such as asynchronous communication that can be organised by the teacher to engage learners in learning processes (McKenzie, 2005). Asynchronous forms of online communication include electronic mail, mailing lists, and message boards. Asynchronous communication affords the user the luxury of posting and responding to messages at any time, from any location that has an internet connection; it is popular as it allows users to interact free of location constraints. Email projects are also popular among connected classrooms, and such projects tend to promote verbal and interpersonal intelligence (Taylor, 2002; McKenzie, 2005). While TPACK competencies can be useful when making announcements, posing general questions, or sharing information, message boards can include discussion groups, newsgroups, and even archived mailing lists. When an email

arrives, a message board is housed at a fixed internet address that one must visit to participate. Some message board services will notify one by email when new messages have been posted, but the need still exists to log in to the virtual location to read and respond to the message (Taylor, 2002; McKenzie, 2005). Using TPACK as a theoretical framework in this study is important, as it places greater emphasis on a teacher's understanding of how technologies, particularly ICT, can be used effectively as a pedagogical tool to ensure that effective teaching and learning are achieved in classroom settings (Hu & Fyfe, 2010: 184).

Contrary to asynchronous communication, synchronous communication includes real-time chat and multi-user virtual environments. The hallmark of synchronous communication is that it takes place in "real-time". In other words, when a message is posted, it is read at the exact moment it is posted. One then reads responses from others within seconds of posting one's idea (McKenzie, 2005). Synchronous interaction is active and engaging. It requires that the parties involved be online at the same moment regardless of location or zone to communicate with each other using text messages (Taylor, 2002; McKenzie, 2005). There are several ways to chat online, including website-based chat, internet relay chat, and instant messaging chat. Website-based chat is extremely common nowadays, as Java applets have made it easy to offer chat on a webpage (McKenzie, 2005: 134). This means that over and above their PCK knowledge, teachers also need to apply technology in learning. Hence, technology, pedagogy, and content have become part of teacher education programmes used to prepare pre-service teachers (Pusparini et al, 2017). Teachers need to incorporate the same principle in classroom settings.

2.2.2 The tablet as a teaching and learning tool

The reality that more people are using technology for teaching and learning is a significant factor driving the exploration and development of new pedagogies, and students using technology to enhance their learning (Attwell & Hughes, 2010; Gilakjani et al., 2013). Internet-based technology has inspired many people, who mostly use search engines such as Google to solve varied problems including social, domestic, and academic challenges. Consequently, tablets have been introduced as learning tools in schools with the aim of enhancing learning in classroom settings where learners can access information through internet-based technology (Mosehlana & Sebola, 2020). Tablets are a major influence on how teaching and learning take place

in the 21st century. For instance, tablets allow learners to create original works as a means of personal expression. Tablets provide opportunities for peer collaboration, which is an approach to leveraging peer support and enhancing learning. One of the benefits of using technology for peer collaborative learning is that it improves learner knowledge through combined strengths, shared responsibilities, and learning from one another to bring together opportunities that enrich the understanding of knowledge (Ratheeswari, 2018; Oliemat et al., 2018). This means that by working collaboratively, learners become the drivers and creators of new knowledge when researching and sharing information with their peers (Naicker et al., 2022). Exposure to collaborative activities enables the learner to assume authority and control over their learning and creates opportunities for leveraging experiences, knowledge, and prior knowledge from peers (Naicker et al., 2022). Using technology in a classroom setting provides opportunities that make teaching interesting and productive to attract and engage learners. Therefore, teachers and learners learn with tablets and smartphones produce outputs as images, movies, audio statements, and more. Technological tools increase learners' motivation to seek more knowledge and information (Lofthus, 2017).

One of the challenges of using internet-based technology, especially tablets, is that they can divert focus from learning, and cyberbullying can be a problem. Some research shows that learners have a more difficult time focusing on schoolwork with internet access than without it (Lofthus, 2017). Alignment of technology with teaching and learning processes can increase opportunities for learner engagement (Mosehlana & Sebola, 2020). As such, teaching with technology requires teachers to have knowledge of how technologies develop new ways of teaching and how learners learn in this digital age. This study investigated learners and teachers' uses of tablets in classroom settings.

2.2.3 Tablets in the classroom

The use of technological tools such as tablets and apps in learning reduces boredom, increases focus and excitement, and motivates learners to enjoy learning (Guri-Rosenblit, 2005). Using technological devices and resources effectively is key to enhancing learning. Essentially, this entails finding the right digital tools such as tablets that will enrich and enhance – but not dominate – teaching, as a teacher also contributes invaluable information to the teaching and learning process. Technology is not meant to replace a teacher and cannot replace the magic that occurs when bright,

creative young people live and learn together in classroom settings (Guri-Rosenblit, 2005). Effectively incorporating technology into teaching and learning can increase learning productivity that favours learner engagement (Elder, 2012). In South Africa, the education sector needs to establish the effective use of tablets as a teaching and learning tool in and outside the classroom.

Tablets are used as learning tools to enhance traditional teaching and learning that happens in and outside a normal classroom setting (Erdogan & Sahin, 2010). Tablets are good communication tools that provide opportunities for communicating thoughts, memories, and ideas, such as recording personal experiences (Neumann & Neumann, 2018). Moreover, tablets enable adequate teaching and learning by allowing teachers to instantly access information that can improve learning. The devices give teachers and learners a mobile source of information, textbooks, interactive media, and a wealth of tools through downloadable applications frequently referred to as apps. Apps afforded by tablets are available for activities ranging from organisation to productivity, as well as allowing users to apply their creativity (Ditzler et al., 2016). Apps enhance interactive capabilities that evoke learner curiosity and interest to complete a task.

Teachers and learners use tablets to search for information (Muller et al., 2012). Teachers can use tablets to give clear instructions, practice exercises, and reinforcement of the content taught; they support learner engagement through multimedia effects such as video, audio, music, and animation. Therefore, tablets can provide a space for participants to voice their opinions and readily lead to deliberation and solving of problems in a classroom (Harry et al., 2012; Kalogiamakis et al., 2018: 172). However, although some learners have experience in using digital tools, the majority of learners and teachers, especially learners from primary schools, have no background with using tablets for learning. Another problem of using tablets as learning tools is that learners are tempted to use tablets for non-educational purposes. Teachers not having the means to monitor the usage of tablets closely opens a window for learners to engage in non-educational activities.

In line with the perceived learning enhanced by using tablets in classroom settings, the GDE embarked on an initiative to provide learners with technological devices as a means of refining the level of education in South African schools (Mosehlana & Sebola, 2020). Even though the correlation between using a tablet for learning and the improvement in learners' success is yet to be established, this study investigated the

effect of using tablets in classroom settings on improving the standard of teaching and learning in Gauteng province. Consequently, this investigation was conducted to ascertain how teachers and learners experience technology in the classroom and how the process promotes learner engagement and critical thinking.

2.2.4 The role of tablets in promoting learner engagement and critical thinking

To enhance learners' engagement, critical thinking, and understanding of content, teachers can incorporate technology into the delivery of their subject matter knowledge, pedagogical knowledge, and pedagogical content knowledge (Hughes 2005: 279). Besides offering many opportunities to learners, technological tools such as tablets have changed the teaching methods and beliefs of teachers on how learners should learn to improve learner engagement (Ominowa et al., 2022). Using tablets for teaching and learning pedagogy has gained ground as an alternative way of providing learning content inside and outside the traditional classroom environment (Kalogiannakis et al., 2019). Consequently, teachers need to explore the use of technology to vary their lessons and accommodate learning preferences in classroom settings.

An essential concern about learner engagement lies in the ability of teachers to utilise technology innovatively. Moreover, some teachers adopt technologies in ways that do not significantly change a learners' approach to learning. Thus, it is important to obtain a better understanding of how best to support and promote technology integration into teaching and learning in both the formal and informal learning that may take place in and outside the classroom. In addition, tablets are known to increase interaction, active learning, and learner engagement during in and outside the classroom. Using tablets to learn can enhance collaborative learning whereby learners develop their thinking skills. This study, therefore, investigates the use of tablets to promote active learning and learner engagement. Active learning as an instructional approach enables learners to actively engage and participate in the learning process. It is also important to note that the constructivist learning theory underpins active learning, whereby learners link new ideas and experiences to existing knowledge. Constructivists believe in students using technology as a tool to find solutions to problems while acquiring new knowledge.

2.2.5 Constructivists' theory and using tablets in the classroom

There is a close relationship between technologies, active learning, and constructivism when applied in a classroom environment. The focus of both constructivism and technology is on the creation of learning environments (Gilakjani et al., 2013). Examples of constructive activities used in classrooms include peer critiquing, field trips, mind mapping, concept maps, and research projects. In the classroom, the constructivists' view of learning points towards several teaching practices. In the most general sense, it usually means encouraging learners to use active learning techniques (experiments, real world, problem-solving) to create knowledge, reflect on and talk about their work while exploring the effect of technology on learners' understanding (Fredric & McDowell, 2013).

With a well-planned classroom environment, learners learn how to learn using technology to realise their potential (Fredric & McDowell, 2013). The essential core of constructivism is that learners actively construct their knowledge and meaning from their experiences (Attwell & Hughes, 2010). The actual experimentation in the manipulation and testing of ideas provides learners with direct, concrete feedback about the accuracy of their ideas. Playing and exploration are self-structured and self-motivated processes of learning that encourage learners to reflect on their ideas in ways generally not promoted by the current South African school curricula. Play and experimentation are thus powerful forces in the development of the individual mind. Constructivism has led to the additional discovery that power gains are made when children work together to enhance learning (Strommen & Lincoln, 1992).

2.2.6 The benefits of using tablets in classroom settings

As noted by Taylor (2002: 24), "teachers are faced with a steep learning curve to understanding the incorporation of technology in their teaching methods". Sometimes teachers struggle to align technology and pedagogy to match the desired learning objectives and outcomes. The relevance of their online lessons depends on how they can adapt to the "computer age". One may argue that learners enjoy using technology and believe it can be effective in learning (Fredric & McDowell, 2013).

There are benefits and challenges that tablets and resources bring into classroom settings. Occasionally, learners' problems are addressed by the teachers and peers or by employing technological tools such as tablets, videos and audios in and outside the classroom. The process usually entails using asynchronous tools, such as email or

conferencing systems to contact friends or a teacher to address the issue at hand. In such circumstances, learners can take advantage of multimedia technology to contact their teachers through the internet to have their problems resolved (Pun, 2013: 33). This study looked at the type of training offered to teachers to develop essential skills needed to incorporate technology into their teaching. Moreover, using tablets may enhance learning using asynchronous and synchronous communication. Application of technology in education is complex for teachers, learners, researchers, and academics.

2.3 Recent Factors that Spurred the Use of Technology in Classrooms

Change in a national educational system is influenced by a variety of factors including economic, social and cultural, political, historical, language and geographical factors. Moreover, external factors including large classes, lack of basic tools or textbooks, and teachers lacking adequate skills can cause poor standards of teaching and learning at school level (Chen & Fang, 2024). Recently, the South African education system was challenged by the effects of the COVID-19 pandemic severe lockdown, which lasted from January 2020 to December 2022, and the significant power cuts caused by the challenged economic factors in the country (Chen & Fang, 2024). During lockdown, people were forced to work from home; the education system reverted to online learning to survive. These challenges, coupled with the already ailing education systems, prompted the DBE to consider interventions that could uplift teacher and learner performances. Therefore, the DBE in Gauteng province decided to introduce technological tools to enhance teaching and learning. Teachers were forced to use online technology to reach learners. Technological platforms served as a bridge to enable online learning. The next section explores the effects of COVID-19 on the introduction of technology in the South African classrooms.

2.3.1 Effects of COVID-19 on using digital resources in South African classrooms

The COVID-19 outbreak emerged as a global problem that imposed barriers on the educational sector including the school-level, curriculum-level, technological, financial, and individual barriers. All these barriers needed research-based solutions that could facilitate the rapid integration of technology into schools (Christopoulos & Sprangers, 2021; Adov & Maeots, 2021; Ferdig et al., 2020; Rasmitadila et al., 2020; Kahasuddin et al., 2020). South Africa is among many countries whose education sector was caught unprepared by the effects of the COVID-19 pandemic. Due to the 2020 COVID-

19 total lockdown, the education sector experienced a complete closedown of all schools in the country and, consequently, face-to-face teaching and learning in classrooms settings. Teachers were forced to promptly re-think and consider using technology, especially internet-based technology, to reach learners in their homes. Teachers were challenged to adapt their classic methods of teaching to a remote approach using technology without compromising quality. The abrupt shift to online teaching and learning unveiled challenges, including the lack of internet access in households, poor internet signal, teachers and learners with poor technological skills, and funding to improve the network structure (Trust & Whalen, 2020). Even though technological tools such as tablets, laptops and software were available before the COVID-19 pandemic, no prior test was done to accommodate emergencies or disasters such as the COVID-19 pandemic.

Before COVID-19, teachers were comfortable with the traditional face-to-face teaching and learning without envisioning that it could be migrated to remote learning using Zoom or MS Teams platforms. The abrupt spread of the COVID-19 pandemic did not allow adequate time to train teachers on the integration of technology into their teaching. This means that teachers were expected to know how and when to use technology in the classroom. Winter et al. (2021) reported that many teachers had little or no training in using technology and were faced with a paradigm shift in their teaching pedagogy. Noticeable barriers, challenges and benefits of using technology in education emerged during the COVID-19 pandemic. As such, teachers found themselves in new relationships with technology and teaching. As professionals, they were expected to adapt immediately to the new pedagogy of teaching with technology. Furthermore, the COVID-19 pandemic brought about a paradigm shift where technology has become a major factor in influencing education today. Major decisions made due to the rapid spread of COVID-19, such as the national lockdown, accelerated the process of implementing effective teaching and learning using technology in online situations, and forced teachers to migrate traditional face-to-face teaching and learning to remote online learning platforms. This transition was abruptly imposed on teachers, many of whom lacked the skills, knowledge, and competencies for online teaching.

Although every school was expected to teach online during the pandemic, a lack of resources to engage in online learning prevented some schools from participating in online teaching and learning. Many learners had never considered the use of

technology for learning purposes. They did not have access to internet connections and/or the necessary devices to enable effective teaching and learning to take place (Lie et al., 2020). Consequently, concerns about effective ways of providing quality education to all learners emerged. While some learners had quality devices, and access to the internet (with good signal), others did not. Learners' inequality and differences included geographical, economic, cultural, and educational aspects, among others. The inclusion of IT variables in teaching also posed and still poses a challenge for unskilled teachers when teaching (Herwin et al., 2022). Furthermore, some learners could not understand the material presented online, where teachers' face-to-face mediation was lacking. Besides the learners' challenges, teachers were also faced with challenges, including lack of adequate skills to apply technology in their teaching approaches and the difficulties of not being able to control learners' activities. It was also established that the level of non-submission of work increased. Therefore, the barriers mentioned in this study and the suspension of face-to-face classrooms during the pandemic are identified as key factors motivating the use of technology to augment teaching and learning. Moreover, there is a globally increasing interest in venturing into online teaching and learning which commenced even before the pandemic (Pun, 2013).

Online learning benefits learners, as it expands their learning opportunities and helps them develop independent learning (Pun, 2013). Therefore, the South African DoE needs to evaluate the infrastructural development in schools to improve network and connectivity. However, it is also necessary to acknowledge that the incorporation of technology into the classroom does not serve a specific pedagogical goal by itself (Pun, 2018). This means that teachers need to creatively combine technology with educational goals, their pedagogy and take actions to create avenues that enhance teaching and learning. The approach to enhancement includes using a projector in a traditional classroom, the interactive whiteboard and open-source software, as well as multimedia application management for distant and e-learning educational platforms. The online platforms provide teacher and learner opportunities to complete teaching and learning tasks at any time from any location. Therefore, it is argued that technology can enhance teaching and learning through the traditional face-to-face encounters and online platforms. The increasing growth of Information and Communication Technology (ICT) in education has prompted studies measuring the impact of technology on learners' motivation. In the same light, this study aims to understand how learners'

engagement in learning when using tablets in their classrooms was enhanced. Besides the recent effects of the COVID-19 pandemic on education, the persistent power outages (loadshedding) over the last few years have significantly affected education in South Africa. The next section explores the effect of loadshedding on Education in South African schools.

2.3.2 The impact of loadshedding (power outage) on education in South Africa

Due to their versatility, technology such as tablets, cell phones, and computers have become the devices of choice for learners. Learners learn better by playing educational games, watching online lessons, using online pictures and/or diagrams, and can compare and identify relationships in graphs, for example, using their tablets. Since the COVID-19 pandemic, the South African education system has followed a hybrid or blended approach to teaching and learning through face-to-face meetings and online platforms. However, this online teaching and learning is affected by the constant loadshedding, which is experienced throughout South Africa, with power outages for up to 10 hours a day. Loadshedding strongly affects development in all areas of society including the education and socioeconomic sectors (Umar et al., 2021). Loadshedding results in frustration, especially for learners whose activities and study materials are installed on technological tools such as tablets. Similarly, loadshedding affects lesson presentations, and learners who rely on tablets to access textbooks, video clips, educational software, and other educational materials. Previous research on loadshedding (Umar et al., 2021: 10) revealed that school-going children lagged in their studies. At times learners failed to study for tests and examinations due to the power outages that happened daily for a period of 6 to 10 hours a day. Learners constantly battled to complete assignments, homework, and projects, as they could not charge their devices.

As most ICT lessons heavily depend on electricity (Umar & Gubareva, 2021), the quality of ICT teaching and learning is negatively affected by loadshedding in South Africa. There is no backup technology to charge or power devices during loadshedding situations. This means that governments need to have plan “B” or alternatives at all times to ensure that the continuity of lessons is not disrupted by loadshedding. Teachers also need to acknowledge and accommodate the unintended late submission of work caused by loadshedding. As “The Classroom of the Future” relies on technology for technology to be functional, loadshedding significantly affects the

implementation of these types of classrooms. Therefore, it can be argued that “The Classroom of the Future” in South Africa could take time to materialise. Educational initiatives, relying on internet access or networks, are affected by loadshedding. This means that loadshedding distracts learning activities accessed using technology (Umar & Gubareva, 2021).

2.4 Learning with Technology

Integration of ICT in education is taking place globally. ICT integration in educational activities can potentially have a positive impact on teaching and learning (Lisene & Jita, 2018). Tablets are some of the devices used in and outside the classroom for teachers and learners to access internet-based resources and multimedia. Learning consists of approaches to learning, and theories of learning such as social constructivism, psychological constructivism, discovery learning, and conception of learning. Effective learning embraces critical thinking, problem-solving, and learner engagements; thinking is an integral part of learning. Therefore, there is no single definition of learning that will be acknowledged in this study. An example of the most popular definitions of learning explains that learning is comprehension, it involves knowledge of some kind or needs an understanding of facts that an individual gains through practice or experience (Olson & Hergenhahn, 2016).

Teachers are responsible for creating activities that develop learners’ critical thinking, problem-solving, and reasoning skills. Therefore, incorporating technology in teaching could enhance teachers’ abilities to create learner-engaging activities. Similarly, technology enables learners to access valuable information that can enhance learning, especially when they have internet access. Additionally, learners acquire skills such as typing, editing, and researching using technology.

For this investigation, two approaches to learning, namely, deep and surface learning (Olson & Hergenhahn, 2016) are explored to ascertain the educational value of using technology, specifically tablets, in classroom settings. To understand the value of using tablets for learning, this study looked at a) approaches to learning, b) theories of learning; in particular, social constructivism, psychological constructivism, and discovery learning, and c) the conception of learning.

2.4.1 Approaches to learning

When technological tools such as tablets are used for teaching and learning, both the deep and surface categories of learning are practiced (Senemoglu, 2011; Donnison et al., 2012; Magno, 2009). A deep approach to learning essentially requires a researcher type of learner who takes the initiative to research for relevant information; tablets can enhance deep learning. Through this approach to learning, learners actively engage with the study material to gather information applicable in decision-making. Besides being used for deep learning, tablets can also promote a surface approach to learning. The surface approach to learning contributes to a learner's ability to remember content taught in a classroom setting. The deep approach to learning using tablets enhances independent learning, where learners are self-regulated, and practice research-based deep-learning techniques that enhance their learning skills and practices (Magno, 2009). Learner engagement, critical thinking and problem-solving skills are improved when technology is used in the classroom. Tablets are easier to navigate than the hardcopy textbooks and they can store valuable information, which can be used for the drill and practice approach to learning; learners can replay a lesson on the device until they are confident of the facts (Magno, 2009). This implies that learners will actively participate in learning and engage with content when tablets are used to foster a learner-centred approach to learning, which is critical for the retention and application of knowledge (Zungu, 2022).

Learners can use tablets as a platform to access internet-based digital content and learning resources while engaging content with or without the help of teachers (Parpala et al., 2010). Learners who grasp the skill of using tablets continue to learn independently even in their homes (Senemoglu, 2011). Moreover, they can acquire knowledge through collaboration with their peers by working in pairs or groups to complete tasks online and sharing information including articles, educational games and videos. They can text, email, or chat on technological platforms to engage with content. Educational software, video clips, and other technological resources can play a vital role in promoting and implementing a deep approach to learning (Hamm & Robertson, 2010; Senemoglu, 2011; Donnison et al., 2012). Educational games learners play on the tablet can improve their problem-solving skills and their thinking abilities. However, while tablets can stimulate the interest of learners to participate in learning, effective learning depends on learner activities loaded on the tablets. Inspiring activities have the potential to engage a learner.

Teachers can use tablets to facilitate face-to-face and online learning in a classroom. However, teachers need to filter information for relevance or construct a cohesive organising principle to access educational information (Zungu, 2022). Similarly, learners can use tablets to interact with each other using language to understand tasks and solve problems; interaction creates a stronger social support system. Vygotsky believed that human mental development occurred from outside, from external forms of mental life. In this theory, language is described as "a powerful and strong tool" in children's interactions. When learners listen and respond to each other's ideas and contributions, they develop and enhance their understanding (Vygotsky, 1986). In this way, learners construct their knowledge through their interaction with the physical world, collaboratively in social settings, and a cultural and linguistic environment. Understanding enables learner engagement. To understand the conditions and practices teachers use to develop teaching models to decipher and apply information to enhance learner engagement, the constructivism and behaviourism learning theories are discussed in this study. The next section explores theories of learning aligned with the enhancement of learner engagement and critical thinking of learners when using technology.

2.4.2 Theories of learning

Learning theories support facilitation of clear communication of knowledge between teachers and learners to make sense of information and engage with the content. The process examines what motivates learners to learn, and the circumstances that enable or hamper learning. Learning theories also consider non-verbal communication. The next section on constructivism contains the details of learning with tablets from a constructivists' point of view.

2.4.3 Constructivism in teaching and learning

There are many definitions of constructivism (Grey & Macblain, 2015, Lisene & Jita, 2018; Ultanir, 2012; Amarin & Grisham, 2013; Kozulin, 2004; Abdal-Haqq, 1998), but they all adhere to the following characteristics:

- People of all ages do not discover knowledge; rather they construct it or make it.
- People create knowledge by relating or connecting it to their previous knowledge.
- Learning involves active cognitive activity and cognitive restricting.

- People use personal experiences to create knowledge.
- Cognitive growth is stimulated when people are confronted with practical or personal problems that create cognitive disconnects.

Grey and Macblain (2015: 92) define constructivism as "an approach to teaching and learning based on the premise that cognition is the result of mental construction". Here, constructivism is seen through the lens of teaching and learning. On the other hand, Ultanir (2012: 196) and Schreurs (2009: 92) maintain that "constructivism is an epistemology, a learning or meaning-making theory that offers an explanation of the nature of knowledge and how human beings learn"; knowledge is only constructed based on learners' previous experience and background knowledge. Constructivism can be used in e-learning environments to explain how teachers can involve learners in the process of knowledge construction using technology in the classroom (Lisene & Jita, 2018). Constructivism as a learning theory is not a single or unified theory, as it is also characterised by different opinions. This means that different sides or viewpoints of constructivism, such as cognitive development, social aspects, and the role of context still need to be discussed further.

In the contemporary digital world, where online teaching and learning incorporate technology such as tablets, interaction carries characteristics of constructivism, where many learners have prior knowledge of using tablets as a tool for communication at home. Some have internet-based technology and use it to gain access to a broad range of information, knowledge, ideas, and opinions well beyond their classrooms. Learners are able to interact with anyone at any given time; they can interact with teachers, mentors, subject matter experts, and peers because of the advancement in networking with technology (Amarin & Grisham, 2013). When technology is used to enhance learning, the social learning theory and social constructivism are supported.

On the other hand, learning includes the process of knowledge transmission from one person to the next. This means that using internet-based tools and innovative online pedagogies fosters meaningful exchanges between academics and learners with peers in geographically distant locations and from different linguacultural backgrounds (Naicker et al., 2022). Therefore, using technology for learning can promote group work and collaborative activities on platforms where learners can create and interact with knowledge. When learners work in a group, they develop higher-level thinking skills and take ownership of their learning; they learn actively through interactive learning

processes. Thus, constructivists shift the focus from knowledge as a product to knowledge as a process. The common core of the constructivist theory is that we do not find knowledge, we construct it. As such, learners work together to represent the most effective form of interaction in the process of knowledge creation or meaning-making (Grey et al., 2015; Lisene & Jita, 2018; Ultanir, 2012). The argument here is that knowledge is not for humans to find and record reality, but it is a process of being a part of reality to resolve problems at hand. Vygotsky advocates that “learning prospers better in social settings than in isolation”. Social constructivism discussed in this study, in the context of using tablets to enhance teaching and learning discussed in the following sections includes Vygotsky and social constructivism, psychological constructivism, Bruner and discovery learning constructivism and behaviourism. First, the role language plays in development of cognition is explained by Vygotsky and social constructivism.

2.4.4 Vygotsky and social constructivism

Social constructivists such as Vygotsky believed that learning takes place through interaction in a social environment. According to Vygotsky, language plays a central role in the development of cognition (Lupyan, 2015). He believed that language carries meaning and sense and must be interpreted by the learner. Through these interpretations, the learner contributes to society and the opposite is also true. The interactive reciprocal nature of these relationships underpins social constructivism. Scaffolding pupils' learning is an approach to mediating thinking. Mediation can be influenced by psychological tools (verbal or written) in the form of a cue, a series of connected questions, a gesture towards the equipment to be used, or a sign such as a nod or shake of the head, or symbols such as a diagrammatic representation of practical instructions given to the child (McGregor, 2007; Lisene & Jita, 2018; Grey & Macblain, 2015: 92). Vygotsky also emphasises that learning happens from the interaction with other people and valuing of the help and teaching received (McGregor, 2007). For Vygotsky, knowledge is social, and what people can do is far more a matter of their upbringing and education rather than resulting from their inborn potential; hence, development is largely a product of the child's participation in the social world (Meadows et al., 1988: 51).

The social constructivism theory argues that the quality and nature of the learner's environment, age, culture, and life experiences are important when planning

dissemination of knowledge (Grey & Macblain, 2015; Lisene & Jita, 2018; Abdal-Haqq, 1998). In the same light, Churcher et al. (2014: 35) maintain that "the use of language between individuals in an environment as an interpsychological tool is central to the social constructivist thought on the learning process. Therefore, successful learning is said to result in an internal dialogue as an intrapsychological tool that is fundamental to knowledge acquisition across varying situations". This approach to learning applies equally to voluntary attention, logical memory, and the formation of concepts (Abdal-Haqq, 1998; Lisene & Jita, 2018).

Learners' development or learning is not an individual process, but a result of an aggregate of social relations embodied within the individual's development (Grey & Macblain, 2015). Therefore, using technology to enhance the culture of teaching and learning creates a platform for interaction in and outside the classroom. Constructivism aligns with the focus of this study, which is on establishing the value of using tablets to enhance learner engagement. Literature reports also confirm that technology enables learners to explore information beyond the classroom (Grey & Macblain, 2015; Pun 2013).

The basic assumption and principles of the constructivist view of learning can be summarised as follows (Amarin et al., 2013; Lisene et al., 2018):

- Learning is an active process;
- Learning is an adaptive activity;
- Learning is situated in the context in which it occurs;
- Knowledge is not innate, passively absorbed, or invented but constructed by the learner;
- All knowledge is personal and idiosyncratic (distinctive);
- All knowledge is socially constructed;
- Learning is essentially a process of making sense of the world;
- Experience and prior understanding play a role in learning;
- Social interaction plays a role in learning; and
- Effective learning requires meaningful, open-ended, challenging problems for the learner to solve.

Integrating mobile technology requires making changes to education for mobile learning to be meaningful, effective, and safe for all (Clarke & Svanaes, 2014). This means social constructivism is identical when tablets are used in the classroom.

Moreover, Ultanir (2012: 199) argues that “knowledge is not for a human to find and record reality, but rather it is a process of them being a part of the reality”.

2.4.5 Psychological or Piagetian constructivism

Psychological or Piagetian constructivists generally regard the purpose of education as educating the individual child in a fashion that supports the child's interests and needs; the child is a subject of study, and the emphasis is on individual cognitive development (Abdal-Haqq, 1998). From the perspective of psychological constructivism, learning is primarily an individual enterprise that takes place within a person. This means that learning is a learner-centred approach that seeks to identify, through scientific study, the natural part of cognitive development expected to take place. Accordingly, a learner-centred approach is taken into consideration, as psychological constructivists regard learning as a personal and natural process. Learner-centred teaching places the learner at the centre of the learning process in the classroom. Therefore, a teacher needs to coach a learner in the skills they need to learn and create opportunities for learners to learn independently (Andiema, 2016; Lofthus, 2017).

The purpose of teaching at any level of education is to bring a fundamental change in a learner's knowledge of a subject (Andiema, 2016). For this change to be seen, learners encounter a new “experience” when they cognitively “adapt” to “accommodation” of their existing thinking and “assimilation” of aspects of the new experience (McGregor, 2007: 51). Most importantly, cognitive constructivism focuses on the ability of individual learners to interpret their experiences in the formulation of new knowledge and engagement in their learning (Lisene & Jita, 2018).

The first principle of constructivist education, inspired by Piaget's theory, is to cultivate a socio-moral atmosphere in which mutual respect is continually practiced. This translates into practices that promote learner autonomy and reasoning. The Piagetian constructivist teacher therefore promotes a feeling of community in the classroom and makes it possible for learners to make classroom rules and decide on their lives in a social classroom. Learners can conduct discussions about social and moral issues, promote conflict resolution, and consult and discuss learning matters. This means that activity time allows learners to pursue chosen projects, including knowledge activities, and group games. A learner-centred approach to learning is encouraged by those who

believe in psychological or Piagetian constructivism (Abdal-Haqq, 1998; Power et al., 2019; Lisene & Jita, 2018; Van Der Ent et al., 2020). This approach to learning assumes that learners come to class with ideas, beliefs, and opinions that need to be discussed with the teacher as a facilitator. The teacher devises tasks and questions to create motivating challenges for learners.

At some point, children acquire new knowledge as it is integrated and synthesised with prior experience, thus building upon an ever-expanding knowledge base. By acknowledging the learner's prior experience, the constructivist sees the learner, not the teacher, as the prime actor or determinate of curriculum direction (Gust, 1995: 3). DeVries (2000: 194) maintains that "viewing the child's adaptation as constituting development, Piaget saw the developmental process as one in which the child is in control" of acquiring knowledge and learning.

2.4.6 Bruner and discovery learning/constructivism

Discovery learning is a teaching method that allows learners to gain a piece of new knowledge without involving direct notification; it makes learners engage in a self-discovery approach to learning. This implies that in discovering a concept, learners need to observe, classify, make assumptions, explain and draw conclusions to discover certain principles (Muharramah & Budi, 2018; Balim, 2009; Saab et al., 2005; Wicaksono et al., 2021). The psychological or Piagetian constructivists' theory of learning, therefore, seems to encourage "discovery learning" and "hands-on activities" mainly occurring at the individual capacity level. The value of using models in instruction is that they enable complex or abstract ideas to be rendered into simpler or visually concrete forms (Lombardi et al, 2014). Accordingly, Kalogiamakis et al. (2018: 172) noted that "young people and children are now growing up in a technology-rich environment, they are already familiar with and use electronic devices daily. This is an added reason why education should exploit the benefits" of ICT in learning.

The discovery-learning model bases its discovery of new knowledge on constructivism. With the introduction of technology in the classroom, learners use their tablets to discover new knowledge using search engines such as Google to inquire, explore, and acquire knowledge about things. Therefore, the constructivist theory in discovery learning shows that its focus is on learners in the learning process rather than on educators. For instance, through virtual classrooms, a motivated learner can absorb

knowledge even without the teacher's direct involvement (Maja, 2023). The basic idea of this kind of learning is that learners can design their experiments in the domain and infer the rules of the domain themselves, to construct their knowledge (Wicaksono et al, 2021). This approach to learning requires learners to have mental readiness that can assist them in learning effectively.

Using tablets, learners can access the internet and are capable of discovering learning activities, communicate, and interact with others to understand content. Therefore, discovery learning is viewed as a process whereby learners can discover the principles of subjects such as Mathematics and Science through exploration (Jordan et al., 2008). Through experimentation activities that explore the principles of a subject matter, learners can build their knowledge of the subject using discovery learning. Therefore, discovery learning is an inquiry-based instruction method considered a constructivist-based approach to education. This is because it occurs when the learner is not provided with the conceptual understanding and must find it independently with technological tools such as tablets (Wicaksono et al., 2021; Balim, 2009).

This perspective on learning focuses on the social, cultural, and historical influences that shape and nurture learners' understanding, and acquisition of knowledge, expertise, and skills in varied situations. Discovery learning encourages learners to learn or to find out more about a selected topic; it stimulates learners' interests to learn on their own. This means that the presence of the stimulus such as the technological resource can be useful in discovering and acquiring knowledge. Consequently, an experienced person, adult, or older peer supports the less experienced person. The support is gradually reduced when the learner can take on the task more independently. Socio-cultural perspectives emphasise how thinking and learning should arise through engagement in cultural practices (Meadows & Cashdan, 1988; Pozzi et al., 2017; Okamoto, 2021; Grey & Macblain, 2015).

2.5 Conception of Learning

Conception of learning requires the use of prior knowledge and cognitive abilities to attain new knowledge to solve problems. Learning is regarded solely as the increase of knowledge. Therefore, knowledge is seen as something external to the learners, which must be taken in and stored. Having conceptions is inherent in human beings, as they attach meanings to their surrounding world. This means that conceptions

influence the way people act and react to their environment through these perceptions. In a contemporary technological classroom, a teacher has an opportunity to use a tablet to design activities that will enhance conception of learning and spark learners' interests in using internet-based technology for learning. When learners use internet-based technology they are more likely to engage in high-order thinking tasks, especially with research activities. In an attempt to cascade knowledge and information to the learners, teachers seem to have different conceptions of teaching and learning described as teacher-centred, content-oriented, or learner-oriented (Konings et al., 2005). The five conceptions of learning investigated to ascertain how teachers perceive learning are discussed in the following sections.

2.5.1 Learning as the increase of knowledge

Learners continuously learn something new to increase their knowledge. Learning is social and it needs people to interact to exchange knowledge and information (Lupyan, 2015). Learners can use technological tools such as tablets to add value to their learning and interact with peers. Even shy learners can interact with peers when they belong to a group chat and can contribute to solving problems. The teacher's role remains to provide learners with opportunities to learn and develop themselves (Ultanir, 2012). In this study, it is important to mention that the teacher is responsible for selecting knowledge or information and creating learning activities that stimulate learning interest. By so doing, teachers can maximise learners' chances of understanding of knowledge. An added benefit of using tablets is their powerful storage system that learners can use to keep the information for revision purposes (Konings et al., 2005).

2.5.2 Learning as memorising

Learning is an individual process, where learning is revealed as a personal change, and non-learning is the absence of change. Learning is constituted of memorisation of steps, for example, steps of conducting experiments and steps of conducting research. Learners are required to remember and reproduce facts during assessments. Therefore, many learners in South Africa still write sit-in, traditional examination papers as summative assessments. During preparation for the assessment, learners memorise information through rote learning and can reproduce the learned knowledge through the recalling process. Previous studies suggest that learners will retain more information if they engage with content during the learning process (Zungu, 2022).

Technology has a remarkable storage capacity which can be used to assist teachers and learners in the processes of storing information for prolonged periods. As noted by Saljo (2010: 53), “personal computers (PCs) have fast processors, remarkable storage capacities and sophisticated software. They have become cheaper and mobile as presently schools in many countries profile themselves by providing students with a portable PC as a basic piece of educational equipment”.

2.5.3 Learning is the acquisition of information that can be utilised in practice

Teachers are expected to create engaging activities that stimulate learners' interest to discover and learn new knowledge. Learning is best conceived as a process, not an outcome. Tablets create opportunities for learners to discover new knowledge, facts, and information. Such facts are used in classrooms, chat groups, WhatsApp, and emails for further learning engagements. This concept of learning places greater emphasis on the ability to apply skills or knowledge situations, where technology unlocks the potential of a learner (Konings et al., 2005).

2.5.4 Learning as the abstraction of meaning

When learners demonstrate an understanding of what was taught or learned in the classroom setting through tests and examinations, they demonstrate a well-informed analysis, conclusion, and meaningful suggestions of what needs to be done to solve a problem. Teachers and learners use technology to organise their work. They look for complex ideas on the internet and research to explore and discover more information. Understanding, as opposed to the reproduction of knowledge and information, is key to learner engagement and development of critical thinking (Konings et al., 2005). When tablets are used to enhance effective teaching and learning, the users need to go beyond retrievals of information in internet-based technology or any technological sources to unpack, synthesise, debate, review, and argue before accepting that such information is valid or authentic. Learners gain meaning during the learning process. Consequently, the concept of learners solving problems to reach a justifiable conclusion promotes meaning-making, high-order thinking, and deep learning in classrooms. Learning is therefore the process of creating knowledge that needs to be grasped by the individual learner (Kolb & Kolb, 2008).

2.5.5 Learning as an interpretive process aimed at the understanding of reality

Learners come to school with valuable knowledge from home and sometimes with misconceptions that need to be verified by a teacher. When learners use internet-based technology such as the internet, they are exposed to an abundance of information. Therefore, it becomes the responsibility of the teacher to help them clarify the information to rectify misconceptions about the information learned and the learning processes (Konings et al., 2005).

The above-mentioned conceptions of learning illustrate that learning is a complex and intractable process that makes the study and understanding thereof difficult and contentious (Hay, 2007). It is also important to establish ways of categorising learning for analytical purposes. Through learning activities designed to promote discussion, debates, and arguments in class, learners share meaningful ideas, knowledge, and skills. This process creates a social learning environment that can be enhanced with technological learning tools. This study aims to explore the use of technology as a platform to promote learning and learner engagement with content as well as peer interaction. Learners learning through dialogues is central to knowledge generation. When learners spend time on social media platforms such as Facebook or Wikis they create virtual communities of practice and a virtual public sphere for discussions that can promote effective teaching and learning (Churcher et al., 2014).

2.6 Thinking Skills in Learning

Theorists typically have preferences about ways of encouraging or developing good thinking, deep learning, and strategic approaches to studying for a better understanding of what is taught to achieve good results. Researchers such as Gust (1995) agree that a person cannot be taught how to think; thinking is person's natural ability. Even though teachers are responsible for designing activities and learning materials that develop learners' thinking skills, for the most part of learning, and in almost any subject field the focus is on how learners think. By developing such content, teachers directly or indirectly ensure that learners grasp and develop the cognitive skill. In educational discourse, "teaching thinking" or "teaching thinking skills" are often used to refer to pedagogic approaches through which specific strategies and procedures may be taught and used by learners in a controlled, conscious way for effective learning to take place (Moseley et al., 2005; Gibby, 2013). Irrespective of how learning is perceived in terms of learning theories, approaches to effective teaching, and

learning using technology to enhance learning alongside other processes that enhance learning, “thinking” is considered a fundamental component of learning in this study. The many types of thinking that exist include creative thinking, reflective thinking and metacognitive thinking. Thinking promotes effective learning and subsequently subscribes to effective learner engagement in classroom settings.

Teachers and learners can use tablets, especially the internet, to clarify uncertainty and verify their answers promptly. Teachers with sound subject knowledge and with good critical thinking skills can use their abilities to improve learner engagement and transfer their skills and abilities to the learner. Moreover, teachers with ICT skills and sound subject knowledge can enhance their pedagogy to maximise opportunities for learning. In this regard, teachers held positive views by affirming that the practice did not change their role as teachers but improved their quality of teaching (Maja, 2023).

As technology enables a learner’s ability to access, compare and evaluate information from many internet-based sources, the process promotes learner engagement and develops cognitive and problem-solving skills. Tablets seem to develop the type of learner engagement that promotes a “caring to know” or “getting it right” attitude (instant corrections) in classroom settings (Kong, 2014). Jahnke and Liebscher (2020: 2) advocate that “learning with technologies means to use technology to extend the cognitive functioning during learning and engage learners in cognitive operation while constructing knowledge that they otherwise would not have been capable of; students can make cognitive connections expressed as a-ha moments”. Hence, teachers and learners can use technology to engage in critical and reasoning thinking. Good academic and social skills help learners make effective decisions regarding their lives, learning, and careers (Moseley et al., 2005; Gibby, 2013; Gust, 1995; Sabri, Llyas, & Amjad, 2015).

In this study, attention is given to critical thinking, as this type of thinking underpins decision-making. This means that education systems need to inculcate a culture of improving critical thinking at all levels of learning for learners to make justifiable and well-informed decision-making (Gibby, 2013; Dryden and Vos, 2005; Erickson, 2007; Peel, 1967). Therefore, this study was undertaken to ascertain how teachers and learners use tablets to improve critical and reasoning thinking in classroom settings. Learning to think critically is important for South African and global learners, as the world requires critical thinkers who can make well-informed decisions. It was thus

necessary to investigate how teachers (and learners) can best use tablets to engage learners in activities that promote thinking skills. To engage learners with thinking skills, it is important to use technology that supports a credibility culture where learners with access to internet-based technology verify answers or test the existing knowledge. Access to and use of technology can clarify learners' misconceptions and add value in developing or strengthening teachers' subject knowledge.

2.6.1 Critical thinking

The many definitions of critical thinking include that of researchers such as Kong (2014) and Gibby (2013), who define critical thinking as a "well-founded judgment, utilising appropriate evaluative standards, in an attempt to determine the trustworthiness, merit or value of something". Erickson (2007: 19) defines critical thinking as "a process by which the thinker improves the quality of his or her thinking by skilfully taking charge of the structures inherent in thinking and imposing an intellectual standard upon them". In this definition, Erickson (2007: 19) indicates that critical thinking is "self-directed, self-monitored, self-disciplined and self-corrective thinking". Hudgins (1977: 179) stated that critical thinking involves "an attitude or a disposition to search for evidence which bears upon an argument or the conclusions drawn from an argument". Hudgins added that "such an attitude should pervade the behaviour of the learner whenever s/he is asked to accept a conclusion, and so we identify this attitude of wanting to know what evidence is available as a hallmark of critical thinking".

In light of the above definitions, critical thinking is considered to be an integral part of learning, which leads to deep learning. Consequently, critical thinking and learning focuses on information-gathering, understanding and thinking to generate productive outcomes. Therefore, thinking is a process (as is learning) that involves restructuring or reorganising one's knowledge or way of viewing a situation to generate a new response (Amjad, 2020; Moseley et al., 2005). Hence, this study examined how teachers and learners use tablets to enhance critical thinking when solving problems. Brenner (2016: 155) regards critical thinking as "an attribute required in many careers" for workers to make informed decisions. It is important to note that critical thinking does not mean opposing, but interrogating an existing situation or piece of information. In the education context, critical thinking involves taking a deep approach to teaching and learning.

Teaching is influenced by several factors including unloading a packed curriculum. A heavy curriculum is a challenge to teachers in the sense that there isn't enough time to promote critical thinking in their teaching. Critical thinking looks beneath the surface of knowledge and reason (Jordan et al., 2008). It encourages learners to look at the advantages and disadvantages of a given situation before making a conclusion. As such, this investigation was conducted to observe the extent to which critical thinking is promoted in a classroom when technology is used for teaching and learning.

To develop critical thinking skills, teachers need to design a problem-based teaching approach which includes collaboration, real-world and open-ended discussions, brainstorming, providing a competitive environment, and using artifacts such as images. Therefore, the components of critical thinking include the disposition to seek truth and understanding and being strategic and skeptical to minimise misconceptions (Zanjani et al., 2017). Tablets could be used to help learners to realise the authenticity of the information. Critical thinkers use logic to solve problems using strategic planning, while considering the validity of all possible solutions to the problem (Erickson, 2007).

Learners can apply critical thinking using technological tools and resources such as chat groups, WhatsApp, emails, and other technological platforms to verbalise their internal communication processes and engage themselves in the problem-solving exercise. It is a teacher's responsibility to organise content and resources to help learners become critical thinkers and problem solvers in their learning journey. Teachers could invite learners to solve problems on the board in front of the whole class following the think-out-loud concept. The think-out-loud concept models the metacognitive process for the class to consider as a smart way to solve a problem through verbalisation of internal communication processes (Gust, 1995).

2.6.2 Problem-solving

Using tablets to access internet-based technology, learners can find information using search engines to solve problems that emerge when learning. However, it is important to acknowledge that learning is a complex and intractable process and accessing credible information on the internet does not necessarily resolve the problem (Hay, 2007; Naicker et al., 2022; Konings et al., 2005). Capable peers or teachers may need to mediate such information for learning with understanding to happen. Similar to critical thinking, problem-solving skills are essential to live in a complex society with

complex problems. Problem-solving is frequently regarded as one of the highest forms of critical thinking. Consequently, critical thinking translates into problem-solving. In a classroom situation, learners are constantly faced with problems that need to be solved, and therefore, teachers are compelled to mediate learning by following appropriate processes to unpack activities supporting learner understanding of content. Teachers therefore need to devise strategies that can help learners understand content, even when leveraging technology.

In the past 10 years, there has been a great increase in the number of computer-based interventions, especially during the COVID-19 pandemic. This implies that class material, sample questions, and other educational resources should all be available on the online education system (Saikat et al., 2021). Technological tools such as tablets are currently used as an intervention strategy to access learning content from the internet to improve the teaching and learning. Learners can store learning material on tablets for easy access. Therefore, when learners use devices for learning purposes, they are likely to improve their schoolwork, as it allows the integration of learning and playing (educational games and videos on their tablets) to solve problems (Hourcade et al., 2014; Neumann & Neumann, 2021).

The different approaches to solving problems include applying a set of rules that enable mediation and looking at a task in different ways to find a solution. For instance, tablets use interactive multimedia displays that stimulate visual, auditory, tactile, and kinaesthetic sensory systems to respond to a learner with instant feedback (Neumann & Neumann, 2021; Van Deventer & Mojapelo-Batka, 2013). Following the chosen processes, possible answers to the problem are generated and the best answer is selected following the set evaluation rules. Learners need to be taught to interrogate the process and solution, and understand how the solution will solve the problem. Furthermore, the advantages and disadvantages of the outcomes, and the cost of implementing the solution are evaluated. Although there may be no definite answers to these questions, the process can assist a learner in considering different ideas and possible solutions. The learner needs to take action to test the effectiveness of possible solutions. Therefore, the learner needs to take accountability for their learning and be innovative in using the available technology.

It is important to note that critical thinking pertains to the quality of reasoning or argument presented to support a belief about problem-solving (Amjad et al., 2015). For

instance, an individual may suddenly gain insight into a problem and find an answer to the problem (Coon, 2004). Gaining insight into a problem is a process where an individual reorganises the elements of a problem, then selects the relevant aspects to combine the bits of useful information to create meaning. Insight also involves the comparison of new problems with old information (Coon, 2004) of already solved problems. Gaining insight into solving problems translates into a learner's ability to perform well.

Occasionally, an individual seems to become stuck in their thinking and cannot find a solution to a problem. Consequently, the individual gets stuck in a mental set or fixation (Van Deventer & Mojapelo-Batka, 2013). Fixation is an example of restricted thinking. Another way of describing this is the tendency to evaluate a problem situation and become stuck in that evaluation while ignoring other alternatives relevant to solving the problem (Van Deventer & Mojapelo-Batka, 2013). For an individual to solve a problem, they need to know how to apply reasoning skills or to illustrate that there was reasoning behind their decision. The next section focuses on exploring "reasoning" as a key aspect of thinking skills applied in learning.

2.6.3 Reasoning

Reasoning is an integral part of critical thinking that distinguishes poor from good critical thinkers. Critical thinking and learning are fundamental to the development of good reasoning skills. As with learning and thinking, defining the concept of "reasoning" is a challenge. This study adopted the definition by (Van Deventer & Mojapelo-Batka, 2013: 5), who stated that "... reasoning is one form of 'thought' and can be defined as 'a process of goal-directed thinking that concludes a set of facts'".

Through reasoning, different bits of information are compared. As stated by Gava et al. (2017: 20), "lower-level thinking procedures and activities support the transfer of knowledge from the educator to the student, while higher-order thinking skills enable student capabilities to apply, analyse, synthesise and evaluate information". In this context, it can be concluded that reasoning may assist in justifying decisions made to solve a problem, and that some of the information may provide evidence to support ideas and other information may not.

Rules are key to ascertaining if reasoning is occurring or not, especially in teaching and learning situations. This means that logic is vital to providing explanations when

used for prediction and generalisation; hence, logic is essential for learning. Even though some people do not use reasoning well, most people apply reasoning in thinking critically and to make decisions. The quality of reasoning depends largely on the suitability of the reasons presented to support the point debated. This implies that reasoning is structured. There are two main structures inherent in reasoning, namely, a premise and a conclusion (Van Deventer & Mojapelo-Batka, 2013; Qu et al., 2021). According to Van Deventer and Mojapelo-Batka (2013: 5), "a premise is a statement from which the conclusion is inferred, and a conclusion is a viewpoint adopted or the claim made". Therefore, a premise provides the evidence that supports a conclusion. The relevance of the premise to the conclusion determines how well the person reasons. A learner's ability to reason can be enhanced with technology.

In everyday life, the relevance of the premise used to support a point of view is crucial if one wants to avoid faulty reasoning. However, there are often subjective reasons (based on social and emotional needs) as to why irrelevant reasons or faulty premises are used to support a conclusion or point of view (Van Deventer & Mojapelo-Batka, 2013). An investigation was conducted on the value of the technology used in schools in improving critical thinking, in which three types of reasoning were discussed, namely, the deductive, inductive and critical methods of reasoning. These methods of reasoning determine whether an individual can make an informed decision. To achieve this, it was necessary to understand that when people employ reason, external and internally stored information is used in the transformation of that information (Coon, 2004).

First, the processes of deductive reasoning are explained. This study bases its explanation of deductive reasoning on Gust's (1995: 7) definition of the concept of deductive reasoning, which states that it is "a logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively". Gust's definition is also supported by (Van Deventer & Mojapelo-Batka, 2013) and Moore et al. (1985), who stated that deductive reasoning refers to the process of drawing a conclusion that follows logically from two or more statements or premises. In essence, deductive reasoning is based on the logical rule, which aligns with the statement made by Van Deventer and Mojapelo-Batka (2013) and Moore et al. (1985), who stated that, if the premise(s) or a statement(s) is (are) true the conclusion is true (and cannot possibly be false). Deductive thinking skills enhance

learners' logical and systematic reasoning during the learning process. Furthermore, this type of reasoning is appropriate for learners' exploration and engagement with knowledge.

Regarding inductive reasoning, Gust (1995: 7) indicated that "inductive learning is a logical process in which a conclusion is drawn containing more information than the observations or experience on which it is based". Gust (1995: 7) also provides an example aiming to explain inductive reason, stating that, "Every crow that has ever been seen is black, so all crows are black". The truth of the conclusion is verifiable only in terms of future experience and is attainable only if all possible instances have been examined. Analysis of the example indicates that there is no certainty that a white crow will not be found tomorrow. However, experience would make such an occurrence seem extremely unlikely (Gust, 1995). Moore et al. (1985) supported Gust's view and stated that "the premises are meant only to provide significant support for the conclusion, in the sense that if they are true, the conclusion becomes more probable, though it might still be wrong". This is because inductive reasoning uses available evidence to generate a conclusion about the likelihood of something happening, which means that there would be no further investigation to prove that the statement is correct.

Hence, in inductive reasoning, conclusions are based on premises, but premises do not guarantee conclusions as they do in deductive reasoning. However, premises in inductive reasoning only provide some support for the likelihood or probability of conclusions (Van Deventer & Mojapelo-Batka, 2013). Through inductive reasoning, learners can make conclusions based on limited information. However, it must be considered that these conclusions are only assumptions; they are not certainties and therefore not facts. Inductive reasoning is used when people form analogies or comparisons (Van Deventer & Mojapelo-Batka, 2013). To prevent misunderstandings and misconceptions, learners must be able to evaluate the information they receive, they should reason correctly, make good judgments, and draw justifiable conclusions. This is what is meant by the term "critical reasoning" (Van Deventer & Mojapelo-Batka, 2013). Reasoning does not translate into criticising. Critical reasoning implies that one is thinking critically about the information, and will make an informed decision. Using critical reasoning improves learners' insight into things, and leads them to be better

informed, to be open-minded, and to make good informed decisions (Van Deventer & Mojapelo-Batka, 2013).

Generally, reasoning skills refer to critical thinking skills that analyse, explain, evaluate, prove, and synthesise information. By inference, they also embrace skills including creative thinking, problem-solving, and information processing that can be enhanced using technological tools such as tablets. Therefore, the tablet is a technological tool that can enhance a learner's reasoning skills.

2.7 Learner Engagement

The 21st-century learning landscape has drastically changed due to the advent of technologies such as the use of tablets for teaching and learning, the result being that teaching and learning processes have become more interactive, engaging, and fun. Technology-based instructions are used to address the expectations of a learner to engage in learning. As such, with the integration of technology in the classroom, teachers are expected to continue creating innovative learning material, both task-oriented as well as learner-centred (Mendezabal & Tindowen, 2018) to improve engagement.

As with learning and critical thinking, teaching is seen as an integral part of learner engagement. Learner engagement is quantified in terms of the quantity and quality of the learners' involvement in learning. Learner engagement has been proven primarily and historically to increase achievement, positive behaviour, and a sense of belonging in learners (Taylor & Parsons, 2011). In general, the concept of "learner engagement" is influenced by a belief that learning improves when learners are inquisitive, interested, or inspired, and that learning tends to suffer when learners are bored, dispassionate, disaffected, and "disengaged" in learning activities. Learner engagement was initially understood in terms of the behavioural indexes of learner participation in educational settings. It was broadly described as the process of active participation of the learner in school-associated efforts. For learners to be engaged in school-associated work, they need to pay attention and show curiosity, interest, optimism, and passion when they are learning or being taught (Gava et al., 2017; Abbott, 2014).

Some researchers (Rescly & Christenson, 2011; Nystrand & Gamoran, 1991; Appleton, 2008) preferred to define the term learner engagement as "involvement or commitment" of a learner and a teacher to schoolwork. Although learners play a key role in such affairs, the teacher also plays a critical part in initiating activities that foster learner engagement in the classroom. Learner engagement is therefore the condition or situation that occurs when learning becomes the unavoidable by-product of the desired activity or process of teaching and learning (Dueck, 2014). The learner's ability to follow the rules and instructions of a teacher and engage in activities can influence the learner's cognitive development. Thus, this self-regulation and effortful control whereby the learner learns to control and inhibit their own emotions and behaviours in the classroom determine the quality of teaching and learning (Rescly & Christenson, 2011). Therefore, learner discipline becomes key when technology is used to enhance learning in a classroom.

Students can be engaged academically, socially, cognitively, or effectively. Academic engagement deals with learning processes' behaviours, such as completing assignments, being attentive, and participating in academic activities. While social engagement is related to the learners' behaviour towards the class rules, for example, being on time and interacting effectively with peers and the teacher, cognitive engagement refers to the level of learner endeavour needed to understand complex subjects and go beyond the minimal obligation. Attitudes such as asking questions, completing difficult tasks, and learning beyond the subject requirements fall into this category. Finally, affective engagement refers to the extent to which learners feel emotionally involved in their learning community (Gava et al., 2017). Furthermore, many researchers including Rescly and Christenson (2011), Mahatmya et al. (2011), Nystrand and Gamoran (1991) and Appleton (2008) also differentiate student engagement in terms of the different ways of understanding how learners engage (Hu et al., 2011). For instance, procedural and behavioural engagement are examples of positive conduct, effort, and participation of the learner in the classroom settings (Nystrand & Gamoran, 1991; Gava et al., 2017). While emotional engagement promotes interest, identification, belonging, and a positive learning attitude (Appleton, 2008), substantive engagement and cognitive engagement, for example, promote self-regulation, learning goals, and investment in effective teaching and learning (Nystrand & Gamoran, 1991; Mahatmya et al., 2011; Appleton, 2008; Abbot, 2014; Gava et al., 2017; Tylor, 2011).

Using tablets in the classroom leads to learner engagement. Technology-enhanced environments afford individuals almost limitless opportunities for exploration and access to information that can support learner engagement and critical thinking. Tablets are technological tools used for exploration and access to information. Access to the internet can enable learners with tablets to get involved in the learning processes including discovering facts, solving problems, and interacting with other learners. Engine searches are used for research purposes and for discovering valuable knowledge that schools can use for effective teaching and learning.

Using tablets can create a learning environment that can help learners reach the level of motivation required for them to learn and progress in their learning. Learners who use tablets are generally found to be engaged in the learning process: they are usually focused, and immersed in their work with little or no awareness of the general world around them. Learners use tablets to test ideas in a synchronised and visual environment to promote diverse participation and engagement with the hope of enhancing effective learning (Harry et al., 2012; McDougall et al., 2018; Ciampa; 2013; Neumann & Neumann, 2018; Hourcade et al., 2014: 3).

Learner engagement is also said to be multidimensional. This multidimensional nature of learner engagement has slowly shaped the concept into both a strategy for improving educational achievement and an independently valuable outcome of schooling (Hu et al., 2011). Many people who are involved in education are concerned that learners are not fully engaged in the classroom. It is important to ascertain why South Africa fails to achieve the international benchmark as compared to other countries (Abbott, 2014; Harris; 2008; PIRLS and the Global Information Technology Report). Therefore, this investigation was conducted to discover how engagement, using technology, enhances the achievement of the different categories of learning. The focus was thus on four forms of learner engagement: procedural, intellectual, social, and substantive engagement, as these types of engagements are more likely to be observed taking place in classroom settings.

In a learning environment, instructions need to be given and/or taken by the learners to learn something new. Such instructions must therefore be organised in a way that will encourage learners to use more effortful strategies that support learning. The three-dimensional strategies are 1) procedural instructions that describe how to complete

tasks in a stepwise manner, 2) principles that describe rules governing the tasks, and 3) examples that demonstrate how instances of the tasks are carried out (Eirikdottir & Catrambone, 2011) in the classroom settings.

2.7.1 Procedural engagement

Teachers give instructions to learners on what needs to be done and how it should be done. In so doing, teachers are more likely to encourage or promote procedural engagement and/or procedural instructions in their classroom settings. Procedural instructions mean that teachers explain how to complete a task or describe the steps or method of what to do to ensure that work is completed. This suggests that teachers and learners do not dig deep to learn more about the activity they are investigating to verify the information; they do not use internet-based technology to prove answers (Nystrand & Gamoran, 1991; Eirikdottir & Catrambone, 2011). Deep learning and critical thinking skills are not a priority in procedural engagement. In procedural engagement, learners do not engage with challenging, problem-solving, and critical thinking work that will help them to improve decision-making in the future.

2.7.2 Intellectual engagement

This type of learner engagement is aimed at increasing learner knowledge in a subject, whereby teachers can create lessons, assignments, or projects that stimulate learner curiosity and eagerness to learn. The teacher is expected to allow learners the opportunity to choose the way they investigate a topic and demonstrate the learning outcomes (Abbott, 2014). Intellectual engagement is important in determining and understanding the emotional and cognitive motivators of students to participate in the required tasks to achieve school success (Hu et al., 2011). Consequently, teachers need to design a learning environment that supports deep intellectual engagement through which learners can develop their reasoning and problem-solving skills to achieve maximum learning. As tablets are known to support students' interaction and participation in learning, the role and the educational value of using tablets in the classroom to improve the intellectual engagement of learners in learning was investigated in this study.

2.7.3 Social engagement

The social engagement aspect of learning requires teachers to use learning strategies or methods that can stimulate student learning through social interactions. Social

interaction can improve learning as it enhances learners' critical thinking and problem-solving skills (Hurst et al., 2013). Learner participation in the classroom setting is vital to determine and identify the type of learner engagement in the process of promoting effective teaching and learning. Learning activities therefore need to be designed in a way that they encourage learners to learn from one another in a classroom setting. Such participation in academic and social or co-curricular activities, active attendance, assignments, and homework completion that aim to release the potential of the learner are all considered crucial for achieving a positive academic outcome (Hu et al., 2011).

Using tablets in learning can foster social engagement in and outside the classroom. While emotional engagement reflects the combination of students' sense of belonging, the feeling of competence, and motivation towards the concept of schooling, it also includes the positive (using tablets to serve educational goals) and negative (use of tablets in the classroom causes disruption) reactions towards peers, teachers, administrators and the school itself. Using tablets in learning motivates learners to learn beyond a classroom setting. Learning with tablets contributes to a learner's willingness to participate in the learning process (Hu et al., 2011).

2.7.4 Substantive engagement

With this type of learner engagement, teachers are expected to set up activities that challenge the cognitive thinking of the learners. In substantive engagement, learners are expected to strive to achieve more than the minimum requirement or procedural engagement when responding to any form of activity (Harris, 2008). In their responses or answers, learners need to include evidence of extensive reading, understanding, critical thinking, problem-solving, and commitment to reach the requirements of high-order thinking that enhances effective learning. Substantive engagement requires more input from teachers than transmitting important knowledge and presenting good lessons. The student's input includes their abilities to pay attention, take in information, and perform the required task. As a result, substantive learner engagement depends on what teachers and learners do together and how they work in terms of each other's requirements and abilities (Nystrand & Gamoran, 1991). Substantive engagement is thus considered more beneficial for learners than procedural engagement. To explore whether learners were substantively engaged in learning through critical thinking, it was necessary to observe them using tablets as a tool that stimulates interest, debates, and arguments in the classroom. An observation tool was used to establish whether

learners using tablets followed procedural and/or substantive engagement in the classroom. The significance of using tablets to motivate and/or engage learners in learning and critical thinking was thereby examined to ascertain its value in terms of learner engagement in the classroom.

Observations of learners in class, where technology is integrated into classroom learning, indicate that technology enables learners' understanding and enjoyment and that learners are procedurally engaged or disengaged. However, the process cannot detect the seriousness of the learner's involvement with the task. It is noteworthy to mention that some tasks and certain patterns of interaction are inherently more substantively engaging. Mendezabal and Tindowen (2018) reported that using tablets in teaching can enhance the processes of learning, as learners' engagement with the task increases. In this context, learning in classrooms may take place if learners can demonstrate that they can go beyond the recall, recognition, and reproduction of information to the evaluation, analysis, synthesis, production, and application of ideas, to attain the process of effective teaching and learning (Taylor, 1999).

Learning is seen as the desired outcome of the teaching, assessment, thinking, and reasoning that take place in the classroom setting. Learning activities thus need to be organised, monitored, and designed in a manner that encourages learners to discover knowledge and acquire skills. Recently, learner engagement has been built around the goal of enhancing all learners' abilities to learn how to learn or to become lifelong learners in a knowledge-based society (Taylor & Parsons, 2011). Learning is sharing and it makes learners take ownership of existing knowledge. Learning is also connected to thinking. Thinking is seen as a strategy to persuade teachers and learners to follow the attitude of "caring to know" or "getting it right", and using technology as a vehicle to promote learner engagement to achieve effective teaching and learning in and outside the classroom. The next chapter presents a description of the theoretical framework followed in this study.

CHAPTER 3: TECHNOLOGICAL PEDAGOGICAL AND CONTENT KNOWLEDGE (TPACK) FRAMEWORK

3.1 Overview of Chapter 3

Harnessing technology in education can enhance learner engagement and improve learner success. South Africa is striving to stay abreast with the rest of the world in the process of introducing technology into education. As technology uplifts the standard of teaching and learning in schools, teachers are compelled to integrate technology into their pedagogy such that learners can also adopt technology in their learning. To help teachers and learners align their educational goals with the relevant technological tools, pedagogical approaches, and evaluation methods, there is a need to adapt the appropriate technology integration framework. Therefore, this study bases its analysis on the Technological, Pedagogical, and Content Knowledge (TPACK) framework to ascertain the successful integration of educational technology in a classroom. TPACK is used to establish teachers' knowledge of the interactions between technology, content, and pedagogy.

Importantly, using technology effectively means creating novel and content-rich tasks that redesign traditional ways of learning and create opportunities that do not exist without the use of technology (Alivi, 2019: 7). As such, there are many frameworks including the Substitution, Augmentation, Modification, and Redefinition (SAMR) model that support the use of technology in the classroom. This study looked at SAMR levels and TPACK components to decide which model is more appropriate for the use of tablets to promote effective teaching and learning. Alivi (2019: 7) maintains that both SAMR and TPACK can foster the teaching and learning process if carried out with students' needs in mind, as these frameworks offer more opportunities for learners to learn independently (Alivi, 2019). However, this study selected TPACK as the best model, as it affords teachers a comprehensive approach in terms of guiding them on how to teach with technology.

Alivi (2019: 5) advocated that the SAMR model has been "popularized by Puentedura (2006), illustrating a hierarchy of technological integration by teachers in pedagogical practice as an evaluation model of teachers' ICT adoption. It starts with Substitution as the lowest level to Redefinition as the highest one". Four levels of Puentedura's SAMR model are explained as follows (Alivi, 2019: 6):

- 1) Substitution means “tech acts as a direct tool substitute, with no functional change” in practice. The substitution process refers to replacing manual teaching instruments with digital instruments. For instance, teachers substitute the use of whiteboards or printout materials as material delivery tools with interactive whiteboard (i.e., using projectors).
- 2) Augmentation indicates that “tech act as a direct tool substitute, with functional improvement”. The example of teaching activities in the augmentation level is that students practice their writing using Microsoft Word to check spelling and grammatical errors. Students not only use ICT (e.g., laptops, MS Word) for writing, but also other ICT functions (e.g., thesaurus, Grammarly), allowing them to acquire more knowledge in the process.
- 3) Modification refers to “tech allows significant task redesign”. In this level, the application of technological functions offers students different types of learning tasks. For example, students are given a task to write collaboratively using Google Docs, and then provide peer feedback online on the Google Docs platform.
- 4) The highest integration level is redefinition, which indicates that “tech allows for the creation of new tasks, previously inconceivable”. This level emphasises greater creativity in students’ learning tasks. For instance, for speaking skills, students are instructed to make a video and upload it to YouTube to reach worldwide viewers.

Alivi (2019: 7) argues that “the SAMR model brings light to teachers for developing their TPACK competence”. The SAMR model has been used as a means to tackle any form of changes in teaching strategies when introducing learning technologies to learners (Nair & Chuan, 2021). The SAMR model indicates that the students are active in each learning task using ICT, and the higher the level, the more engaged the learners are in achieving their autonomous learning capacity (Alivi, 2019) in and outside the classroom.

Researchers of the TPACK model including Schmidt et al. (2009: 123) maintain that TPACK was introduced to the educational research field as a theoretical framework for establishing the teacher knowledge required for effective technology integration in teaching and learning. In this study, the TPACK theoretical framework is used to identify knowledge gaps of teachers when using tablets for teaching in the classroom.

Figure 3.1 presents the outline of sub-topics for this chapter, which will elaborate on why this framework was chosen and how it is used in this study.

Chapter 3: TPACK Framework									
Overview of Chapter 3	Preview of TPACK	Integrating technology into South African schools	Components of the TPACK framework	TPACK impact on teaching and learning with technology	Significance of TPACK as a theoretical framework in this study	Enhancing learner engagement using the TPACK framework	Limitation of using TPACK	The strength of using TPACK as a theoretical framework	Chapter summary

Figure 3.1: Outline of sub-topics in Chapter 3

3.2 Preview of the TPACK Framework

Globally, the education arena has experienced significant changes in the 21st century that have posed distinctive challenges to teachers and learners (Piyatamrong et al., 2021). Among other factors such as student demographics, revolving learning needs, lack of learner engagement, and sub-standards of teaching and learning, the global educational landscape has been reshaped by the onset of technology (Jansen et al., 2015). Occasional challenges such as the COVID-19 pandemic lockdown and long hours of power outages have also affected the South African education system. Therefore, incorporating technology in the education arena has become a new approach to improving the education system. Technology can improve communication, networking and the dissemination and receiving of information.

Globally, researchers have realised that for effective teaching and learning to take place, there is a need to introduce technology in the classroom (Collins et al., 2009; Piyatamrong et al., 2021). Although digital tools and online resources can provide exceptional learning opportunities, effectively integrating them into the classroom can be overwhelming to teachers and learners. Therefore, teachers need to be proficient in employing technology to effectively enhance learner engagement and promote critical thinking and problem-solving skills. Additionally, teachers need to be mindful of technology-driven distractions that can obstruct learners' ability to stay focused on their learning.

3.3 Origins of PCK

Tuithof et al. (2019: 75) established that a much-cited model of the PCK of science teachers was developed by Magnusson, Krajeik and Borko (1999) building on Shulman (1987), Grossman (1990), and Tamir (1988). This model contains five PCK element. Magnusson and colleagues (1999) added three PCK elements to Shulman's key elements. Two key PCK elements in Shulman's model are 1) instructional strategies and representations, i.e., the ways in which the teacher transforms subject matter knowledge, and 2) knowledge of students' understanding, i.e., the learning process and the content-related problems of students. Researchers have used these two key elements as starting points, subsequently adding new PCK elements, namely, 3) knowledge of assessment, which pertains to the knowledge that teachers use to establish what students have learned, while the next element, 4) contains the knowledge about the curriculum and corresponding curricular goals prescribed by the educational authorities, and the knowledge that a teacher requires to implement and plan this curriculum. The final element, 5) notes that teaching orientation represents "a general way of viewing or conceptualizing ... teaching" (Tuithof et al., 2019: 75).

Many teachers know how to teach the concepts in an existing curriculum to facilitate the understanding of learners. This is because they are capable of choosing and developing examples, representations, assignments, strategies, and tests (Tuithof et al., 2019) to explain these concepts to a specific group of learners. However, along with technological developments, education is also changing. Teachers and learners therefore need to adapt to new ways of teaching and learning. In line with this, Tuithof et al. (2019: 73) denote that "Shulman (1987) introduced the concept of Pedagogical Content Knowledge (PCK) for this specific knowledge and drew attention to the fact that teachers need to transform content knowledge for their teaching practice". PCK affords a teacher "the flexibility to select a teaching method that does justice to the topic" (Tuithof et al., 2019: 73). To develop PCK, teachers have to develop a profound understanding of their students, their subject, and teaching strategies. There has been much debate on the definition, nature and meaning of the concept PCK. PCK can be seen as a toolkit of suitable teaching means or as a rich repertoire of subject material (Star, 2023; Tuithof et al., 2019) based on learner knowledge linked to a teaching process. Tuithof et al. (2019: 73) describe PCK as a "useful concept and tool for describing and understanding teaching practice".

Researchers including Schmidt et al. (2009), Mishra and Koehler (2006), Archambault and Barnett (2010), Graham et al. (2011), Koehler et al. (2014: 102), and Koehler and Mishra (2005) acknowledge that the formulation of the TPACK framework has extended Shulman's (1986) delineation of teachers' knowledge to fully consider the role of technical knowledge in effective teaching. Furthermore, Koehler et al. (2014: 102) reported that "the TPACK framework builds on Shulman's construct of Pedagogical Content Knowledge (PCK) to include technology knowledge in the content and pedagogical knowledge". As technology, content, and pedagogical knowledge are three components required by the teacher to enhance effective technology-based teaching, teachers need to be equipped with skills necessary to teach with technology to enhance learner engagement with content. Once the teachers' knowledge gaps are identified, educationists and policy-makers can set up appropriate systems to train teachers on how to integrate technology for effective teaching to take place.

3.4 Integrating Technology into South African Schools

South Africa is concerned about learners struggling to read, write, and count, among other challenges faced by their education system. For example, the TIMSS report (2019) findings indicated that Grade 4 learners in South Africa cannot read for meaning, count, or write (Cotter et al., 2019). Therefore, the government has considered leveraging technology in the classroom as a means to improve education in the country. On that notion, the Gauteng Department of Education (GDE) introduced tablets into schools to improve the education system in Gauteng province through "The Classroom of the Future" concept. This concept is an intervention strategy aimed to enhance teaching and learning by adopting technology for teaching and learning in and outside the classroom. Appropriate technology-enhanced teaching skills can enable learner engagement in critical, creative, conceptual, and higher-order thinking.

Hence, the TPACK framework can be used to establish and mitigate teachers concerns on using technology for effective pedagogy enhancement. Teachers' training on the integration of technology in their work is key to ensuring that effective teaching and learning with tablets takes place (Erickson, 2007). Using TPACK, teachers can integrate ICT into their pedagogy to enable them to select and use hardware and software, identify the affordances (or lack thereof) of specific features, and use the

tools in a pedagogically appropriate and effective way (Voogt et al., 2017). Relevant ongoing training and workshops on teaching with technology need to be implemented and monitored at school level. Koehler et al. (2014: 102) also noted that "the central idea of pedagogical content knowledge (PCK) is that learning to teach a particular subject matter requires not only understanding the content but also developing appropriate instructional strategy and skills appropriate for learners". According to Ozden and Hu (2013) and Koehler (2006: 102), PCK refers to "the knowledge of how technology can create new representations for specific content". Roblyer and Doering (2014: 69) advocate that "the TPACK model intends to equip teachers with skills and knowledge" to identify learner needs and the relative advantage of using the technology in question. Glowatz and O'Brien (2018: 15) maintain that teaching with technology requires teachers and learners to know how technologies develop new ways of understanding, what needs to be taught, and how it should be taught.

Teachers and learners thus need to acquire appropriate skills needed to adapt and respond to the fields of technology, content, and pedagogy (T, C, and P) and the areas of interplay between PCK, TPK, TCK, and TPACK discussed in section 3.2 (Glowatz & O'Brien, 2018: 15). Therefore, this study uses TPACK as the theoretical framework and focuses on exploring the use of tablets as teaching and learning tools in and outside the classroom to enhance learner engagement, particularly in the Gauteng Department of Education.

3.5 Components of the TPACK Framework

Teachers are at the core of designing learning activities intended to engage learners in learning and, therefore, they need to understand how the TPACK framework operates. Researchers including Rahmawati et al. (2019), Nursyifa et al. (2020: 16), Malik et al. (2018: 498), Schmidt (2009), Archambault and Barnett (2010), Graham et al. (2011), Koehler et al. (2014) Mouza et al. (2013) and Koehler (2006: 102) maintain that the TPACK framework comprises seven components. To explore teachers' knowledge of teaching with tablets in the context of TPACK in the classroom, the seven components of the TPACK framework are defined as follows:

1. *Technology knowledge (TK)*: Technology knowledge refers to the knowledge of various technologies, ranging from low-tech technologies such as pencil and

paper to digital technologies such as the internet, digital video, interactive whiteboards, and software programs.

2. *Content knowledge (CK)*: Content knowledge is about the subject matter to be learned or taught. Teachers need to understand the nature of the content they teach and how that differs for various content areas.
3. *Pedagogical knowledge (PK)*: PK refers to the methods and processes of teaching and it includes knowledge on classroom management, assessment, lesson plan development, and student learning.
4. *Pedagogical content knowledge (PCK)*: This refers to the content knowledge that deals with the teaching process (Shulman, 1986). Pedagogical content knowledge is different to the other content areas, as it blends both content and pedagogy, with the goal of developing better teaching practices in the area.
5. *Technological content knowledge (TCK)*: TCK refers to the knowledge of how technology can create new representations for specific content. It suggests that teachers understand that, by using a specific technology, they can change the way learners practice and understand concepts in a specific area.
6. *Technological pedagogical knowledge (TPK)*: This refers to the knowledge of how various technologies can be used in teaching, and understanding that using technology may change the way teachers teach.
7. *Technological pedagogical content knowledge (TPACK)*: TPACK refers to the knowledge required by teachers for integrating technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies.

Following the above-mentioned seven components of the TPACK framework, Schmidt (2009: 124) advocates that "TPACK is a framework that introduces the relationships and the complexities between all three basic components of knowledge, namely, technology, pedagogy, and content". Researchers including Alrwaished et al. (2017), Koehler et al. (2014), Mishra and Koehler (2006), Archambault and Barnett (2010), and Koehler and Mishra (2005) describe TPACK as the types of knowledge required by teachers for the effective integration of technology in education. This kind of knowledge includes classroom management, assessment, lesson plan development, learners' learning (how learners get to know something new / learn methods of teaching), and

digital technologies such as the internet, digital video, interactive whiteboards, and software programs.

The components of TPACK were used as part of the observation criteria to observe teachers and learners using tablets in the classroom. The observation sheet consisted of seven components of TPACK used to ascertain four objectives. The first objective was to establish what teachers and learners perceive as benefits of using tablets and, subsequently, internet-based technology in and outside the classroom setting. The second objective aimed to map teachers' and learners' variations on using tablets in the classroom. The third objective was to ascertain how teachers blend technology with practical activities that need to be completed in the classroom settings or outside the classroom to enhance learner engagement and promote critical thinking skills. The fourth objective aimed to determine the educational value of using tablets in schools, especially in the classroom settings. As such, four teachers teaching the Natural Sciences were observed. Concurrently, learners were observed using tablets as a tool to engage themselves in reading materials, completing classroom activities, researching, watching educational video clips, and playing educational games that enhance effective learning and critical thinking.

One of the reasons for observing teachers using tablets in class was to interrogate the argument of Cohen et al. (2003: 119), which states that teachers who know a subject well, and know how to make it accessible to learners, are more likely to make good use of tools and resources available (including technological) in the classroom and to use them to frame tasks effectively. On the contrary, teachers who do not know the subject content well, or know it but do not know how to make it accessible to the learners, especially if they do not know how to integrate technology, would struggle with using technology effectively.

3.6 TPACK Impact on Teaching and Learning with Technology

Technology is a tool that can shape and/or change the way teachers teach and learners learn. With the emergence of the digital age, learning appears to be shifting from a focus on what has already been discovered towards a focus on knowledge creation and connected learning in the classroom settings (Fredric & McDowell, 2013). Furthermore, Koehler et al. (2014: 101) argue that "one way in which researchers have tried to better understand how teachers could better use technology in their classrooms

has focused on the kinds of knowledge that teachers require to use technology more effectively". The kind of knowledge that teachers need to know includes the following three essential components of the TPACK framework: 1) The TK, where teachers are required to know how to adapt and/or move away from traditional technology, for example, pen, pencil, and paper to digital technologies such as the internet, digital video, interactive whiteboards, and software programs. Fredric and McDowell (2013: 30) argue that "digital learning assists in any instructional practice that effectively uses technology to strengthen the student learning experience" to ensure that effective teaching and learning occur. 2) The CK, which is the kind of knowledge required to master subject content by knowing what to teach (curriculum requirement) and how to teach (relevant methods of teaching) the subject. 3) The PK, which means that teachers are required to possess knowledge in classroom management (for example, issues, procedures, protocols of learner discipline, classroom atmosphere and organisation), assessment, lesson plan development, and student learning (Koehler et al., 2014). Teachers understand and apply learning theories, processes, and approaches in the classroom settings. The three kinds of knowledge (TK, CK, and PK) required by a teacher to integrate technology in teaching need to interconnect to produce TPK, TCK, and PCK to champion TPACK (Roblyer & Doering, 2014) and are shown in Figure 3.2, which also indicates what is achievable in "The Classroom of the Future" when teachers integrate technology into their teaching.

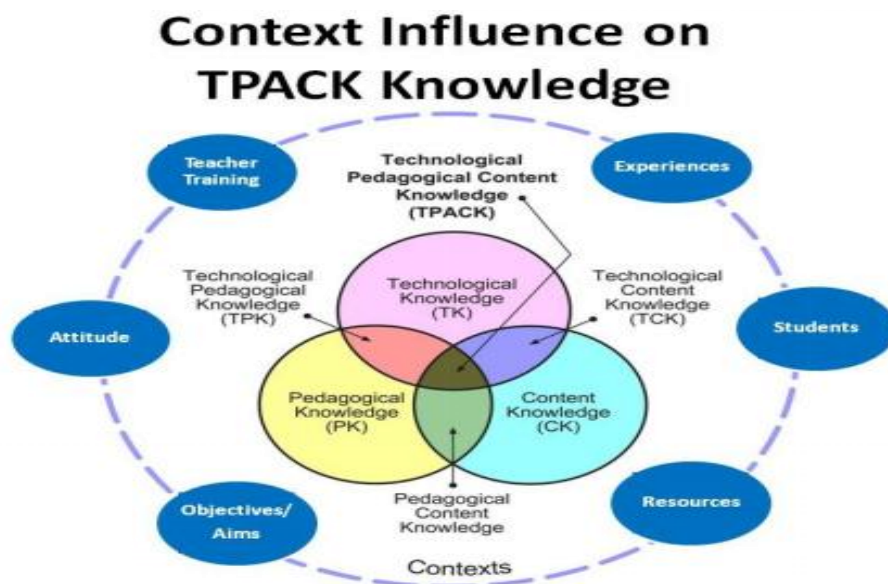


Figure 3.2: A diagram showing how the TPACK framework might be useful for the development of classroom technology skills (Roblyer & Doering, 2014)

However, it should be noted that there are still concerns regarding the issue of teacher training and the development of technological and resources. Teachers do not possess sufficient knowledge about TK, PK, and CK needed to integrate technology into teaching to champion TPACK and provide opportunities to use technology effectively in their classroom (Wang & Baker, 2018). This means that a need exists for teachers to have an understanding of connections and interactions between CK, TK, and PK to make the most effective use of technology in their classrooms (Koehler & Mishra, 2005). At the intersection of these three knowledge types is TPACK, which is an intuitive understanding of teaching content with pedagogical methods and technological tools and resources (Schmidt, 2009: 125; Koehler, 2006: 102). In light of the extra outer layer shown in Figure 3.2, which highlights the importance of attitude and experiences in affecting TPACK, this study conducted phenomenographic interviews to ascertain teachers' conceptions, perceptions, views, and experiences of using technology for learning (see protocol 1 in Chapter 8).

3.7 Significance of TPACK as a Theoretical Framework in this Study

This section explores the significance of using the TPACK model as a framework to understand the use of tablets as technological tools for effective teaching and learning in and outside the classroom. The TPACK framework is used to observe how teachers integrate technology in their teaching to enhance effective learning. Additionally, it has been established in this study's literature review that teaching is an integral and key part of learning and it can be enhanced by technology. Graham et al. (2012: 4) stated that "research has shown that teachers recognise that technology can enhance their pedagogy and improve students' understanding of content". Hence, using tablets for educational purposes has many benefits that can allow learners to reach their full potential. Furthermore, Graham et al. (2012: 4) state that "teachers considered using technology to be beneficial in many ways, including the enabling of graphical representations, allowing concepts to be applied to the real problem-solving environment, making assessment easier and helping students visualise concepts, engage in active learning, maintain positive attitudes, build confidence to promote enjoyment and improve efficiency". Teachers also related to the notion of learner engagement, which is influenced by a belief that learning improves when learners are inquisitive, interested, or inspired, and that learning tends to suffer when learners are bored, dispassionate, disaffected, and otherwise "disengaged" in learning activities (Abbott, 2014). For this reason, it is crucial to understand that a teacher's input is more

important in facilitating effective learning than learners only using technology. This led to the question of whether teachers had received sufficient training on how to integrate technology into their teaching, or on how technology could be used to enhance their teaching.

3.8 Enhancing Learner Engagement using the TPACK Framework

Using technological tools such as tablets as a vehicle for promoting learner engagement in the contemporary classroom is achievable using technological resources including the internet, social media, WhatsApp and emails. The effectiveness of using tablets for educational purposes depends heavily on the knowledge, skills, and understanding of the user. This view supports the arguments of Cohen et al. (2003: 129), who stated that "the differences [referring to skills and knowledge of using tablets devices for learning between teachers and learners] depend on the use of technology; access only creates opportunities for using tools and resources". The TPACK framework is used as a theoretical framework for this study because teachers are at the centre of learner development; they design the content taught and how it is taught. However, using tablets in the classroom also presented challenges from the teaching perspective (Glowatz & O'Brien, 2018). This study intends to use TPACK to further interrogate the notion that "technology should not replace traditional teaching, but it should rather be used to enhance the learning experience" in classroom.

3.9 Strength of using TPACK as a Theoretical Framework in this Study

Using technological devices such as tablets as an educational technology tool has become significant in the 21st century. Teachers are compelled to make a gradual movement from the traditional way of teaching to integrating technology into their pedagogy to enhance learning (Piyatamrong et al., 2021). The TPACK framework used for this study has seven components, which can assist in understanding the type of knowledge required to help teachers teach with technology. Tablets are used to access internet-based technology and are envisioned to be libraries of the future. They particularly attract young people, including learners who spend hours on the web, engaging in conversations and games, reading about what is happening in the world, and exploring different sites that relate to their interests. The availability of internet-based technology gives people, including learners who have been deprived of an education a way to improve their learning (Collins et al., 2009). Hence, TPACK has

emerged as a clear and useful construct to understand technological integration in teaching and learning to optimise the potential of the learner to learn (Baran et al., 2011). According to Lye (2013: 295), "the TPACK model presents a clear and useful framework which can examine and identify the opportunities and challenges faced by ICT implantation" in and outside classroom settings.

Cohen et al. (2003: 119) advocate that "teachers who know a subject well, and know how to make it accessible to learners, would be more likely to make good use of technological tools (such as tablets) and resources available at schools. These knowledgeable teachers can use these resources to frame tasks more productively, than teachers who do not know the subject, or know it but not how to make it accessible to the learners". Olson (2000) argued that technology does not often fit into the existing teaching culture and that it may even undermine the teacher's sense of efficacy. Hence, the TPACK framework is used in this study to examine the knowledge, skills, perceptions, conceptions, experiences, and views of teachers and ultimately learners about using technology as a vehicle for learner engagement in and outside a classroom setting. As reported by Roblyer and Doering (2014: 69), TPACK is a reminder that teachers' understanding of the content and pedagogical knowledge is just as important as the technology used when developing classroom technology skills. Therefore, there is a relationship between the TPACK framework and using technology to engage learners in learning and subsequently improve learner engagement. TPACK explains that teachers can make sensible and creative choices in using technology in the classroom (Baran et al., 2011).

3.10 Limitations of using TPACK

The major limitation of the TPACK framework is the lack of effective teacher professional development, monitoring and support in the process of integrating technological tools such as tablets in teaching and learning. Furthermore, learners lack knowledge, skills, and understanding of using/integrating technology in their learning. This is reflected in the study of Koehler et al. (2014: 109), who stated that "research has indicated that most pre-service and in-service professional development of teachers often fail to support and develop educators' identities as fluent users of advanced technology". Furthermore, researchers of the TPACK framework such as Koehler et al. (2014), Mouza et al. (2013), and Roblyer and Doering (2014) agree that "programs that emphasise the development of knowledge and skills in these three

areas (CK, PK, TK) in an isolated manner are destined to fail”. Thus, effective teacher educational and professional development needs to systematically develop, monitor, and support technology in an integrated manner.

Teachers also have difficulty integrating technology into their instructional processes. Although the ICT applications have proven to be effective in isolation, this does not always imply that the same effects are also realised in natural educational settings (Voogt et al., 2017). According to Mishra et al. (2006: 1029), there is no single technological solution that applies to every teacher, every course, or every view of teaching. Quality teaching requires developing a nuanced understanding of the complex relationships between technology, content, and pedagogy, and using this understanding to develop appropriate context-specific strategies and representations. This means that teachers’ professional development needs to be aligned with understanding content, competency with using technology, and effective pedagogy to maximise opportunities for attaining both effective teaching and learning. In a global context, schools have been poorly resourced with educational technology, which challenges the integration of technology into a classroom.

3.11 Chapter Summary

In summary, this chapter established reasons for using TPACK as a theoretical framework for this study and the limitations of using TPACK. TPACK was chosen as the theoretical framework for this study as it can be used for understanding teacher professional development and learner engagement when technology is employed to add educational value in classroom settings. TPACK considers that teachers require pedagogical tools that use technology to teach content and knowledge that present concepts to learners as tangible (Glowatz & O’Brien, 2018). This means that teachers and learners need to be equipped with skills and knowledge of using technology for educational purposes. Furthermore, this chapter discussed the origins of PCK and the seven components of TPACK, namely, TK, CK, PK, PCK, TCK, TPK, and TPACK, which are aimed at equipping teachers with the knowledge necessary to integrate technology into teaching and learning. Figure 3.2 illustrates that the TPACK framework might be useful for the development of classroom technology skills. Furthermore, the TPACK framework shown in Figure 3.2 represents three essential skills, namely, the CK, TK, and PK that teachers need to understand to effectively teach with technology in the classroom setting. For this reason, it is essential for the teacher in "The

Classroom of the Future" to understand the content, technological and pedagogical knowledge and be able to integrate technology (the rationale for, and educational value of, using tablets in schools) with teaching (teaching methods) and learning (learner engagement). The next chapter contains a description of the methodology followed during the research.

CHAPTER 4: METHODOLOGY

4.1 Overview of Chapter 4

This chapter reports on the strategies and techniques employed in the data collection process and analysis to explain and support the rationale and value of using tablets to enhance effective teaching and learning in a classroom setting. The content in this chapter will enable critical evaluation of the study's general reliability and validity. Figure 4.1 below provides an outline of the sub-topics in Chapter 4.

Chapter 4: Methodology								
Overview of Chapter 4	Location of the investigation	Mixed methods	Four specific mixed methods designs	Sampling approaches	Data collection	Limitations	Ethics	Chapter summary

Figure 4.1: Outline of sub-topics for Chapter 4

4.2 Location of the Investigation

The location for this investigation was one high school in Boksburg, Gauteng province. This high school was strategically chosen for this study, as it was one of the seven schools selected by the government to pilot the "Classroom of the Future" project. In general, the teachers at the school were all computer literate. The primary school at which this researcher teaches is a feeder school for a high school. It is noteworthy to mention that tablets are not used at the primary school level. Consequently, learners entering high school do have a sound foundation on how to use tablets for learning purposes. It was therefore anticipated that for many of the learners, this would be their first experience of using tablets in an educational context. It was also necessary to ascertain more information about the processes involved in training Grade 8 learners to adapt to and use tablets to their best advantage. There were 45 learners per classroom. This means that the teacher-to-learner ratio was at an acceptable level for enhancing effective learning. In this school, teachers use tablets (or laptops) to teach all subjects. This aligns well with the focus of this study, which is on using tablets for teaching and learning. The questions that the researcher considered for classroom observations were:

- What was the learners' learning experience of using tablets for learning in the classroom?
- Is teaching and learning enhanced when learners use tablets for learning purposes?
- If so, what type of learning takes place when using tablets in classroom settings?
- If not, what needs to be done to enhance effective learning using tablets?
- What were the drawbacks?

Using qualitative phenomenographic research methods, the researcher aimed to establish the lived experience of teachers and learners using tablets for teaching and learning (Khan, 2014; Akerlind, 2005; Rands & Gansemer, 2016; Reed & Ingerman, 2013; Entwistle, 1997). This was in line with the main intention of the investigation, which is to evaluate and explore the rationale for, and educational value of, using tablets in schools. To complete the study, all Grade 8 teachers and learners were given questionnaires to map variations about their experiences, perceptions, and conceptions of using technology for learning in classroom settings.

4.3 Mixed Methods

A mixed methods approach was employed for this research to cater for the qualitative and quantitative elements present in the results and discussion. Many researchers have defined mixed methods research as an approach that combines both qualitative and quantitative methods into a single study in order to provide a broader and more complete vision of a problem (Almeida, 2018; Creswell & Clark, 2007; Greene, 2006). Migiro and Magangi (2011: 3759) define mixed methods research as “a research in which the researcher uses the qualitative research paradigm for one phase of a research study and the quantitative research paradigm for another in order to understand a research problem more completely”. This means that when used in combination, the qualitative and quantitative components complement each other and allow for a more complete analysis of the research problem (Migiro & Magangi, 2011). Creswell and Clark (2007: 138) stated that “mixed methods research is a research design (or methodology) in which the researcher collects, analyses, and mixes (integrates or connects) both qualitative and quantitative data in a single study or a multiphase program of inquiry”. In the context of this study, this latter definition will be

adopted in order to investigate the use of tablets to promote effective teaching and learning in South African schools.

Mixed methods is used in this study as it is regarded as a form of research that is more than simply collecting both qualitative and quantitative data, with the potential or ability to indicate that data will be integrated, related or mixed at some stages of the research process (Creswell et al., 2004; Mckim, 2017). For example, the results and discussions of questionnaires (Part C) are fused with the interviews (Part A) and classroom observations (Part B) of this study. Studies indicate that neither qualitative nor quantitative methods are sufficient in themselves to capture the trends and details of the phenomenon under investigation (Creswell et al., 2004; Heyvaert et al., 2013; Mckim, 2017). Mixed method is used as it will add value in increasing confidence in the research results by showing validity in the findings, informing the collection of the second data source, and assisting with knowledge creation (Mckim, 2017) about the use of tablets to promote effective teaching and learning in South African schools.

Grade 8 teachers and learners were given questionnaires (Part C) about the use of tablets in the classroom. It is important to note that 34 teachers teaching Grade 8 (regardless of the subject they were teaching) participated in surveys to ascertain their 1) experiences about the use of tablets for teaching, 2) feelings, 3) perspectives, and 4) conceptions about the educational value of using tablets in schools. A total of 146 learners responded to the questionnaires given to them. The results and discussions of questionnaires (Part C) are fused with the interviews (Part A) and classroom observations (Part B) of this study.

4.3.1 Interviews with teachers

Following protocols by phenomenographic researchers such as Rands and Gansemer-Topf (2016), Akerlind (2005), Stamouli and Huggard (2007), Harris (2011), Woollacott et al. (2013) and Entwistle (1997), the participants' descriptions of their experiences of using tablets for educational purposes in classroom settings were documented. Four teachers, teaching Natural Sciences in Grade 8, were interviewed using the one-on-one approach. The questions included establishing whether teachers had received training on using tablets, felt comfortable using them in the classroom, felt that technology was imposed on them, or whether it was exactly what they wished for, and why. Teachers were also asked whether they adjusted their pedagogy to accommodate

new technology and why or why not. The intention was to establish how the teachers' views and perceptions on using technology in the classroom to enhance the processes of learning had been impacted by their experiences of using the tablets.

4.3.2 Interviews with learners

To eliminate gender bias the 40 participating Grade 8 learners comprised 20 boys and 20 girls, who were interviewed through one-on-one interviews to establish their experiences, feelings, viewpoints, and conceptions about the introduction and use of tablets in the school. The interviewees responded to open-ended and semi-structured questions (Reed & Ingerman, 2013; Marton, 1981; Harris, 2011). It is noteworthy to mention that some of the learners interviewed came from primary schools that had not yet been allocated tablets for learning. Grade 8 learners, who were experiencing this phenomenon for the first time, were allowed to describe and compare their learning at the primary level without tablets and learning at high school with tablets in classroom settings. Furthermore, it was essential to ascertain the kind of support they received from the teachers and the school in general. It was also important to establish how the DBE monitors and trains learners in using this new programme.

4.3.3 Interviews with GDE officials

Two levels of government officials, namely, one district official and one GDE official were interviewed to ascertain the government's perceptions about the introduction of tablets in schools. The representatives were asked questions related to government strategies to improve basic education using technological tools such as tablets and the support and training government offers teachers. The researcher explored how the officials felt about the introduction of tablets in schools and their viewpoints on the role of technology in the enhancement of effective learning and teaching. The interviews also aimed to establish the significance of the GDE's decision to embark on implementing the substantial project, "The Classroom of the Future".

4.4 Classroom Observation

In Part B, 12 lessons consisting of three per Natural Science teacher were observed to map variations of data collected from observing the use of tablets for teaching and learning in a classroom setting. The analysis for classroom observation used a Likert scale to evaluate teaching effectiveness and the impact of tablets on learning. This is

aligned with quantitative. Natural Sciences was chosen in this study, as it was important to ascertain how teachers blend technology with practical activities that need to be completed physically in or outside the classroom (to ensure that all senses are used when teaching sciences). As stated by Stamouli and Huggard (2007: 181), phenomenographic research projects often focus on mapping variations in a population's experiences. In line with this explanation, the researcher decided to maximise and vary the experiences, as a single source of data collection could not produce a sufficiently well-informed argument and justifiable conclusion. To overcome this challenge, four teachers teaching the Natural Sciences were observed. Concurrently, learners were also observed using tablets as a tool to engage themselves in reading material, completing classroom activities, researching, watching educational video clips, and playing educational games that could enhance learner engagement, effective learning and critical thinking.

The observation method was used to collect data while describing the classroom setting in terms of size, technological facilities, and number of learners, to examine how these might influence the use of tablets, and to establish the effects of access to the internet on learning and learner engagement. Using findings from the observation method, the researcher could ascertain what teachers and learners perceive as the benefits of using tablets in a classroom setting.

Furthermore, mixed methods was used in this study to overcome the limitations of qualitative and quantitative methodologies, allowing the researcher to acquire rich information that could not be obtained using each method alone. Mixed methodologies will therefore be used where both comparative analysis and the development of aspects of the study need to be undertaken comprehensively and in depth (Almeida, 2018) to answer the research question and sub-questions and to gain a more complete understanding of the research problems (Doyle et al., 2009). Creswell and Clark (2007: 139) introduced the various phases in the process of mixed methods research and proposed four specific mixed methods designs (Creswell & Clark, 2007), as elaborated in the following section.

4.5. Four Specific Mixed Methods Designs

These four methods of designs were used to validate the findings of this mixed methods study in which 146 Grade 8 learners and 34 Grade 8 teachers completed

questionnaires, and which also included classroom observations and interviews conducted with four Natural Sciences teachers, 40 Grade 8 learners and two officials from the DBE. The questionnaires were intended to ascertain the teachers' and learners' experiences, feelings, conceptions and perceptions about the educational value of using tablets for teaching and learning in and outside the classroom. Classroom observation was used to investigate how teachers teach and learners learn when tablets were used in the classroom. Across 12 lessons, teachers and learners were observed incorporating reading, activities, research, video clips, and educational games using tablets. The analysis for classroom observation used a Likert scale to evaluate teaching effectiveness and the impact of tablets on learning. Phenomenographic interviews were conducted with 40 learners and four Grade 8 Natural Sciences teachers in a pilot school.

4.5.1 Triangulation design

The purpose of using triangulation design is to obtain different but complementary data on the same topic. As stated by Migiro and Magangi (2011: 3759), "triangulation tests the consistency of findings obtained through different instruments". The interpretation is based on qualitative and quantitative results derived from different types of mixed methods evaluations, such as a different conceptual framework, different methods of data collection, different interviews, different times and different locations and context (Creswell & Clark, 2007).

4.5.2 Embedded design

This approach assumes that a single data set is not sufficient and, therefore, the use of different types of data is required. It establishes the concept of primary data, which may be qualitative or quantitative, and the secondary role assumed by other data types.

4.5.3 Explanatory design

This is a two-phase approach, in which the qualitative data helps explain or build upon the initial quantitative results. An explanatory design therefore has a strong quantitative orientation, as quantitative data is the key element to commence the process.

4.5.4 Exploratory design

Similar to the explanatory design approach, but with the qualitative data as the primary source of information, this design is particularly suitable for exploring a phenomenon in which there is not a guiding framework or theory and measures or instruments are not available.

There are various reasons or advantages of using mixed methods. Migiro and Magangi (2011: 3759) suggest the following reasons for/ advantages of using mixed methods:

- Different methods can be used for different purposes in the study.
- It helps to explain qualitative and quantitative data sets to provide well-validated conclusions.
- It enables triangulation to take place.
- It uses qualitative data to develop a theory that is subsequently tested.
- It enhances a study with supplemental data sets, either qualitative or quantitative.

Migiro and Magangi (2011: 3760) maintain that sampling approaches/schemes “fall into one or two classes: 1) random sampling (that is, probalistic sampling) schemes or 2) non-random sampling (that is, non-probalistic) sample schemes” in mixed research. The following approaches (or sampling schemes) are used in data collection in mixed research: open-ended questions, closed-ended questions, observation, document data, text and image analysis, interviews, focus groups and research data (Migiro & Magangi, 2011: 3760). Table 4.1 below shows the major sampling approaches/schemes in mixed research that were appropriate for this study.

Table 4.1: Major approaches/sampling schemes in mixed research

Approaches/Sampling Scheme	Description
1. Random purposeful	Selecting random cases from the sampling frame consisting of a purposeful selected sample. (In this study, certain group of teachers, learners and department officials were selected for interviews.)

2. Maximum variation	Choosing settings, groups, and/or individuals to maximise the range of perspectives investigated in the study. (In this study, classroom settings were chosen to observe teachers and learners using tablets for teaching and learning.)
3. Simple	Every individual in the sampling frame has an equal and independent chance of being chosen for the study. (In this study, questionnaires were used to map the experiences, perspectives, and other skills and knowledge of teaching and learning with tablets.)

Source: Migiro and Magangi (2011: 3761)

For the purpose of this study, three methods of collecting data were used to obtain information, namely: 1) phenomenographic interviews with teachers, learners and government officials, 2) classroom observation and 3) questionnaires. The descriptions of these three methods are also aligned with major approaches/sampling schemes in Table 4.1. In order to increase representation, it is essential that analyses are conducted in both qualitative and quantitative research. Such analyses need to provide researchers with information regarding appropriate sample sizes for both qualitative and quantitative phases of a mixed methods research (Migiro & Magangi, 2011). It is also useful to consider the full range of possibilities for data collection in this study and to organise these approaches by their degree of predetermined nature, their use of closed-ended versus open-ended questioning, and their focus on numeric versus non-numeric data analysis (Migiro & Magangi, 2011).

4.6. Data Collection

There are different types of information collection methods, namely, qualitative, quantitative, or mixed methods. McMillan and Schumacher (2010), Pitney and Parker (2009), De Vos (1998), Leedy and Ormrod (2001) and Creswell (2014) acknowledge that different and credible methods are used to collect, analyse, interpret, and present data. The research conducted in this study aimed at ascertaining the effectiveness of using tablets in the classroom to improve learner performance. From the collected data, findings, arguments, discourses, conclusions, and recommendations are deduced. In light of the aim of this study, the research methods focused on: 1)

observing how teachers teach and learners learn when using tablets in the classroom, 2) understanding their experiences regarding the use of tablets in the classroom, and 3) understanding the government's goal for introducing the concept of "The Classroom of the Future" in South Africa. Questionnaires were used to map the variation on how teachers and learners used tablets in and outside the classroom. Based on the objectives of the study, the qualitative research methods were chosen as the appropriate research methods for gathering the required information. This chapter presents the qualitative research methods used to investigate and establish teachers' and learners' experiences, feelings, perceptions, conceptions, and viewpoints on using tablets in and outside the classroom.

Qualitative methods are appropriate for the collection of data needed to map teachers' and learners' varied experiences when using tablets for teaching and learning. Researchers including Schurink (1998), Creswell (2003, 2014), De Vos (1998) and McMillan and Schumacher (2010) acknowledge that there are many forms of qualitative research. The different forms of qualitative research include grounded theory, ethnography, phenomenography, qualitative case study, action, narrative inquiry, and observation research (Schurink, 1998; Pitney & Parker, 2009). To explore variations in how teachers and learners use tablets for educational purposes, this study employed the phenomenographic approach (McMillan & Schumacher, 2010) and observation to specifically investigate the effect of using tablets in the classroom on learning, critical thinking, and learner engagement. The study also explored whether the intended outcomes of the government's intervention of introducing tablets had been achieved. Table 4.2 below maps out the advantages and limitations of the data collection methods used in this study (Creswell, 2003; Harris & Brown, 2010).

Table 4.2: Data collection methods used and their advantages and limitations

Data collection methods	Options within types	Advantages of the type	Limitations of the type
	Complete observer: The researcher observes without participating.	Useful in exploring topics that may be uncomfortable for participants to discuss. The analysis for classroom observation used a Likert scale to evaluate teaching effectiveness and the impact of tablets on learning. This is	Certain participants (e.g., children) may present special problems in gaining rapport.

		aligned with quantitative methods as well.	
Interviews	Face-to-face: One-on-one, in-person interviews, open-ended interviews.	Useful when participants cannot be observed directly.	Provide 'direct' information filtered through the views of interviewees.
Questionnaires	To ensure that variations about the educational use of tablets are taken into consideration.	More objective research tools that can produce generalisable results due to large sample sizes.	Faulty questionnaire design; sampling and non-response errors; biased questionnaire design and wording; errors in coding, processing and statistical analysis; respondent unreliability, ignorance, misunderstanding, reticence, or bias.

Source: Creswell (2003) and Harris and Brown (2010)

Through teaching, learners are transformed from passive recipients of knowledge into dynamic constructors of knowledge. Researchers including Schurink (1998) and McMillan and Schumacher (2010) agree that qualitative researchers aim to understand the reality of a situation by discovering the various meanings that people in particular settings attach to it. The qualitative approach was used at this point because: 1) it is a method that accommodates and supports variations, and 2) it allows and encourages people to customise their situation. Schurink (1998: 240) describes qualitative research as a "multi-perspective approach (utilising different qualitative techniques and data collection methods) to social interaction aimed at describing, making sense of, interpreting or reconstructing this interaction in terms of the meaning".

Accordingly, Table 4.2 outlines the data collection design, which was divided into two sections as follows: Part A dealt with interviews only and Part B dealt with classroom observations only. Through the two data collection approaches, the researcher focused on 1) observing how teaching and learning take place using tablets in the classroom, 2) understanding the teachers' and learners' experiences when using tablets in the teaching and learning processes, and 3) understanding why the South African government introduced tablets to schools.

4.6.1 The Phenomenographic Approach to Research in this Study

It is important to note that a variety of methods can be used in phenomenographic-based research, including interviews, conversations, participant observation, action

research, focus meetings, and analysis of personal texts. To collect data for Part A, the interview-only section, teachers and learners were interviewed using phenomenographic methods (Lester, 1999). Although many researchers including Khan (2014), Alsop and Thompsett (2006), Stamouli and Huggard (2007), and Woollacott et al. (2013) define the concept of phenomenography differently, the prime interest of phenomenographic research lies in identifying and describing the variation between the conceptions as distinctly different categories that capture the essence of a phenomenon (Khan, 2014). According to Reed (2006), phenomenography was developed from the work undertaken by Marton et al., in the mid-1970s amongst university students to understand what it takes to learn at the University of Gothenburg in Sweden. The definition of phenomenography used for this study by Stamouli et al. (2007: 181) states that "a phenomenographic research project reveals the qualitatively different ways in which a phenomenon can be experienced, understood or perceived by a student cohort". The subject and object of an experience are not separated, and an individual's experience of a phenomenon is the internal relationship between them (Reed, 2006). This implies that the meaning of phenomenography stems from the relationship between an individual and a phenomenon, or rather, the relationship between a subject and an object. This methodology was therefore chosen, as it has the potential to contribute new insight into teachers and learners as the objects of the investigation. Moreover, this approach has potential to capture qualitative differences. Data collected was analysed to gather information that would assist in understanding the effect of teachers on learning by responding to the "what" and the "how" of using tablets in a classroom (Harris, 2001). During the process, teachers and learners experienced and conceptualised the learner engagement phenomenon to be of importance. Teachers and learners consider using tablets as an approach to promoting effective teaching and learning as the learners engage in learning (Woollacott et al., 2013). Consequently, phenomenographic interviews were suitable for mapping the variation of teachers' and learners' conceptions, experiences, perceptions, and outcomes of using tablets for teaching and learning (Rands & Gansemer-Topf, 2016). In so doing, the solution to the problem of the lack of learner engagement and the enhancement of effective teaching and learning would be ascertained (Khan, 2014).

A qualitative investigation was conducted to establish the most important experiences of teachers and learners using tablets in a classroom setting. Using a phenomenographic interview approach, teachers and learners were interviewed on

their conceptions, experiences (Harris, 2011), perceptions and beliefs (Akerlind, 2005), as well as their views and understanding of using technology for educational purposes (Khan, 2014). Researchers such as Khan (2014), Alsop and Thompsett (2006), Stamouli and Huggard (2007), Woollacott et al. (2013), and Rands and Gansemer-Topf (2016) maintain that at the centre of phenomenography, "a non-dualist and second-order perspective takes place. Therefore, phenomenography aims to describe the key variation in the experience of a phenomenon rather than focus on the richness of individual experiences". According to Woollacott et al. (2013: 749), phenomenography is characterised by "striving to take the second-order perspective on the phenomenon in question, thereby avoiding descriptions of the phenomenon establishing people's experiences". In this study, phenomenography explains how teachers use tablets to improve learner engagement in learning.

Phenomenographic researchers including Reed (2006) and Woollacott et al. (2013) argue that the most important aspect of the phenomenographic interviews is that they have the ability to enable an individual to reflect on their experience of a particular phenomenon. To conduct phenomenographic interviews to establish the rationale for, and the use of tablets in schools, 40 learners (20 girls and 20 boys) and four Grade 8 Natural Sciences teachers were selected as participants from the piloted school. The participants were interviewed to ascertain their perspectives on using tablets for educational purposes. The variation in the selections of the participants was aimed at maximising the variation in experiences. Furthermore, government officials (one district official and one GDE official) were interviewed to establish reasons behind the introduction of tablets in classrooms as educational tools.

Phenomenographic interviews were therefore conducted to explore learners' and teachers' conceptions, feelings, perceptions, and experiences of using tablets as educational technological tools in classroom settings. Thereafter, government officials were interviewed to gather data, to include in mapping the variations. Table 4.3 presents an outline of the three methods of data collection discussed in detail in this chapter.

Table 4.3: Outline of the data collection methods

Part A: Interviews only	Part B: Classroom observation only	Part C: Questionnaires

A) Teachers' interviews	A) How teachers teach using tablets	To map variations of learners' and teachers' conceptions, feelings, perceptions and experiences of using technological resources in the classroom settings
B) Learners' interviews	B) How learners learn using tablets, or what learners are doing with tablet in class and beyond the classroom	
C) Officials' interviews		

The first part of the data collection using interviews was intended to uncover the GDE motive behind using technological tools in classroom settings. Secondly, the classroom observations were aimed at establishing the influence of using tablets on the processes of learning, learner engagement, and subsequently the development of critical thinking. Thirdly, the questionnaire aimed to map the variations of learners' and teachers' conceptions, feelings, perceptions and experiences of using tablets in the classroom setting. Part C is therefore fused with Part A and B in the results analysis and discussion of this study.

Agyei (2014: 1) reports that ICT is viewed as an indispensable tool that enables users to fully participate in the knowledge society. ICTs are, therefore, perceived to provide opportunities for educational institutions and other organisations to harness and use technology to complement and support educational processes. Therefore, the TPACK model was used for the research, as it has processes in place that teachers can use to integrate ICT into their teaching. The model was also used to examine and identify the opportunities and challenges related to ICT implementation in classroom settings (Lye, 2013).

Researchers such as Agyei (2014: 1) maintain that the successful use of tablets in and outside a classroom setting requires "people who will ultimately use the innovation to possess sufficient knowledge and skills to do the job". Koehler et al. (2014) argue that "learning to teach a specific subject matter requires not only understanding the content but also developing appropriate instructional strategies and skill relevant for learning". This is especially important when the innovation involves using specific tools such as a tablet. Adequate training to ensure proper use of the tool or technique is needed for the innovation to be successful (Agyei, 2014: 5). Hence, training of the participants was included in the phenomenographic interviews conducted with teachers.

For completeness of determining the integration of technology with pedagogy, PCK was taken into consideration in this study. PCK plays a role in blending both content

and pedagogy to develop better teaching practices in these areas (Schmidt et al., 2009). Teachers therefore need to adapt the traditional way of teaching – for example, pen, pencil, and paper – to digital technologies such as tablets, the internet, digital video, interactive whiteboards, and software programs. In this digital age, teachers need to possess sound classroom management skills to address issues of learner discipline, assessment, lesson plan development, and learners learning to use tablets to learn. Moreover, as the educational landscape changes (Kress, 2003), acquiring knowledge requires new communication platforms and technologies (Gallardo-Echenique et al., 2015). Adapting technology in education could enhance the teacher's abilities to master subject knowledge (Amarin & Ghisham, 2013; Brodie, 1996). Using technology exposes teachers to a broader scope of knowledge (curriculum requirement) and the teaching approach (relevant methods of teaching) to subjects and topics.

The use of technological resources affects not only personal life, but also educational life (Rahim et al., 2021), largely due to the digital revolution taking place worldwide. Traditionally, the four paradigms shift, namely, the positivist paradigm, the interpretivist paradigm/constructivist paradigm, the critical paradigm/transformational paradigm and the pragmatic paradigm have played a significant role in influencing educational research studies (Chaturvedi, 2020). Specifically, three educational paradigms, namely, the tutoring, broadcast and engaged paradigm (Pavlik, 2015) are also discussed here to locate this study's viewpoints on paradigm shift.

4.7 Traditional Paradigms

As this study adopted mixed methods, it is important to consider that mixed methods research uses competing paradigms, with relatively equal footing and merit given to each. As such, this “dialectical” perspective recognises that using competing paradigms gives rise to contradicting ideas and contested arguments, which are features of research that need to be honoured and that might not be reconciled (Migiro & Magangi, 2011). For example, this study is in the position to support both the interpretivist paradigm/constructivist paradigm and also the pragmatic paradigm. Such opposing paradigms reflect different ways of making knowledge claims. This perspective maintains that mixed methods research may be viewed strictly as a “method”, thus allowing researchers to use any number of philosophical foundations

for its justification and use. This means that the best paradigm is determined by the researcher and the research problem, but not by the method (Migiro & Magangi, 2011).

4.7.1 The positivist paradigm

The positivist paradigm advocates the use of quantitative research methods as the bedrock for the researcher's ability to be precise in the description of the parameters and coefficients in the data that are gathered, analysed and interpreted (Kivanja et al., 2017). It is grounded in research methods as a scientific method of investigation. This means that it involves a process of experimentation that is used to explore observations and answer questions (Kivanja et al., 2017). This paradigm relies on deductive logic, formulation of hypotheses, testing those hypotheses, offering operational definitions and mathematical equations and making predictions based on measurable outcomes. The positivist paradigm's epistemology is said to be objectivist, its ontology naïve realism, its methodology experimental and its axiology beneficence. The objectivist epistemology holds that human understanding is gained through the application of reason (Kivanja et al., 2017: 30).

4.7.2 The interpretivist paradigm/constructivist paradigm

The interpretivist paradigm/constructivist paradigm suggests that every effort is made to understand the viewpoint of the subject being observed, rather than the viewpoint of the observer (Kivanja et al., 2017: 33). In this study, the use of tablets to engage learners into learning activities is viewed as the subject. An attempt was made to study how/what teachers are doing with tablets. In the main, this is located within this paradigm, as the emphasis here is placed on understanding the individual (teachers and learners) and their interpretation (how and what they used tablets for) of the world around them (to enhance learning or to allow learner engagement to take place). The key tenet of the interpretivist paradigm is that reality is socially constructed (Kivanja et al., 2017). This study also advances the notion that "learning is social" (Vygotsky, 1978). This means that the use of tablets for learning maximises opportunities for learner engagement, creativity, learning through play, interaction and discovery. This paradigm assumes a subjectivist epistemology, a relativist ontology, a naturalist methodology, and a balanced axiology. These elements are briefly explained (Kivanja et al., 2017: 33) as follows:

- The assumption of a subjectivist epistemology means that the researcher makes meaning of their data through their thinking and cognitive processing of data

informed by their interaction with participants. There is the understanding that the researcher will construct knowledge socially as a result of his or her personal experiences of the real life within the natural settings investigated.

- There is the assumption that the researcher and their subjects are engaged in interactive processes in which they intermingle, dialogue, question, listen, read, write and record research data.
- The assumption of a relativist's ontology means that one believes that the situation studied has multiple realities, and that those realities can be explored and meaning made of them or reconstructed through human interactions between the researcher and subjects of the research participants.

A balanced axiology assumes that the outcome of the research will reflect the values of the researcher, in attempting to present a balanced report of the finding. At best, the researcher can make inferences which in themselves are influenced by the researcher's ability and skills to make sure that the findings truly emerge from the data gathered and analysed for the research (Kivanja et al., 2017).

4.3.3 The critical paradigm/transformative paradigm

The critical paradigm situates its research in social justice issues and seeks to address the political, social and economic issues, which lead to social oppression, conflict, and power struggle at whatever levels these might occur. Because it seeks to change the politics so as to confront social oppression and improve the social justice in the situation, it is sometimes called the transformative paradigm (Kivanja et al., 2017). This paradigm assumes a transactional epistemology (in which the researcher interacts with the participants), an ontology of historical realism, especially at it relates to oppression, a methodology that is dialogic, and an axiology that respects cultural norms (Kivanja et al., 2017).

4.7.4 The pragmatic paradigm

This paradigm arose among philosophers who argued that it was not possible to access the "truth" about the real world solely by virtue of a scientific method as advocated by the positivist paradigm, nor was it possible to determine social reality as constructed under the interpretivist. For these philosophers, a mono-paradigmatic orientation of research was not good enough (Kivanja et al., 2017: 34). These theorists looked for approaches to research that were more practical and pluralistic approaches

that could allow a combination of methods that in conjunction could shed light on the actual behaviour of participants, the beliefs behind those behaviours and consequences that are likely to follow from different behaviours. This paradigm advocates a relational epistemology (i.e., relationships in research are best determined by what the research deems appropriate to that particular study). A non-singular reality ontology (that there is no single reality and all individuals have their own and unique interpretations of reality), a mixed methods methodology (a combination of qualitative and quantitative research methods) and a value-laden axiology (conducting research that benefits people) are aspects of this paradigm (Kivanja et al., 2017).

4.8 Educational Paradigm

4.8.1 Tutoring paradigm

The first paradigm of education existed pre-media technology. It was a form of one-to-one tutoring or mentoring. On one hand, mentoring is highly effective from a learning perspective, but it is very expensive, typically requiring one-on-one instruction. It is generally for only the elite. In this paradigm, great teachers mentor their pupils using primarily oral communication (Pavlik, 2015). On the other hand, educational technology is often characterised as a “game changer” because it is considered as a tool that has the power to positively impact the current pedagogical approaches to teaching and learning (Pinzariu, 2020). Advancement in ICT has not only reshaped the traditional learning settings, but also potentially improves creativity among learners through different pedagogical strategies. Various exciting possibilities associated with ICT have emerged to reshape students’ learning behaviour and teaching methods (Khlaif et al., 2018).

4.8.2 Broadcast paradigm

The second paradigm of education emerged with the advent of analog media technology, especially the printed book in the Middle Ages. It is a model of learning based on one-to-many communication. Put in its simplest terms, it is a broadcasting model of education. A teacher teaches a group of learners assembled in a classroom. Learners read printed materials typically outside of class time and complete assignments to facilitate and test their comprehension of course materials (Pavlik, 2015). This means that learning materials are designed and compacted into chunks and consumable formats before releasing them to learners (Oyelere et al., 2016).

4.8.3 Engaged paradigm

A third paradigm of education is defined by interconnectedness among teachers and learners and features many-to-many communication and multidirectional mentorship (see Table 4.3). The teacher is no longer in the role of the grand master of knowledge exploration and discovery. In this study, teachers and learners were observed using tablets as a tool to connect to the internet in order to access knowledge and information. This paradigm represents the decline of hierarchy in learning. It portends the end of courses. Learners are in the position to access learning materials and activities everywhere and at any given time. As maintained by Khlaif et al. (2018: 2), “the ways of learning are changing, people can learn anytime, anywhere, formally and informally either in classroom or at home”. In this paradigm, learning becomes fluid and boundary spanning and interconnected. It is built on crowd-sourcing (Pavlik, 2015: 115). Education has transformed dramatically and is more engaging for learners in and outside the classroom settings with the distinctive rise of e-learning, whereby teaching is undertaken remotely and on digital platforms. While some believe that the unplanned and rapid move to online learning – with no training, insufficient bandwidth, and small preparation – will lead to a poor user experience that is un conducive to sustained growth, others believe that a brand-new hybrid model of education will emerge, with significant benefit (Chaturvedi, 2020: 142). Table 4.4 below outlines the three educational paradigms on bases of direction, interactivity, media, constraints and outcome (Pavlik, 2015:115).

Table 4.4: The three educational paradigms

Paradigm	Direction	Interactivity	Media	Constraints	Outcome
1) Tutoring	One to one	High	Oral (face to face)	Time, place, cost	Knowledge
2) Broadcast	One to many	Limited, Low	Lecture, Mediated (book)	Time, place, content	Information
3) Engaged	Many to many	High	Hybrid (personal tutoring, online peer mentoring)	Imagination, connectivity	Creative problem solving, innovation, knowledge

Source: Pavlik (2015: 115)

This study is located in the third educational paradigm (see Table 4.4 above) because it is NOT about subject mastery. It is about the use of technological resources such as

the internet to engage learners into learning activities. Educational technologies such as Artificial Intelligence (AI), the Internet of Things, Augmented Virtual Reality, and Mixed Reality have been attracting attention for the past decade and are considered as key components for fostering the investments in ICT and for emphasising the study of educational technology in order to facilitate learning and the improvement of performance by sharing, using and managing the appropriate type of technologies in terms of resources as well as processes (Pinzariu, 2020). This paradigm is suitable for this study, as it features online video learning modules available on an almost unlimited number of subjects, for which the Khan academy and MOOCs are especially well designed (Pavlik, 2015). This means that E-learning happens across all educational areas and domains. This paradigm is relevant to this study because it advocates the uses of web and digital technologies such as tablets to make experiences that instruct learners in general. During and post the COVID-19 lockdown period, the e-platform of learning has become an essential mode of education (Chaturvedi, 2020). However, the arrival of the third educational paradigm does not spell the end of the previous paradigms, just as the rise of the second paradigm did not spell the end of the first paradigm. Rather, each paradigm shift tends to push the previous paradigm to the side, which nevertheless remains as an avenue of tutoring (Pavlik, 2015). Table 4.5 shows examples of the observations from a lesson in the classroom setting, in relation to the seven components of the TPACK framework.

Table 4.5: Seven components of TPACK observed in class

Seven components in the TPACK framework	Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)	Teachers know various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies including the internet, digital video, interactive whiteboards, and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)	Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)	Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)	Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and can blend both content and pedagogy to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)	Teachers know how to create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can

	change the way learners practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)	Teachers know how various technologies can be used in teaching and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)	Teachers know how to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Researchers including McMillan et al. (2010), Leedy et al. (2001), and De Vos (1998) mention a few reasons that support using observation as a technique for collecting data. For this study, the following two reasons were the basis of using this technique for data collection: (1) It enables the researcher to record any behaviour that occurs naturally inside the classroom; even unexpected behaviour is documented and analysed. (2) It allows the researcher to study what occurs in real life, as opposed to artificial settings (McMillan et al., 2010; Leedy et al., 2001; De Vos, 1998). This approach is in line with the central idea of this study, which was to investigate the rationale for, and educational value of, using tablets in schools. Table 4.6 outlines the schedule of classroom observations to map the variations in teachers' and learners' use of tablets in a classroom setting.

Table 4.6: Outline of the schedule of classroom observations

	Schedule for Grade 8 Natural Sciences teachers	
Activity	Teachers	Number of lessons observed
1	1	3
2	2	3
3	3	3
4	4	3
Total lessons observed		12

The 12 lessons observed in total mean that each teacher was observed three times, to ensure that they were familiar with the presence of the non-participant observer and were natural in what they were doing in the classroom. Teachers were observed in action (see protocol 6: Chapter 8) to understand how they use tablets to enhance effective teaching, learning and learner engagement. Therefore, the researcher was able to describe what was happening inside classrooms and comment accordingly.

4.9 Limitations of Mixed Methods

Despite numerous advantages of using mixed methods, there are limitations or disadvantages that also need to be taken into account. Doyle et al. (2009: 183) mentioned the following limitations or disadvantages in this regard:

- The belief exists that qualitative and quantitative research methods cannot be mixed in a single study as they have vastly different ontological (the nature or reality) and epistemological (how we know what we know) origins.
- Many authors would suggest that practicality inherent in pragmatism is a concern with finding the most appropriate method to answer a research question or set of research questions.
- There is also a requirement that the researcher has at least sufficient knowledge of both qualitative and quantitative methods independently and how to mix these methods appropriately to achieve a valid study outcome.
- According to Mckim (2017: 202), “many researchers do not have training in qualitative and quantitative methodologies; so, this can mean finding additional researchers with expertise in a particular area” to assist with analysis and interpretation of data.

It is important to acknowledge that there are many limitations when using qualitative methods, especially if appropriate precautions were not taken into consideration. It is difficult to code, organise, interpret, and analyse qualitative data, as most of the questions asked in the interviewing processes and questionnaires are either open-ended, unstructured, or semi-structured. Therefore, the qualitative processes, or techniques of collecting data made it difficult (for the researcher) to analyse, write reports and make firm conclusions due to the amount of unstructured information obtained. A qualitative approach, therefore, requires extensive resources and more time to code and analyse the collected information (Leedy & Ormrod, 2001).

The primary challenge in this study was to conduct prolonged interviews (Reed et al., 2013; Marton, 1981; Entwistle, 1997; Harris, 2011) and to direct the participants on how to express their perspectives of their everyday life experiences with the phenomenon under investigation. McMillan and Schumacher (2010: 360) note that “a tape or digital recording interview ensures completeness of verbal interaction and

provides material for reliability checks". However, this did not mean that using a tape recorder would eliminate the need for taking notes to help reformulate questions and probes and to record nonverbal communication, which could facilitate data analysis of unexpected events (McMillan & Schumacher, 2010). To overcome this challenge, the researcher ensured the hand-written records including all significant aspects of the conversations were typed or the tape transcribed immediately on completion of the interviews, while the data was still fresh in the interviewer's mind.

Furthermore, the researcher acknowledged the many limitations of the observation techniques. These included the following: (1) It was difficult to measure how the observer's presence affected the behaviour of subjects (learners and teachers) during the observations (McMillan & Schumacher, 2010). To minimise this challenge, the researcher sat somewhere out of sight in the classroom where the learners would not be distracted by his presence. (2) It was difficult to record complex behaviour. McMillan and Schumacher (2010: 209) state that even though objectively recording simple behaviour is relatively easy and straightforward, recording more complex behaviour, which most studies focus on is a difficult task to define and access through observation. To overcome this challenge, the researcher drew up an observation schedule with themes and possible behaviour types of learning, learner engagement, critical thinking, and teaching expectations. When teaching and learning were in progress, the lesson(s) was/were recorded at the same time to uncover the facts without exerting any influence (Leedy & Ormrod, 2001). Furthermore, to overcome the challenges of using the observation tool (see Protocol 6: Chapter 8), data was colour coded to simplify the analysis process.

4.10 Ethics Considerations

Letters of notification about the interviewing process and ethical considerations were sent to all participants in this study, to obtain permission from them. The letters entailed information requesting their consent to proceed with the investigation of using technology in the respective schools. All participants were informed that interviews would take place during break times or immediately after school. The interviews did not last longer than 20 minutes. The participants were assured that the conversations between them and the researcher would be recorded for data analysis and the partial fulfilment of this study's requirements.

Participants were assured that their responses to any questions asked during the interviews were strictly confidential. This meant that findings would not be discussed with colleagues, principals, or friends. Participants' names, the names of the classes they teach, or the names of their schools would not be disclosed in the writing of this thesis, in any speeches and presentations of the findings, or any other public forum. Assurance was given that the findings would be used for the sole purpose of this thesis, and the raw data collected would be destroyed after five years. During these five years, the data would be kept securely locked up. All participants were given assurance that they had a right to choose not to participate in this study and, if they did choose to participate, that they may stop at any time without any negative implications to their work or studies. They also had the right to choose not to answer question(s) asked during the interview without being intimidated or persuaded to answer.

Although the phenomenon of learner engagement in learning and critical thinking was explored from many perspectives during the interviews, the researcher felt that interviews alone would not capture the essence of what was happening inside classrooms and how learners were engaged in the process of learning when using technology. Therefore, teachers and learners were also observed in the classroom using technology for educational purposes. Classroom observations were used to ascertain what and how learners learned, and how teachers taught using tablets in a classroom. However, the researcher selected only one subject, Natural Sciences – as it was essential to ascertain how teachers blend technology with required practical activities – to conduct classroom observations and four teachers who presented the subject to participate in phenomenographic interviews. Subsequently, the 40 learners selected responded to interviews that explored in-depth experiences of using tablets in the promotion of effective teaching and learning. In line with this, the GDE research approval letter and protocol number: 2017 ECE 003D were granted.

4.11 Chapter Summary

In summary, this chapter presented details regarding the methodological approaches used to collect data. To ascertain the teachers' and learners' views and experiences on the usage of tablets for teaching and learning (Harris, 2001), the phenomenographic research approach was selected for the collection and analyses of data. This phenomenographic qualitative method was used because 1) it accommodates and supports variations and 2) allows and encourages people to describe their situation or

environment in their own way. Specifically, this chapter outlined two parts of data collection, namely, Part A (interviews only) and Part B (classroom observations only). In Part A, phenomenographic interviews were conducted with teachers, learners, and government officials to explore learners' and teachers' conceptions, feelings, perceptions, and experiences of using tablets in classroom settings. In Part B, 12 lessons (three per Natural Science teacher) were observed to map variations and to ascertain the effect of using tablets in classroom settings to enhance teaching and learning. The outline of the schedule of classroom observation was presented in this chapter. Furthermore, the relationships between the seven components of the TPACK framework and the use of technological tools such as tablets to engage learners in learning and subsequently to improve learner engagement were reported, as well as the outline of the schedule of classroom observations. The significance and ethical considerations of the study were also discussed in this chapter. The next chapter presents the findings, discussion and analysis of the findings of this research.

CHAPTER 5: RESULTS AND DISCUSSION PART 1: PHENOMENOGRAPHIC INTERVIEWS

5.1 Overview of Chapter 5

For this study, it is important to acknowledge that the primary goal of phenomenographic research is to describe a “live experience” of a phenomenon (Reed et al., 2013; Marton, 1981; Harris, 2011; Waters, 2015; Lester, 1999; Booth, 2008). Figure 5.1 below presents the outline of sub-topics for Chapter 5, namely: 1) overview of Chapter 5, 2) results of phenomenographic interviews, 3) discussion of the key findings from the questions and answers, 4) the “What” and “How” of using tablets to enhance teaching and learning, 5) effect of using tablets in teaching and learning, 6) educational value of using tablets for teaching and learning in a classroom settings, 7) teachers’ and learners’ uses of tablets in and outside the classroom, 8) benefits of using tablets for teaching and learning, 9) challenges encountered when using tablets for teaching and learning, 10) interview and questionnaire outcome, and 11) training, access and learning. This study reports and discusses the findings in the context of establishing the rationale for, and educational value of, using tablets for teaching and learning to enhance learner engagement. The focus is on gathering information to understand the effects of tablets, exploring variations in learning processes, analysing how tablets enhance learner engagement and critical thinking, understanding how tablets enhance effective teaching, and establishing their use in and outside the classroom.

Chapter 5: Results and Discussion Part 1 - Phenomenographic Interviews										
Overview of Chapter 5	Results of phenomenographic interviews	Discussion of the key findings from questions and answers	The “What” and “How” of using tablets	Effects of using tablets in teaching and learning	Educational value of using tablets for teaching and learning	Teachers’ and learners’ uses of tablets in and outside the classroom	Benefits of using tablets for teaching and learning	Challenges encountered when using tablets for teaching and learning	Interview and questionnaire outcome	Training, access and learning

Figure 5.1: Outline of sub-topics for Chapter 5

As the incorporation of technology into teaching and learning in the South African education system is minimal, the Gauteng Department of Education (GDE) opted for a new intervention strategy in 2013 known as "The Classroom of the Future" as a prototype that would subsequently be implemented in South African schools. The aim was to improve the standard of learner engagement, learning, and critical thinking in a classroom setting using tablets as a technological learning tool. The MEC representative of Gauteng province emphasised the importance of incorporating technology in classrooms to prepare for the Fourth Industrial Revolution, aiming to create a paperless, technology-driven "classroom of the future". The government planned to implement "The Classroom of the Future" project in Gauteng province, introducing tablets and smartboards to Grades 10–12, and then rolling them out to all learners in Grades 8–9, even though the value of using tablets for learning was not yet clear in South Africa.

5.2. Results of the Phenomenographic Interviews

The phenomenographic interviews were used to explore the teachers' and learners' experiences of using tablets both inside and outside the classroom (Pitney & Parker, 2009). These questions were aligned with their beliefs, views, understanding, conceptions (Harris, 2011), experiences (Harris, 2011; Boeree, 1998), and perceptions (Booth, 2008; Lester, 1999). The government goals and policies guiding the results and discussions in this section are shown in Table 5.1, while the learners', teachers' and government responses to the rubrics are reported in Tables 5.2, 5.3 and 5.4, respectively.

Table 5.1: Government goals and policies

Item number	Descriptions	Some relevant questions for analysis in this study
1	Government goal	1. Your plan is that every high school learner in Gauteng will have a tablet by the end of 2017. Is this realistic? 2. In which schools have they been introduced? How were the schools chosen?
2	Government policies	1. How were you informed about the new policy of using tablets for teaching?

During the phenomenographic interviews, data was collected from 46 participants comprising 40 learners, four Natural Sciences teachers, and two DBE officials. Teachers and learners were interviewed using phenomenographic methods. As previously stated, only Grade 8 Natural Sciences teachers participated in the

interviews. This decision was based on two reasons: 1) these learners came from a primary school that did not use tablets for teaching and learning, and 2) the researcher wanted to establish the kind of training offered to the learner who would be using tablets for the first time for educational purposes. The 24 questions were crafted to establish the educational value of using tablets in schools. Of the 40 learners interviewed, each learner was required to answer 22 questions, as per Table 5.2, which also displays the learners' responses.

Table 5.2: A rubric of learners' responses to the questions

Item number	Question(s)	Learners responses					
		Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Total responses
1	You are in a class that uses tablets in the classroom. Tell me a little about your experience of tablets. Do you enjoy using them? Why? Why not?	20	11	5	1	3	40
2	When did you first start using tablets at school? Is this for the first time?	40	-	-	-	-	40
3	Had you ever used one (or seen one) before? Yes.	40	-	-	-	-	40
4	Do you have/use any other technology (like a computer) at home?	34	6	-	-	-	40
5	Do you have a smartphone? If so: have you ever used it for learning? (Yes, but not for learning)	29	2	-	-	9	40
6	What do you use your tablet for – anywhere – in the classroom and outside? (To assess study materials)	40	-	-	-	-	40
7	Does using tablets in the classroom help your learning? If so, how?	22	2	2	3	11	40
8	Do you think you could learn better if you used books instead of tablets and relied on the teacher? Why do you say that?	19	2	6	3	10	40
9	How does your teacher use the tablets in class to teach you? What do you use them for? (Used as technological resource)	40	-	-	-	-	40
10	Do you think that using tablets improves your knowledge and understanding of the subject taught? Why do you think this? (Yes, it improves knowledge and understanding.)	21	-	3	4	12	40
11	Do they (tablets) add value (contribute) to your learning experience? If so, explain why. If not, suggest possible alternatives / resources that could be used or suggest how you think that they could add value.	19	11	2	3	5	40
12	Are you monitored when using tablets in class? If yes, how?	-	3	1	2	34	40

13	Do you take the tablets home? Do you use them there? If so, what do you use them for at home?	40	-	-	-	-	40
14	Does anyone else in your family use your tablet? If so, what for? Do they ever start discussions about subjects at home?	1	-	-	-	39	40
15	Do you use your tablet to find information by yourself?	40	-	-	-	-	40
16	Are the tablets used for content creation or content receiving (e.g., to upload articles, learners' activities and questions to be discussed or feedback from the teacher / peers) in the classroom?	36	4	-	-	-	40
17	Do you only use your tablet in your classroom, or do you use paper as well? (Both tablets and paper)	40	-	-	-	-	40
18	How do your teachers assess your work (class activities, assignments, etc.) when you use tablets? (Still write on a paper/worksheet)	40	-	-	-	-	40
19	Do you use your tablet to share your learning experience with others (like having discussion forums, debates, group discussions, announcements, assignments, uploading interesting articles, etc.)? If so, please tell me what you do?	4	-	-	-	36	40
20	Do you use your tablet to solve problems (like conducting research, and investigations)? How?	34	-	-	-	6	40
21	Are you worried that your tablet might be stolen? Have you ever felt unsafe because you are carrying a tablet? Do you know of anyone in your class/year whose tablet has been stolen?	31	9	-	-	-	40
22	Is there anything else that you would like to tell me about your experience of using tablets in the classroom/at school?	-	-	-	2	38	40
Total		590 (67%)	50 (5.5%)	19 (2.5%)	18 (2%)	203 (23%)	880 (100%)

Questions 2.1 to 2.4 were aimed at discovering learners' experiences and exposure to operating tablets. Learners were interviewed to establish their experiences, feelings, viewpoints, and conceptions about the introduction and use of tablets in the school (Waters, 2015; Lester, 1999; Harris, 2011; Booth et al., 2013). In addition, teachers were questioned about the “what” and “why” of their skills and training in using tablets to understand their competences in using tablets for teaching, and to establish their feelings of using tablet technology for effective teaching and learning. Furthermore, teachers were asked questions to establish the effect of using tablets on integrating new technology into their pedagogy.

Table 5.3: A rubric showing the teachers' responses to the questions

Item number	Question	Teachers responses					
		Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Total responses
1	How long have you been teaching? (Above 10 years of experience)	3	-	-	1	-	4
2	Could you give me some background on why you decided to become a teacher and when and why you came to this school? (Because learning never stops)	2	1	1	-	-	4
3	When were tablets introduced into this school? (In 2013)	4	-	-	-	-	4
4	How were you informed about the new policy of using tablets for teaching? (Never informed)	-	-	-	-	4	4
5	How did you feel about using tablets for teaching in your school? (Happy)	4	-	-	-	-	4
6	When did you first start teaching with tablets? (10 years ago or more)	3	-	-	-	1	4
7	What kind of support in using tablets for teaching did you receive from the Department of Basic Education? Did you get training? What kind? Technical only? Who provided the support? (Have you received training)	-	4	-	-	-	4
8	Did you receive any training in the pedagogical aspects of using tablets in the classroom?	-	-	-	1	3	4
9	Please comment on the training. Was it useful?	3	1	-	-	-	4
10	Please describe your experience of using tablets. (Challenging)	1	2	-	1	-	4
11	Do the tablets add value to your teaching? If so, in what ways?	4	-	-	-	-	4
12	How do you use the tablets in the classroom? (For accessing study materials)	1	3	-	-	-	4
13	Are tablets used to find answers to questions?	2	2	-	-	-	4
14	The introduction of tablets was explained in terms of the "paperless classroom". In what respect have they replaced paper? Or do you feel that they have replaced paper?	-	-	-	3	1	4
15	Please describe a typical lesson and explain how it differs from the same lesson that you would have given without the use of this technology. (Good/interesting)	1	1	1	1	-	4
16	How has your teaching changed since the introduction of tablets? (Has improved)	3	1	-	-	-	4
17	Do you think that tablets help learners learn better? If so, how? If not, what do you think	1	3	-	-	-	4

	would help learners to learn better? (Help learners learn better)						
18	Have you noticed any difference in the learners' engagement in the classroom when they use tablets?	2	2	-	-	-	4
19	Do you think that using tablets has encouraged the learners to think critically? How?	1	-	1	2	-	4
20	How have the learners responded to using tablets? (Interested/excited about this opportunity)	3	1	-	-	-	4
21	Do you think that using tablets has increased learners' enthusiasm for learning? Please elaborate.	4	-	-	-	-	4
22	Has using tablets assisted you to identify different abilities in the class?	2	-	-	-	2	4
23	Do you allow each learner to work at their own pace or does the whole class do activities together?	1	3	-	-	-	4
24	Can you mention features that have made a difference to teaching and learning using tablets? (E.g., internet, etc.)	4	-	-	-	-	4
Total		49 (51.5%)	24 (25.5%)	3 (3.5%)	9 (9%)	11 (9.5%)	96 (99%)

Lastly, two levels of government officials from the GDE and Ekurhuleni South District were interviewed to ascertain the government's intentions of introducing tablets into schools. The findings are shown in Table 5.4.

Table 5.4: A rubric of the government officials' responses to the questions

Item number	Question	Government officials responses					
		Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Total responses
1	The Gauteng Department of Basic Education has shown a keen interest in using technology for learning in schools since 2001 when Gauteng Online was implemented, until now with the introduction of the textbook-free programme (the paperless classroom). What was the motivation behind these initiatives? (To improve teaching and learning)	1	1	-	-	-	2
2	How do you envisage that the use of tablets will assist in improving the level of education in the country? (By using and monitoring Grade 12 results)	1	1	-	-	-	2

3	What was the reason(s) for the introduction of tablets? Why tablets specifically? (To enhance teaching and learning)	1	1	-	-	-	2
4	In which schools have they been introduced? (Township schools)	2	-	-	-	-	2
5	How were the schools chosen? (By applying equity procedures)	2	-	-	-	-	2
6	How do you think teachers responded to the directive that they should use tablets in the classroom? (Excited)	-	1	1	-	-	2
7	Were teachers trained in the use of tablets? Who provided the training? What did the training consist of?	-	1	1	-	-	2
8	Are there evaluation strategies in place to assess whether tablets are proving successful in improving teaching and learning?	-	2	-	-	-	2
9	Has there been any noticeable improvement in the quality of teaching and learning since the introduction of tablets?	-	2	-	-	-	2
10	Is there any indication that learner performance has improved? Or whether learner engagement and motivation to learn has improved since the introduction of tablets?	-	2	-	-	-	2
11	Your plan is that every high school learner in Gauteng will have a tablet by the end of 2017. Is this realistic?	-	-	2	-	-	2
12	What challenges or limitations (if any) have been faced by the schools since the mobile technology (tablets) was introduced in their classrooms and how have the challenges been addressed? (Are there any challenges ...?)	2	-	-	-	-	2
13	Do you think the availability of resources (like tablets) in schools can add value or make a difference in terms of improving teachers' practice and learners' ability to learn? If so, how? If not, what do you think would bring about more effective teaching and learning in schools?	1	1	-	-	-	2
14	How is the use of the tablets monitored? (Every month)	-	-	2	-	-	2
15	What do you perceive as the merits/benefits of using tablets in teaching and learning? (E.g. improves access to information)	2	-	-	-	-	2
16	Is there anything I have not asked or am unaware of that I should know about the introduction of these tablets or the initiatives in general?	-	-	2	-	-	2
Total		12	12	8	0	0	32

		(37.5%)	(37.5 %)	(25 %)	(0%)	(0%)	(99%)
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A summary of eight key findings of this study with their corresponding descriptions and explanations are presented in Table 5.5. First, the use of tablets as a technological tool is explained in terms of a) time spent on tablets in the classroom, b) the role of internet-based technology, and c) a need for teacher development, and challenges and benefits posed by the use of tablets in the classroom. Secondly, teachers' and learners' variations and/or mixed feelings, experiences, conceptions, and viewpoints about the introduction of tablets into schools and the educational value of using tablets as a learning tool are explained. Thirdly, the emerging argument is described in terms of a) coupling the allocation of resources with appropriate training, and b) establishing the positive or negative effects of using tablets to enhance learning. The fourth component describes the emerging relationship between the phenomenographic approach and the TPACK framework. Reality, being the fifth component, concludes that the classroom of the future is not in existence yet. The sixth component, proposing future research, focuses on a) creating a monitoring tool to regulate learners' access to unlimited information and foreign content, and b) policy formulation and development on the use of tablets in classroom settings. The seventh component addresses recommendations including a) teacher development for the optimal integration of teaching with TPACK, b) policy development to monitor learners when using tablets in the classroom, c) establishing the learners' mindset change when using tablets, and d) creating a training manual with guidelines on the use of tablets for effective teaching and learning. Lastly, the conclusion comprises the benefits of using tablets to a) promote effective teaching and learning, b) enhance social interaction or support the social constructivism approach to learning both within and outside the classroom, as learners can engage in tasks at any given time, and c) maximise choices that add value to teaching and learning processes.

Table 5.5: A summary of key findings with their corresponding descriptions and explanations

	Key findings	Description/explanation
1	Use of technology	Many learners did not use time optimally for formal learning; they did not use tablets to engage in learning activities. When internet-based technology is integrated into education, teachers are more likely to maximise opportunities that make content more accessible to learners. Teacher development on TCK, TPC, and TPACK is urgently required to equip teachers with skills that enhance integration of technology into their pedagogy. Technical problems, safety of the learners using tablets, and monitoring tools, are the major problems and concerns that negatively affect effective teaching and learning. Using tablets in the classroom is more likely to promote learner engagement and social interaction.
2	Emerging findings	The findings of this study are explained in terms of mixed feelings about the introduction of tablets into schools. Learners miss the tradition approach to problem-solving, e.g., conducting practical activities and learning to spell. The tablet fixes everything for them and leaves them no room for learning.
3	Emerging argument	When technology is used in classroom settings, learners miss the traditional approach to solving problems by themselves. Providing teachers and learners with well-advanced resources without proper training on how to use them is a worthless exercise. Using tablets tests the individual learner's character and self-discipline.
4	The emerging relationship between the phenomenographic approach and the TPACK framework	While the phenomenographic approach is associated with the object of learning and focused on understanding and conceptions that people hold rather than the misconceptions (Stamouli et al., 2007), TPACK emphasises the connections among teachers to understand content, pedagogy, and technology to be effective teachers (Koehler et al., 2014). One can therefore argue that when technology is used in classrooms, learners face the dilemma of being distracted by inappropriate content and not focusing on educational activities. As such, everything depends on a learner's ability to differentiate between the good or bad content. Any phenomenographic approach is associated with the object of learning; that is, how a phenomenon is experienced by a specific group of learners and variation in the ways this phenomenon is understood. Thus, such studies adopt a positive attitude towards learning, by focusing on <u>understanding and conceptions that people</u> hold rather than on misconceptions (Stamouli et al., 2007). On the other hand, the TPACK framework also emphasises how <u>the connections among teachers' understanding of content, pedagogy, and technology interact with one another to produce effective teaching</u> (Koehler et al., 2014). Effective teaching translates into effective learning.
5	Reality	The classroom of the future is yet to be fulfilled. Currently, hybrid teaching and learning are taking place in the classroom setting.
6	Future research	Future research will focus on creating a monitoring tool and policy guidelines that will assist teachers in the process of controlling or regulating the learners' access to websites or information that are irrelevant to the advancement of learning content prescribed in the curriculum. The policy should prescribe the consequences of violating the misuse of tablets in the classroom.

7	Recommendations	The government should assist in teacher development to achieve optimal integration of teaching with TPACK. This means that teachers' professional development should be aligned with integration of technology with pedagogy to maximise opportunities for learner engagement. This study suggests the alignment of teaching with tablets with a comprehensive plan of teacher professional development. Development and implementation of policy to monitor learners when using tablets in a classroom to ensure that learners realise that tablets should be used for educational purposes only in the classroom. Create a training manual on using tablets to enhance effective teaching and learning.
8	Conclusion	The use of tablets as an educational tool enhances social interaction and supports the social constructivism approach to learning both within and outside the classroom, as learners can engage in tasks at any given time. Tablets enable teachers and learners to use resources for educational purposes, as they can optimise applications including downloading online lessons, video clips, and games-accessing apps, among other. To unlock a full process of learner engagement, there is a need to acquire teachers' technology-related skills. The focus should be on 1) integration of technology with pedagogy, 2) class management to restore order when tablets are used for educational purposes, 3) developing policies and monitoring systems that will improve teachers' confidence, and 4) applying the findings to teaching and learning to effectively use the internet-based technology.

5.3 Discussion of the Key Findings from the Questions and Answers

In addition to the tabulated findings and deductions in Table 5.5, four approaches to unlocking the process of learner engagement have been explained in the following sections. The focus was on learner engagement towards learning, critical thinking, and structural dimension of the aspects of the phenomenon that can be grouped to constitute each particular category. Researchers including Reed and Ingerman (2013), Marton (1981), Stamouli et al. (2007), Booth et al. (2013), and Harris (2011) reported that one of the processes and principles of data collection in phenomenographic studies is to examine the data from different perspectives.

Extracts from the interviews were grouped according to the format in Tables 5.2, 5.3, and 5.4. These tables show important categories of Marton's framework (which includes the "what" and "how" of the referential and structural frameworks) and the relationship between descriptions and interview questions. Following Marton's framework, the outcomes of the learner engagement phenomenon and how it influences learning variations amongst participants when tablets are used in and outside the classroom settings are revealed (Woollacott et al., 2013, Ornek, 2008). Furthermore, the aspects of data analyses consisting of a referential dimension on the

focus category are analysed. While Marton's internal horizon is comprised of how learners engage in learning and critical thinking and how the category of experience relates to the context in which it is situated, its external horizon is the influence of tablets on enhancing effective teaching and learning (Woollacott et al., 2013). Many researchers, including Marton and Booth (1997), Pramling (1983), Reed and Ingerman (2013), Marton (1981) and Harris (2011) used this framework to study learners' conceptions of learning. In this study, the researcher also referred to Marton's framework to explore what is learned and how it is learned when teachers and learners use tablets as learning devices in and outside the classroom. The outcomes of the interviews are discussed in the following sections.

Table 5.6: Application of Marton's framework in this study

Components of Marton's Framework	Descriptions	Some relevant questions for analysis in this study
What	- Is described as the outcome of learning What is learned?	- What is the outcome of using tablets as a tool to enhance teaching and learning? - What are learners doing or learning using technology? - What are teachers doing or teaching using technology?
How	- Refers to the process How it is learned	- How do learners learn and teachers teach using tablets? - How are learners engaged in learning processes? - How do teachers teach with tablets?
Structural	- Refers to structural arrangement - The given explanation The process	- How are learning activities designed and completed by the learners? - How are instructions or guidelines given to the learners to focus on learning? - How do learners learn and teachers teach? - How are learners engaged?
Referential	- Refers to the outcomes - What is focused on The intention	- What are the benefits and limitations of using technology for educational purposes? - What is the intention and focus when engaging learners using tablets?

Source: Ideas were taken from Harris's (2011) article. Harris, L. R. (2011). Phenomenographic perspectives on the structure of conceptions: the origins, purposes, strengths, and limitations of what/how and referential/structural frameworks. Educational Research Review. The University of Auckland, Elsevier, New Zealand.

5.4 The “What” and “How” of using Tablets to Enhance Teaching and Learning

Following Marton's framework, the outcomes of the interviews discussed in this section are aimed at answering the first objective investigated, which seeks to understand the “what” and “how” effects of teachers and learners using tablets for teaching and learning in schools. The interview questions based on “The rationale for implementation of the tablet project” shown below in Table 5.7 are discussed in this section.

Table 5.7: The rationale for implementation of the tablet project in the Gauteng province

Item number	Descriptions	Some relevant questions for analysis in this study
1	Expectations of using tablets in a classroom setting	1. What was the reason(s) for the introduction of tablets in classrooms? Why specifically tablets? 2. What kind of support in using tablets for teaching did you receive from the Department of Basic Education? Was your training only technical? Who provided the support? 3. What did you expect your learners to do with tablets in the classroom settings to achieve the learning objectives? 4. What do you perceive as the merits/benefits of using tablets in teaching and learning? 5. How long you have been using/integrating technology in your lessons?
2	Experience of using tablets in a classroom setting	1. What do you think counts as learning? 2. How do you view teaching? What counts as teaching in a classroom setting? 3. How do you think teachers responded to the directive that they should use tablets in the classroom? 4. How did you feel when tablets were introduced (Happy / Excited / Imposed)? 5. How do you feel about using tablets as a teaching tool in your classroom? 6. How has your teaching changed since the introduction of tablets? 7. How have the learners responded to using tablets? 8. How do you envisage that the use of tablets will assist in improving the level of education in the country?

5.4.1 Outcomes and discussion

In South Africa, the GDE uses Grade 12 results as a benchmark to determine the academic standard or performance of schools in the province (Letsoalo et al., 2019). The MEC representative also confirms that, "Grade 12 is the key to determine our standard" (Letsoalo et al., 2019).

5.4.2 Rational for implementation of the tablet project

In this study, tablets were introduced to seven piloted schools in the Gauteng province to investigate the effects of using tablets as a resource tool for teaching and learning. The DBE used tablets as a prototype solution for redressing the imbalances in the South African education system. The imbalances, which are underpinned by income inequalities that are prominent within the different racial groups, as well as urban and rural areas, can cause serious developmental challenges. These educational imbalances are prominent throughout schools with few or no technological tools availed to enhance teaching and learning. Therefore, "The Classroom of the Future" programme is aimed at eradicating the differences in educational tools and resources between townships schools and "privileged schools" (Lesufi, 2015: 1). Accordingly, the MEC representative reported that the main reason for introducing tablets into schools was "to bridge the digital gap between the 'privileged schools' and townships schools"

(Reuban et al., 2020). The MEC representative further stipulated that the DBE introduced technology into Gauteng schools as a prototype that would be implemented later in all South African schools to make sure that all learners are empowered with skills that can benefit them throughout their academic journey. Investing in technology in schools would empower learners with technological skills that would improve their quality of education (Chanee, 2020). The introduction of technology can be valuable in bridging the educational imbalances and improving learner performance in South African schools.

5.4.3 Experiences of using tablets in a classroom setting

Learner engagement: Teachers and learners observed a phenomenon of learner engagement during the interview process, as learners were observed using their tablets for learning. It is important to note that analyses of the responses showed that only 22 of the 40 learners who participated in the interview process had used tablets before and had previously used other technological devices such as computers. However, all teachers and learners were able to download lessons and experiments and display them on projectors or share them with others. Teacher 1 communicated that tablets provide more options for learning, such as links to online lessons for experiments. Furthermore, Teacher 3 noted that learners ask questions after watching experiments, which is when s/he starts engaging them or correcting misconceptions. Presented differently, learners can learn with or without the physical presence of a lesson. Teacher 4 stated that teachers and learners are even allowed to Google at school or in the classroom to maximise opportunities of grasping the concept presented. Using tablets enables teachers to organise meaningful and engaging activities for the learners to learn effectively. This study revealed that teachers use tablets to find alternative interesting ways of designing and presenting lessons, for example, Teacher 1 revealed that the internet makes “miracles or wonders” when teachers and learners explore more knowledge and study materials using internet-based technology. Such technology enhances classroom resources, allowing teachers to better reach learners' abilities, thereby improving learning and engagement. They can upload learning material such as video clips, online lessons, diagrams, and images that can enhance learning (Hourcade et al., 2014). In this way, tablets are used as a tool in promoting effective teaching and learning (Woollacott et al., 2013).

Retrieving study material and searching for information: Similarly, learners revealed that they use tablets to retrieve study material, which gives them opportunities to maximise their knowledge and learning skills through research activities, navigation of the system, and other forms of exploration. This aligns well with the interview findings, whereby Teacher 1 revealed that learners are eager to find out more about a task when they Google. In the same light, Learner 11 revealed that they explore more information if there is access to the internet, as they do not have to rely on one source to gather information. These findings also align well with the view that learners can discover the principles of subjects such as Mathematics and Science through exploration (Jordan et al., 2008). Learners use tablets to improve their self-discovering skills instead of waiting for the teacher to clarify any confusion or misconceptions; they simply use tablets to seek solutions from the internet (Muller et al., 2012). Furthermore, learners reported that they learn through multimedia, as this platform has much information that equips them with numerous skills and knowledge to attain their learning objectives.

Interactive and discovery learning: Using tablets encourages collaborative learning, sharing, and interaction among learners. Tablets seem to champion some characteristics of the social constructivism theory of learning. Vygotsky's theory of social constructivism maintains that learning is social, and learners learn by writing and typing. Therefore, tablets develop learning skills (Vygotsky, 1978). Tablets empower learners with skills to practice discovery-learning activities, communicate and interact with others (through internet access), and learn more about the task. Learner 6 revealed that "all my teachers use laptops, and all the programmes we have on our tablets are also installed on their laptops: they show us videos, notes, music, study materials, and other forms of multimedia". This finding aligns well with the literature notion that tablets help to engage learners; multimedia effects such as video, audio, music, animation and interactive capabilities afforded by tablets evoke curiosity and interest to learn new things, especially when learners have access to the internet (Naidoo, 2017; Mosehlana & Sebola, 2020).

Although the introduction of tablets was explained in terms of "The Classroom of the Future" that is paperless, the findings of this study established that the school was not 100% paperless, but instead employs a hybrid approach whereby technology is blended with traditional ways of teaching and learning (Harris, 2018). Teacher 1 stated that "the school is not 100% 'paperless' [as] they are no longer carrying textbooks but

still writing using pen, pencil and paper" (see response item number 17 (learner responses) in Table 5.2). Learners are encouraged to use Moodle Software to complete available activities that engage them in learning processes.

5.5 Effect of using Tablets in Teaching and Learning

In this section, various processes that enhance teaching and learning when using tablets in the classrooms are reported, as well as the benefits of using tablets as a tool. The interview questions that prompted the results and discussions in this section can be seen in Table 5.8.

Table 5.8: The benefit of using tablets as a tool to enhance teaching and learning

Item number	Descriptions	Some relevant questions for analysis in this study
1	The benefits of using tablets	1. What is the outcome of using tablets as a tool to enhance teaching and learning? 2. What is learned when tablets are used in and outside the classroom settings? 3. You are in a class that uses tablets in the classroom. Tell me a little about your experience of tablets. Do you enjoy using them? Why? Why not? 4. Do you think that tablets help learners learn better? If so, how? If not, what do you think would help learners to learn better? 5. Have you noticed any difference in the learners' engagement in the classroom when they use tablets?

5.5.1 Outcomes and discussion

Both the teachers and learners recognised that tablets allow them to access different technology including the internet, apps, and software that add value to learning. However, although education has recently revolved around the introduction of tablets as a teaching tool in the classroom, teachers acknowledged that they had never received any training in the pedagogical aspects of using tablets for teaching and learning in the classroom. It is worth noting that previous studies found that there are three common pedagogical prospects when tablets are used for teaching and learning: 1) tablets improve learners' motivation (86%), 2) tablets facilitate active teaching and learning (82%), and 3) tablets support independent learning (70%) (Rikala et al., 2013). The findings from this study on the effects of using tablets in a classroom are reported in the following sections.

Improving communication skills and build relationships: Using tablets for educational purposes enhances communication skills and builds relationships through interaction and sharing of knowledge. There is a relationship between the constructivist theory of learning and the use of ICT in the classroom. This means that the use of technology

for teaching and learning supports the constructivist theory of learning. Previous studies underpinned by constructivism as their framework confirmed that research continues to view constructivism as a suitable theory for ICT integration (Kafyulilo et al., 2015). Learners work independently to discover information on the internet as a resource. At times, they use tablets to ask one another questions or to request information from their peers via emails, WhatsApp group chat, and other technological resources. This study also established that learners use their tablets to create social groups, store information, share information, and upload and send information to their friends.

Enhancing blended and collaborative learning: ICT in the classroom improves teachers' pedagogies and learner engagement by blending technology with the traditional teaching and learning methods. Previous studies reported that ICT could save teachers time in preparing lesson planning, as virtual online lesson plans can be adapted and adopted to traditional classroom teaching (Zungu, 2022). Despite learners using their tablets for personal reasons, it was established that learners did not enjoy "The Classroom of the Future". They used both tablets (replacing textbooks) and paper (to take down notes and write class activities and assessment tasks). Therefore, even with the introduction of tablets, teachers still mark handwritten work and learners' books for formal activities.

A previous study by Naicker et al. (2022: 499) about collaborative online international learning found that "learners engaged in collaborative learning build their knowledge through a process of assimilating information into their understanding by active engagement". In this study, the findings revealed that learners do not have a discussion forum to facilitate formal debates or any form of learner engagement in tasks or learning. They therefore formed their own WhatsApp group to communicate or share a variety of information (personal and sometimes learning). They debated or raised their concerns in the classroom to obtain the attention of the teacher rather than using their tablets as a vehicle to facilitate any form of debate, argument, or engagement for learning.

Saving time: The overall benefits of using tablets include saving time, as a tablet has all the features necessary for teaching and learning. For example, Teacher 7 and teacher 15 agreed that it is quicker to use tablets as they save time. This finding aligns well with the previous findings, whereby teachers stated that the biggest benefit

provided by tablet-supported education is the increase in the learning speed of students as a result of visuals and interaction provided by tablets (Soykan, 2015). Moreover, teachers simply project their work on the whiteboard instead of writing. The traditional habits and ways of teaching and learning have changed since the access of internet-based technology. All textbooks and activities are loaded on the learners' tablets for easy access. The participants including teachers agreed that the introduction of tablets in schools saves time and adds tremendous value to teaching and learning. Teacher 4 maintained that they use every opportunity to "Google at school or in the classroom" to confirm answers, search for information, and download information.

Versatility and viability: When using tablets, there is no need to carry many textbooks, and less usage of paper, as tablets save physical storage space and do not generate litter. Teacher 1 maintained that "technology saves a lot of time"; for instance, there is no time to spend on writing numerous notes in the classroom, as all information is installed on the tablets. Teachers felt that it is necessary to keep up with technology. Teacher 2 maintained that "I do not feel I can go back to the old way of teaching", as in so doing one consumes a great deal of time waiting for learners to complete their tasks. The main task of the teacher is to ensure that resources for learning are available to the learners. As teacher 1 said, "I organise videos or websites for my learners to reinforce what I said in class and previously it wasn't like that because I used to give them examples only". It can be inferred from the interview responses that technology is here to add value in changing the way learners learn. Consequently, tablets encourage modern ways of teaching and learning, including the use of apps, PowerPoint presentations, and software such as Moodle. The use of mobile education devices and preference for a mobile learning environment depends on the adaptation and acceptance of individuals at the relevant level of education (Soykan, 2015). The majority of learner activities, including previous question papers for revision purposes and other inspiring activities are all stored on tablets.

Enhancing collaboration: The interview responses indicated that teachers in schools support one another to ensure that they teach with confidence in classroom settings. Learners continuously interact with content and people in general using internet-based technology; all they need is connectivity. When learners are exposed to collaborative learning activities where they share experiences and knowledge using tablets, they

create opportunities to learn from each other. This means that a learner assumes authority and control over their learning (Naicker et al., 2022). Newly appointed teachers were also allowed to observe good practices of using tablets for teaching from experienced teachers for about two weeks.

Promote skills development: Besides accessing information, learners can learn different skills such as typing, communication, interpreting, and analysing video clips and games. For effective use of technology in and outside the classroom the TPACK framework was used to assist in establishing the readiness and understanding of teachers on how to integrate technology into their teaching in a way that would improve learning (Koehler, 2014).

In the school where the study was conducted, an Information Technology (IT) specialist assists teachers with any form of technical problems. Teachers felt that the types of training they received were useful in terms of equipping them with the necessary skills on how to implement the programme. Randall et al. (2005) previously reported that having IT specialists on site will enable the school to enjoy benefits, including the teachers and learners being trained on web-based content, online assessment, learner performance tracking, and hands-on activities. Moreover, IT specialists can provide knowledge of network configurations and have the ability to diagnose and troubleshoot networks when designing curriculum materials. IT specialists are also able to help teachers align learning objectives to state standard frameworks for Mathematics, Science, and language arts by creating a standards alignment database.

Promote adaptability: Teachers are also willing to learn something new when using tablets for teaching; lifelong learning is inevitable in this new technological era. It was established from the findings that teachers were not new in the field of education, as their years of experience in the sector ranged from five to 23 years. They all had experience in the traditional way of teaching and learning where a pen, pencil, and paper were used in the classroom as teaching and learning tools. They were excited to be exposed to new ways of teaching. They felt that the new tool helped them to enhance their teaching to enable students to grasp the content presented. As noted by Teacher 1, "learning is not going to stop" as we evolve with time. They are prepared to use technology to explore new ways of engaging learners. Teacher 3 also communicated that "the introduction of tablets allows them to grow as a person every day. They explore interesting and challenging situations".

5.6 Educational Value of using Tablets for Teaching and Learning in a Classroom Setting

The interview questions guiding the results and discussions in this section are presented in Table 5.9.

Table 5.9: Educational value of using tablets in the classroom settings

Item number	Descriptions	Some relevant questions for analysis in this study
1	<i>Prior knowledge of using tablets</i>	1. Have you used tablets before for teaching (teachers), learning (learners), or other purposes? If yes, explain your answer.
2	<i>Teaching</i>	1. Do you only use the tablet and/or paper or both to teach in your classroom? Explain your answer. 2. Please describe a typical lesson and explain how it differs from the same lesson that you would have given without the use of this technology. 3. Can you mention features that have made a difference to teaching and learning using tablets? 4. Do you use any other technology (like a computer) at home?
3	<i>Learning</i>	1. Do you use tablets to find answers to questions? 2. Do you use your tablet to find information by yourself? 3. Do you use your tablet to solve problems (like conducting research, and investigations)? How? 4. Does using tablets in the classroom help you to learn better? If so, how? 5. Do you think that using tablets improves your knowledge and understanding of the subject content taught? Explain your answer. 6. Do you only use your tablet and/or paper or both for learning in the classroom? Explain your answer. 7. Do you use any other technology (like a computer) at home? 8. Can you mention features that have made a difference to teaching and learning using tablets? 9. Do you think you could learn better if you used books instead of tablets and relied on the teacher? Explain your answer.
4	<i>Evaluation</i>	1. Are there evaluation strategies in place to assess whether tablets are proving successful in improving teaching and learning?
5	<i>Educational value and conclusion</i>	1. What is it that teachers are doing or teaching using technological tools and tools and resources? 2. What are learners doing or learning using technology? 3. How do learners learn and teachers teach using tablets? 4. How are learning activities designed by teachers and completed by the learners? 5. How do teachers and learners experience the use of technology in the classroom? 6. What is the educational value of using tablets in schools?

5.6.1 Outcomes and discussion

Learners are expected to take the initiative to download the necessary information and revise it at their convenient time. They can also use free Wi-Fi on the school premises to search the internet. In a classroom setting, learners connect their earphones to the tablet, especially if the sound is not clear, to listen or work without distracting others. As Teacher 4 explained, "they put on their earphones if the sound is not clear and open the textbooks" to complete activities. Teachers expressed that there is a need to limit

learners' access to the internet to minimise confusion and distraction in the classroom. The findings of using tablets to enhance effective teaching and learning in classroom settings are discussed below.

Accessing information: The intended main use of tablets in the classroom is to access textbooks and YouTube educational videos. However, learners were found to access non-education material such as music videos and social media. As tablets were introduced in the school to replace textbooks, the onus is on the teacher to plan the lesson in a way that helps to engage learners in meaningful learning processes. Part of a teacher's responsibility is to select the knowledge that learners must access to achieve optimal learning. The teacher can achieve this by selecting educational videos, games, additional articles, and relevant web pages that can engage learners in critical thinking and learning.

At any given time, teachers and learners can access valuable information/knowledge to answer questions or develop meaningful activities that stimulate interest in teaching and learning. As all previous question papers and memorandums are loaded in the system and are accessible at any given time, it was established that learners use their tablets to find answers to questions posed by the teachers. Teacher 1 stated that "some learners are fast" in terms of completing classwork. Teacher 3 stated that "learners have access to free Wi-Fi to Google or search for information", which helps them to respond well to any question(s) asked in the classroom. Govender (2016: 12) maintained that "modern technology is making education more 'potent' by creating platforms for effective teaching to take place". Teacher 2 believes that technology "brings you close to the learner", as it can be used to share information/knowledge at hand or knowledge that exists in the public domain.

Preparing and presenting lessons: The findings showed that teachers prepare and present their lessons in a way that supports online learning. It was established that they also posted information and instructions on chat groups or emailed it to parents during COVID-19 to continue assisting learners at home. Teachers use tablets as traditional textbooks because the information that learners need to learn is loaded on the tablets. Furthermore, they use tablets to access internet-based technology to explore more information that can help learners engage in critical and interactive learning. Technology opens doors for personal development and growth that enables

effective planning for teaching and learning purposes. Teachers can edit and add interesting information to their lessons that could spark debates, arguments, thinking, and deep learning. A study by Trust et al. (2020: 112) about lessons learned from the COVID-19 pandemic found that teachers need to be “fluent users of technology, creative and collaborative problem solvers; and adaptive, socially aware experts throughout their careers”. It was interesting to note that teachers were forced to use technology when presenting their lessons or distributing study material to reach learners at school and at home. This study found that teachers are compelled to prepare PowerPoint presentations and install the lesson presentation on the system for all learners to access. As Teacher 2 said, "All my lessons are in PowerPoint including pictures, videos, and diagrams, so all types of learners and learning styles are more accommodated than before" in the traditional teaching pedagogy.

Networking: Learners use tablets as a tool to network with others. In general, the concept of "learner engagement" is influenced by a belief that learning improves when learners are inquisitive, interested, or inspired, and that learning tends to suffer when learners are bored, dispassionate, disaffected, and otherwise "disengaged" in learning activities (Abbott, 2014). Teacher 2 perceived the use of the technological resource as a powerful tool to "influence the world". By using the information found on the internet such as video clips, activities set on Moodle, and general questions found in the electronic textbooks, learners' interest in raising issues, debates, and arguments were encouraged or improved in the classroom settings. Consequently, learners were engaged in thinking, learning processes, and tasks through networking. Moreover, networking can correct learners' misconceptions and misunderstandings are less likely, as the internet can be used to access or confirm facts useful for learning.

5.7 Teachers’ and Learners’ Uses of Tablets In and Outside the Classroom

The interview questions guiding the results and discussions in this section are presented in Table 5.10.

Table 5.10: Teachers’ and learners’ uses of tablets

Item number	Descriptions	Some relevant questions for analysis in this study
1	<i>Teachers’ and learners’ uses of tablets</i>	1. How has your teaching changed since the introduction of tablets? 2. Has using tablets assisted you in identifying different abilities in the class? 3. Do you have a smartphone? If so, have you ever used it for learning?

		4. Are learners using tablets to enhance and optimise learning? 5. Has there been any noticeable improvement in the quality of teaching and learning since the introduction of tablets? 6. Are you monitored when using tablets in class? If yes, how? OR how is the use of the tablets monitored? 7. Do you take the tablets home? Do you use them there? If so, what do you use them for at home? 8. Does anyone else in your family use your tablet? If so what for? Do they ever start discussions about subjects at home? 9. What are the benefits and limitations of using technology for educational purposes?
2	<i>Drawbacks and concerns</i>	1. What challenges have been faced by teachers and learners by the introduction of tablets in the classrooms? 2. Are you worried that your tablet might be stolen? Have you ever felt unsafe because you are carrying a tablet? Do you know of anyone in your class/year whose tablet has been stolen?

5.7.1 Outcomes and discussion

Teachers' and learners' uses of tablets: Learners are capable of using tablets for multiple purposes during class time while a lesson is in progress. First, learners can use tablets to access their study materials (for example, textbooks and the internet), and second, tablets can be used to serve their intents, such as private communication. Therefore, it can be argued that access to study material may maximise learning opportunities, but cannot guarantee that the learning process is taking place. Literature findings stipulated that schools assume that teaching staff are ready to operate tablets from the outset. The findings of this study established that teachers lack skills to incorporate technology into their pedagogy. Therefore, government should create adequate opportunities for professional development in this regard to ensure that effective teaching and learning takes place (Habler et al., 2015). Equally important, learners need to manage their time between focusing on educational content and wasting time on distractions. This study revealed that teachers encouraged learners to download study materials on their tablets to maximise learning. Moreover, learners are not given any form of hardcopy textbooks to study, which leaves them only the option of downloading electronic or digital study material to complete their work. Rikala et al. (2013: 119) reported that tablets give teachers and learners “an opportunity for quick information retrieval, knowledge generation, and improved communication”. It is also noteworthy to acknowledge that some of the learners use school time and data/free Wi-Fi to download songs, movies, and other content or information that is not school related. Furthermore, it is important to acknowledge that thinking about teaching and learning extends beyond the classroom setting. Teacher 2 felt that teaching is important

in the sense that one has "an opportunity to influence the world", as by the time a child reaches adulthood they would be able to use that knowledge and information to change the world or to influence decision-making. Access to the internet can also change or has the power to influence the way learners learn and are taught, as its use or influence minimises any form of learners' misconceptions and maximises their opportunities for questioning the credibility of knowledge and learner engagement.

Drawbacks and concerns: Despite the freedom of choice and pedagogical self-design, the methods of teaching and learning are, in many ways, still traditional and teacher-centred. The findings from this study revealed that teachers preferred PowerPoint presentations over tablets to avoid discipline issues or distractions tablets might cause when used in the classroom. However, COVID-19 posed a challenge whereby teachers and learners had to rethink learning by understanding that internet-based technology can be used for teaching through face-to-face and online platforms. The COVID-19 challenges changed the teachers' thinking to understanding that tablets can diversify and enhance their pedagogy, particularly in supporting learner engagement, learner motivation and independent learning (Rikala et al., 2013).

5.8 Benefits of using Tablets for Teaching and Learning

The use of tablets as a teaching and learning tool is a novel experience in the Gauteng province in South Africa, with both teachers and learners in the process of learning how best they can use this tool to engage learners and improve the learning processes. Teacher 1 stated, "I am still learning and interested to know more, and learners are eager to learn". Therefore, teachers' development and constructive criticism on how best to use technological tools for learner engagement in classroom settings is a necessity.

Skills development: For the most part, teachers were trained on how to use/implement the programme in classroom settings. Teachers 3 and 4 both confirmed that in-house training was useful, as they now "know how to use the programme". They know how to download teaching resources such as textbooks and videos from YouTube. Teacher 3 noted that "learners benefit because they are exposed to all forms of learning. I show them pictures, PowerPoint presentations, and videos". However, some teachers felt that when using technology, there is a need to have an alternative plan. Teacher 2 said, "This system is new and challenges teachers to be more innovative in their teaching. Furthermore, teachers and learners sometimes experience technical

problems such as the battery running out and the tablet freezing; all the time you must have plan 'B' to continue with the lesson at hand".

Integrating technology in the pedagogy: Teachers felt special, excited and honoured to be in one of the schools that use tablets for teaching and learning. Teacher 2 maintained that we are "so special because other schools in the province do not have this privilege and internet access in the classroom, projectors for PowerPoint presentations" and other technology that add value in the process of improving the standard of education in South Africa. Therefore, they welcomed the initiative and looked forward to the process of integrating technology into their lessons. They felt that they now have a backup and multiple ways of engaging learners or explaining concepts. As stated by Teacher 3, "I can design my lesson the way I wish". They can easily find examples and use live videos to reinforce or correct misconceptions. Teachers felt that the use of tablets promotes inclusion, as they can now accommodate many learners who have different learning abilities in one lesson. Tablets were found to make life easier for both teachers and learners by promptly clearing misconceptions, as both teachers and learners used the internet to clarify problems. The internet was used extensively to confirm facts when learners knew where and how to search for the information needed to complete tasks. However, learners still used teachers and books in some instances as the main source of information.

Promoting learner engagement, critical thinking, and deep learning: Cognitive and substantive engagement is needed to go beyond the minimum school requirements (Hu & Fyfe, 2010; Nystrand & Gamoran, 1991). Teacher 3 believes that, "it is the type of questions asked that may help a learner to think critically". Therefore, the type of activities and questions posed play a vital role in ascertaining whether learners are engaged substantively and cognitively or not in the classroom settings.

Teachers were interviewed to determine their experiences in terms of incorporating technology into teaching to enhance learning, learner engagement and critical thinking. Critical thinking and learning partially contribute to 1) information-gathering, 2) building understanding, and 3) thinking that generates outcomes to promote teaching and learning (Moseley et al., 2005).

Teachers were positive about using tablets to access technological resources such as Moodle Software, emails, online videos, and games to learn from. Teacher 1 mentioned

that "in Moodle Software there are many baseline tests and tests in general that one can use to identify different abilities" to accommodate all learners in the learning processes. As all the work was done on the tablets, it was established that learners did not move at the same pace. As Teacher 1 said, "I allow them to work at their own pace and others are doing work in advance or from home, they do not wait for the teacher while others need teachers' assistance to catch up with their work". Consequently, access to technological resources such as the internet made a substantial difference in promoting deep learning.

5.9 Challenges Encountered when using Tablets for Teaching and Learning

The use of tablets in educational settings has received much attention, as researchers and teachers have looked at the benefits and drawbacks of integrating technology in today's classroom. The shift to increasing technology in classrooms brings its own set of challenges (Abiladi, 2018). This section discusses the challenges teachers and learners encounter when using tablets as educational tools. *Lack of policies:* One of the major challenges identified was the lack of policy directives on the use of tablets in the classroom. As stipulated by the MEC representative, the "lack of policy about the use of the technological resource is a concern. It is impossible to punish a learner who lost or damaged the devices. They have the right to education, regardless of their conduct". This means that in the absence of policies, the school does not have the power to act against learners who are negligent with their tablets. Both the teachers and the school are not supported by the Constitution or policy to reprimand a learner. This study established that tablets were introduced and piloted in certain schools in the Gauteng province in 2013. Unfortunately, there is no policy or code of conduct to guide and monitor users of tablets for educational purposes in schools.

Lack of ICT skills: This study identified ICT challenges associated with using tablets as teaching and learning devices in classroom settings. Findings from a previous study by Lisene and Jita (2018: 112) reported barriers encountered by teachers with the integration of modern technologies in the teaching of Physical Science in Lesotho. These included teachers' lack of skills related to ICT integration into teaching and learning, insufficient time, inaccessibility to ICT resources, using inappropriate software, curriculum limitations, and lack of confidence, and support, among others. Integration of ICT in teaching and learning comes with several barriers and obstacles,

which have prompted studies measuring the impact of technology on learners' motivation, performance, and engagement (Christopoulos & Sprangers, 2021).

This study established that continuous training and support are essential for all teachers who use technology in the classroom. Acquiring the appropriate operational skills would enable proper and effective usage of tablets for teaching and learning. Researchers such as Erickson (2007: 22) have raised the concern that "teachers are not even trained on how to use technology in an effective way to improve their practice and engage learners in critical, creative, conceptual and higher-order thinking". Teacher 1 said, "We had one workshop organised by the GDE that taught us how to download videos from YouTube, and how to enter de-merit on the system....". However, they were not trained on how to integrate technologies into teaching (pedagogy). On the other hand, Teacher 4 maintained that "there is ongoing in-house training". Teachers need to know or be trained on how to integrate technology into pedagogical approaches in classroom settings to enhance effective teaching and learning. Knowing how to manipulate tablets or download what is needed for learning cannot automatically translate into effective use of information for learning that can subsequently develop into critical thinking.

Aligning pedagogy with teaching methods: From the teachers' perspective, this simply means learning how to teach with tablets to achieve deep learning. The findings reveal that it is difficult for teachers to use technology beyond the retrieval of information, to achieve deep learning substantive engagement, high-order thinking, and critical thinking. Agyei (2014: 1) maintains that "ICTs are perceived to provide a window of opportunity for educational institutions and other organisations to harness and use technology to complement and support teaching and learning". For example, it has been established that it is still a problem to align pedagogy and technology in the classroom. The GDE suggested that it is up to the individual school or teacher to devise a workable system to monitor learners' engagement in learning with tablets.

Classroom management: Teachers need to manage all resources in the classroom environment. Classroom management is one of the most important factors that ensures that learners interact to achieve their educational goals (Bilgisi, 2017). In this study, teachers felt that in some instances the introduction of tablets in the school worsened the situation in terms of classroom management and discipline. Learners were overexcited when they were asked to use their tablets and did not follow teachers'

instructions. Learners also expressed their concern about the use of tablets in the classroom settings. As Learner 42 revealed, "I am not happy about the use of tablets in the classroom because using tablets makes us fail as we do not listen to teachers' instructions. We play too much during contact time and chat a lot with friends in the classroom". This means that learners sometimes lose focus when using tablets in the classroom. They become distracted from learning and waste time on personal stuff. It was noted from the study that there is no system in place that teachers can use as a point of reference to monitor the use of tablets in a classroom setting.

Misuse and maintenance of tablets: There is a risk of deviating from the core purpose of learning, as learners become exposed to varied information sources that may or may not enhance learning. It was established that some learners use tablets for non-academic purposes. Learners easily become addicted to social media platforms such as Facebook and TikTok (Esposito et al., 2017). Therefore, additional guidance is required to educate learners on the primary uses of tablets, their benefits and drawbacks, and the consequences thereof. The MEC representative maintained that "learners delete schoolwork to load music or non-academic content such as entertainment" (Semerci, 2018). Teachers also expressed that it is very expensive to maintain tablets compared to textbooks. In this regard, the MEC representative stated that the GDE is concerned about the "licensing of installing e-textbooks to tablets because it is too expensive. Some schools want to go back to the traditional textbooks because the money involved in the issue of renewing licenses every year" is a concern. It can be argued that the education system lacks the infrastructure to support technological tools such as tablets, which means that tablets were introduced into schools prematurely.

Safety issues: As learners take their tablets with them to possibly continue learning at home, they are at risk of being targeted by criminals wanting to steal their tablets. Therefore, the security of these learners when traveling back and forth from school is compromised. The MEC representative stated that "learners are targeted by criminals because they know that they carry tablets to school", with "hardware theft" being the main concern, as criminals steal the tablets and sell them. The finding from the study indicate that the participants felt unsafe to carry their tablets back and forth to school. Even within the school, other learners steal tablets. Theft is a major challenge that led to schools proposing discontinuation of using tablets for teaching and learning, and

instead returning to traditional textbooks. However, the GDE suggested that schools should individually develop structured systems to address operational and safety issues to enable learners to safely operate and store their tablets. A structured system would enable teachers to ensure that learners under their care take responsibility for looking after their tablets. As noted by the MEC representative, "it is the DH's responsibility to monitor the curriculum delivery and pedagogy" in the classrooms. Currently, the department only monitors the retrieval of tablets in the schools. The MEC representative confirmed that a "device audit is done twice per month" to ensure that schools are taking care of the state resources.

5.10 Interview and Questionnaire Outcomes

Questionnaires were used to ascertain variations about the value of and educational use of tablets in classroom settings. The main objective of using questionnaires was to produce generalised findings to accommodate 1) the views, 2) feelings, 3) experiences, and 4) conceptions of Grade 8 teachers and learners (Harris et al., 2010). Figure 5.2 presents variations in the educational value of using tablets to enhance learning processes in classroom settings. The findings revealed that teachers and learners had mixed feelings about the rationale for, and educational value of, using tablets in schools. Therefore, it was difficult to find a balance between the benefits and limitations of learner engagement when technology is used for teaching and learning in a classroom setting.

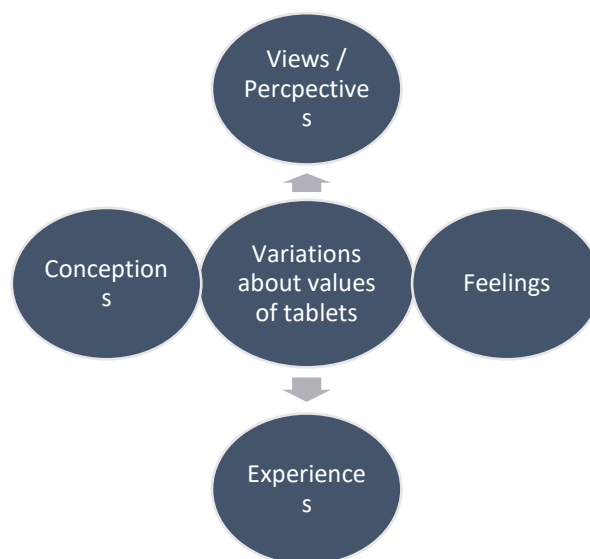


Figure 5.2: Variations about the educational value of using tablets to enhance learning processes in classroom settings (Alraddadi, 2021)

5.10.1 Teachers' and learners' responses to questionnaires

As stated in Chapter 4, Grade 8 teachers and learners were given questionnaires about the use of tablets in the classroom. It is important to note that 34 teachers teaching Grade 8 (regardless of the subject they were teaching) participated in surveys to ascertain their 1) experiences about the use of tablets for teaching, 2) feelings, 3) perspectives, and 4) conceptions about the educational value of using tablets in schools. A total of 146 learners responded to the questionnaires given to them.

To ascertain the value of using tablets in the classroom, learners were asked to communicate how they used their tablets. This study established that study materials such as textbooks and educational software are located on every learner's tablet and their task is to download it and use it for learning. Furthermore, the 146 learners indicated that tablets are used to download school information in the form of teacher's notes, textbooks, class activities, homework, and video clips.

It was established from the survey responses that using tablets in the classroom setting to access the necessary programme, which has e-textbooks used for learning, is a central idea in each class. The e-textbook is alike to all other textbooks, as it consists of all learner activities and teachers can refer learners to a specific page to complete class activities. Therefore, the procedural engagement does not change much in the era of tablets. The only exception is that learners have access to the internet, which affords them the privilege of adding value by promptly accessing their study learning material efficiently. As noted by Learner 71, "[we] use tablets to access our e-textbooks and use them to note down homework or research". Access to information or learning resources is essential in the process of forming a solid platform and a fertile ground for learning and learner engagement to take place. Learner 80 seemed to benefit greatly from this initiative of introducing tablets in schools and noted that tablets are used "for study, to do research, record me at home when I'm doing speeches and practicing" to present in class. However, it depends on the individual user of such a technological tool to access resources available from school or home and use them effectively for educational purposes. As stated by Cohen et al. (2003: 129), "access only creates opportunities to the resources". However, it is the individual learner's responsibility to use the tool resources appropriately to enhance learning.

5.10.2 Teachers' and learners' experiences of using tablets for educational purposes

The findings in this study show a well-distributed variation and diversity of teachers' experiences and knowledge of using tablets for educational purposes. Their experiences range from one year's experience to 15 years of experience in the field of work. The findings confirm that the 146 learners who participated in the study associated the use of tablets with leisure, entertainment, and/or for keeping in touch with people for social interaction rather than education.

Therefore, for the effective use of tablets for learning, teachers need to transform the learners' prior knowledge of using tablets for other purposes into a meaningful learner engagement for learning. Teachers need to change the way they design learning activities and use learners' strengths to achieve educational goals. This study revealed that learners were interested in using technology for learning. Learners have the potential to teach themselves and others how to utilise the tool. Some learners were observed teaching their friends how to operate the tablet for communication purposes. For example, they learn to attach and send photos, send messages, make calls, form or join group chats, download videos from YouTube, and more.

This study established that technology has the potential to motivate learners to learn. Instead of using tablets, the 34 teachers participated using laptops. As with learners, the school installed teaching materials such as e-textbooks and videos on their devices to add value to and support their teaching. The Moodle programme was installed as an additional resource for teaching and learning. Teachers attempt to use all these digital resources to explain the concepts they teach. Teacher 2 maintained that the use of technology for teaching purposes is "very effective" because teaching materials are on their laptop. S/he said, "Learners have their textbooks on their tablets. Learners can access the lessons and PowerPoint presentations presented in class on their tablets." This is in line with Taylor (2002: 24), who noted that "delivery of learning using traditional methods generally required only the teacher, a textbook and whatever additional support materials the teacher was able to gather. With the advent of computers and internet-based resources, education and training has changed" towards "The Classroom of the Future".

This study revealed that learners use their tablets for many things at any given time. This ranges from personal skills (how to operate the tool itself and communication),

social skills (how to share information, knowledge, and skills), and academics skills (downloading teaching and learning materials). Teachers give learners guidelines and instructions to complete activities or tasks using their tablets as a source of information. Teacher 3 said, "Learners use tablets to download lessons, e.g., PowerPoint presentations, videos, etc., and also to complete short quizzes and tests on the topic". According to Govender (2016: 12), "modern technology is making education more accessible, potent and focused". Learners have everything they need on their tablets and, therefore, save time which they would otherwise spend going to libraries to look for information.

Tablets create opportunities and unlimited access to educational information. Learners also use tablets to access internet-based technology to advance their studies. These learners' experiences relate to teachers' experiences. Teacher 2 indicated that the use of technology for teaching purposes is "very effective" in enhancing the processes of teaching and learning and added, "learners have their textbooks on their tablets. Learners can access the lessons, PowerPoint presentations presented in class on their tablets". Previous findings suggested that technology affords learners access to knowledge, enhancing learning both in and outside of the classroom (Maja, 2023). In this regard, it is the responsibility of the learners, through the guidance of the teacher or the help of capable learners, to use the information on their tablets to achieve educational goals. As technology becomes integrated into teaching and learning processes, the teacher's role in the classroom changes: they become facilitators who assist learners in constructing their knowledge, information, and understanding (Amarin et al., 2013).

5.10.3 Teachers' and learners' feelings about the value of using technology to teach and learn

This study established that the introduction of tablets in schools created excitement and learning opportunities. Variations in teachers' and learners' feelings about the introduction and use of tablets were captured in this study. It was noted that the introduction of tablets in schools means different things to different teachers. As with learners, teachers share similar sentiments. They both experienced the advantages and disadvantages of using tablets in the classroom, and learned to rise above the challenges technology presents in the classroom. Even though introducing tablets into classrooms was aimed at enhancing the engagement and critical thinking skills of the

learner, this study established that learners and teachers have mixed feelings about the introduction of tablets in schools.

The 146 learners who responded to the questionnaires in Grade 8 were happy about the GDE's decision and initiatives to introduce tablets to schools. They anticipated that using tablets would bring many benefits in their journey as learners. However, 56 learners (38%) felt that the introduction and use of tablets in the classroom is not helping them to learn: it disrupts their learning and the teacher's ability to teach. Learners felt downcast as they observed their peers play music and games while a lesson was in progress.

Some learners felt that it was a wasteful expenditure to invest in this "Classroom of the Future". They revealed that others lose concentration easily because some of their classmates send text messages, voice notes, pictures, songs, games, and other non-educational content to each other during a lesson. These learners' feelings relate to the feelings of Teacher 11, who indicated that "I don't like my learners to use tablets all the time because I want them to listen to me as a teacher, take my instructions and guidance and notes rather than relying on tablets. They spend time downloading personal stuff but they do not study". Therefore, using tablets in the classroom is contrary to the culture of teaching and learning, and makes it difficult for both teachers and learners to attain the intended educational goals. However, some teachers are happy about the introduction of tablets in the school, as everything they need for learning is loaded onto their tablets; parents no longer need to buy textbooks every year.

Tablets loaded with internet-based resources create unlimited educational opportunities. Using technology in the classroom setting exposes learners to all types of information. Learners are expected to select valuable school information and not to be distracted by wrong non-academic information. Therefore, it depends on the individual learner to optimise the opportunities availed by the internet to solve problems and use tablets to add value to their learning experience. In this way, using technological tools is largely dependent upon the individual's ability to use the tablet to enhance their learning.

Using tablets in the classroom to enhance teaching and learning approaches builds teachers' and learners' confidence. Learners feel they have authority and control over

their learning. Tablets also create opportunities for learners to learn valuable skills such as typing, searching for information, and team skills (emailing, group chatting, etc.), which is a prerequisite for employment (Naicker et al., 2022). This study established that learners' lives were made easier, as they do not need to carry many textbooks and, most importantly, can use the tool to access the internet. As stated by Learner 34, "It's very clever because we can still use Google to ask a question we don't understand, and it makes our bags much lighter". Learner 55 was even more enthusiastic, stating: "I feel so educated and happy" about the use of tablets in the classroom. It is important to note that learners also felt that they benefit or learn better by watching video clips and thereafter discussing them in the classroom with their teachers and peers. The teachers felt the same way, with Teacher 8 stating that s/he is very happy about the use of tablets in the classroom settings because "it gives you multiple ways of explaining something, for example, you may use video clips or download songs and music relevant to the topic". Learners felt that they were engaged in learning, as the teacher and capable peers were able to explain and clarify certain aspects or meanings of what had been shown in the video clip. Learner 58 said, "the use of technology makes life easier, and even how the teachers explain to us the concepts is changed". Almost all senses are utilised to mediate knowledge. Previous findings indicated that technology could improve the educational process by enhancing collaboration and communication with learners, providing flexibility, and assisting learners to better understand the teacher (Zungu, 2022).

It is important to note that learners' development or learning is not an individual process, but the result of an aggregate of social relations embodied within the individual's development (Grey et al., 2015). Learners use tablets to equip them with a variety of skills. Thus, using technology in classroom settings equips learners with multiple skills that will better support them to make a living in the future. Such skills include computer literacy and human relations. Learner 54 said, "I feel great about using them [tablets] because I want to learn/research more". Furthermore, this feeling of accomplishment relates to those of Teacher 9, who indicated that s/he felt happy about the use of tablets in the classroom because "... now I created my database of my videos and I know which video I can upload for my learners ... the use of tablets does make the difference". Integration of technology into learning enables learners to be more actively involved in their learning as they are given a chance to try something or to do something on their own. Through corrections and appraisals, learners develop

their critical thinking and problem-solving skills. Previous findings suggested that learners would retain more information if they were more involved in the learning process (Zungu, 2022).

It is worth noting that the school has not yet fully implemented “The Classroom of the Future”. Therefore, it was observed that learners were required to do their classwork in their workbooks and write formal assessments on their worksheets or papers. However, learners were encouraged to use the internet to search for information, thereby encouraging discovery learning. Using the tablet allows learners to share information via group chats, SMS, and WhatsApp; they learn from each other.

It can be argued that changes in education systems (for example, eradication of corporal punishment and changes from traditional to digital) have left teachers powerless and with no means of monitoring or disciplining learners in the classrooms. Some teachers felt that the introduction of tablets in classrooms exacerbates learners’ ill-disciplined behaviour. Teacher 7 maintained that tablets were “imposed” on them. S/he said, “I do not like it because learners are not behaving in the classroom because of tablets”. Some teachers felt that they spent much time maintaining discipline in class instead of engaging learners with tasks. As Teacher 11 said, “I don’t like my learners to use tablets all the time because I want them to listen to me as a teacher, take my instructions and guidance rather than relying on tablets. They spend time downloading but they do not study” during contact time.

In addition, teachers felt that essential skills such as writing and drawing have not been taught thoroughly since learners started using tablets. As stated before, Teacher 19 noted, “I do not like this new technology because some essential skills such as writing skills, drawing skills, and note-taking skills are not practiced when using tablets in the classroom. We want them to download information and expect them to write a test or exam on paper. They can’t spell, they can’t write properly, and they can’t finish their formal tasks and tests because they are not used to writing. They are used to scrolling or navigating on the tablet”.

The study found that teachers and the education system acknowledge that the use of tablets in classrooms should be to ensure comprehensive learning without compromising student skills. The primary goal of a learner using technology is to enhance their thinking capacity. As maintained by Elder (2012: 10), “The rapid

integration of social networking and mobile technology such as tablets provides an excellent opportunity to draw out and shape the innate learning capacities of our learners". Teacher 6 felt that using technology in the classroom assisted him/her greatly, but s/he felt that tablets "must have a more interactive" approach to engage learners in tasks in the future.

The utilisation of technology such as the internet significantly alters the teaching methods of educators. Previous findings suggested that a motivated learner could absorb knowledge even without the teacher's direct involvement when using technology for teaching and learning (Maja et al., 2022). In line with this, this study established that teachers also felt the need to re-invent lesson presentations to learners. Teacher 8 stated that s/he is very happy about the use of tablets in the classroom settings because "it gives you multiple ways of explaining something, for example, you may use video clips or download songs/music relevant to the topic". As noted by Fredric and McDowell (2013: 33), "The concepts of knowledge and learning are changing. The digital age has led to a shift in learning focus from discovery to critical thinking, knowledge creation, and connected learning". Teachers felt that using technology enabled them to create and build information that would be used to enrich their lessons and presentations to the learners.

Teacher 9 indicated that s/he is very happy to be part of the team that uses technology in the school, because "now I created the database of my videos and I know which video I can upload for my learners, and it does make the difference" to the acquisition of knowledge and engagement in the classroom. Therefore, digital technology can enhance learning skills and dispositions by incorporating video diaries, podcasting, and learning journals that focus on both the learning process and the learning product (Elder, 2012: 12). Moreover, some teachers felt that hybrid education is the best approach to ensuring that learners grasp the necessary knowledge and skills throughout the spheres of learning. As Teacher 28 said, "I feel that technology must be blended with the traditional way of teaching". The study found that learners continue to write their formal tests and assignments on paper. Therefore, the implementation of "The Classroom of the Future" in classroom settings has not been fully achieved.

5.10.4 Perspectives of teachers and learners on the educational value of introducing tablets in classrooms

Before enhancing a learner's understanding of technology in a school setting, it is crucial to understand their perspective (Gust, 1995: 3). Learner 14 explained how a general procedure or instruction is given to start the lesson: "We take the tablets out then we open a network on Chrome or internet browser called the TYB Portal. Then we click on Grade 8. Then we select the subject, then download, then the term, then the lesson number, then the notes or worksheet of the day, and thereafter start writing in the workbook". The next section explores the perspectives of teachers and learners on the benefits and drawbacks of utilising tablets in the classroom.

Tablets used for multipurpose: Tablets enable learners to perform various activities such as making calls, downloading e-lessons, playing games, sending text messages, sending pictures, searching for information, and general communication. Learner 9 said, "We use TYB mostly and sometimes SNAPLYFIG", which are programs designed to assist users in accessing e-lessons and e-textbooks. This also supports the notion of Learner 34, who emphasised that they "use them [tablets] for textbooks, reading books, going to the internet, and downloading certain lessons that need to be downloaded". Some students utilise their tablets for gaming primarily, not for school-related tasks. 52 learners of the 146 participants shared the same sentiments with Learner 12, who highlighted that the use of tablets in the classroom can sometimes be a disadvantage: "learners don't use tablets for school purposes but use them for games, music, and other purposes". Moreover, 11 teachers out of the 34 participants expressed their concerns regarding the use of tablets in the classroom. This study established that learners perceive their tablets to be for both learning and private use. Therefore, a need exists to correct misconceptions about certain learners' perceptions and feelings towards the introduction of tablets in schools.

Monitoring and discipline challenges: Learners were granted unlimited access to diverse information, enhancing their learning opportunities and potential through the use of the internet without any plan in place to monitor the usage of tablets in the classroom. The freedom to access the internet at any given time without regulations is a concern. Since the introduction of tablets, some students have been using them for SMSes, charts, emails, and even dating, which has disrupted and negatively affected formal teaching and learning in the classroom. As a result, teachers found it difficult to

control their learners and keep them focused on their work. Learner 11 said that using tablets in the classroom setting "is monitored by you as a learner by not listening to music and ensuring that there are no games on internet apps irrelevant to schoolwork like WhatsApp, Facebook, Snapchat, and other social media". This implies that teachers also rely on the self-discipline and self-regulation of the individual learners in the classroom.

Tablets replacing hardcopy textbooks: Alike to learners, teachers perceive the introduction of tablets in schools as the replacement of the hard copy traditional textbooks with e-textbooks. Teacher 9 said, "These tablets intend to replace textbooks. I asked the learners to read poems, literature and stories, on their tablets". Having tablets to access e-textbooks has great value as there are many e-textbooks installed on one tablet, which allows learners to access multiple learning resources from one source. Teacher 10 noted that, "Learners have the opportunity to use different textbooks to simplify information, then I give them activities or questions to be answered in their workbook to reinforce what was taught in the classroom settings". According to Elder (2012), tablets enable learners to acquire effective learning skills and dispositions. By enabling learners to quickly access a variety of knowledge from a single source, digital technology helps to unleash the potential of the learner. Teacher 16 confirmed that, "The school has a system with all study materials, whether you are using a tablet or laptop, everything is installed. I ask learners to download the lesson of the day and videos relevant to what I am teaching for enrichment".

Teachers use tablets for storage purposes: To help students reach their objectives, teachers save information (such as movies, books, and other study resources) on their devices. Teacher 15 said, "I upload interesting lessons and videos of Mathematics, whereby other educators present ideas like fractions in ways that differ from mine. I think learners are benefiting [rather] than listening to me every day". Teachers probe learners with questions in order to ascertain their misconceptions, areas of strength and weakness, and how best to explain information or clarify ideas for learners to comprehend what is being taught in class. Teachers also give learners instruction about lesson preparation and what s/he intends to teach and how. Teacher 12 said, "I ask learners to download a page/textbooks, videos, or diagrams to enhance their learning. I prepare PowerPoint presentations and upload everything to the system so

that they can download them". Furthermore, Teacher 14 said learners are expected to "read the information from their tablet as per instruction and I display diagrams and play videos for them using the overhead projector". This procedure is based on the format of questions that the teacher employs to make sure that students understand the material being covered in class. Therefore, using tablets for teaching purposes helps teachers design learners' activities appropriately.

5.10.5 Teachers' and students' experiences using tablets on the culture of teaching and learning

To determine the effectiveness of tablet use for education, students were asked to list the advantages and disadvantages of the device. Among the advantages were the availability of educational resources such as an internet network, which not all schools previously had access to, due to pricey data plans (Ferdig et al., 2020; Rasmitadila et al., 2020). This study also established that learners perceived tablets to be a walking library. They are aware that the tablet has all the educational software they require loaded onto it and that they can use it to connect to the internet and access additional materials. As Learner 72 indicated, "we log in and go to the textbooks and presentations (teachers' notes) the teacher made for us to read". Students claimed that because they had tablets, they did not need to travel to a library to study or learn. According to earlier research, instructors also believe that implementing technology in the classroom improved their use of a variety of approaches and improved their digital skills, which improved student outcomes (Maja, 2023). Tablets are perceived to be learning tools used in classroom settings to increase a learner's access to knowledge. As advocated by Learner 9, "it is easy to navigate on the tablet to download video clips as a learning channel, it is easy to get access to the internet and its use often makes me, or other learners understand more about lessons we have learned on that day". Learners who have access to the school's wireless network can quickly obtain the information they need. Learners get to see first-hand the benefits that technology offers in educational environments.

However, learners also acknowledge that technology is not always reliable. The findings of this study indicate that learners sometimes encounter technical problems whereby the device cracks, the battery becomes flat, and they cannot access study materials. For example, Learner 139 said that "... your tablet can break, and you want to have a textbook on it to read or learn. Normally, this destruction is caused by poor

network”; this is beyond their control. Therefore, the use of tablets to undertake successful technology-based teaching and learning practices is sometimes negatively impacted and delayed by such technical issues. Teachers were also aware of the benefits and drawbacks of utilising tablets as a teaching tool.

Teachers' perceptions of these differences are significantly impacted by their personal opinions about the value of technology for improving instruction and student learning. Previous research has shown that ICT saves teachers time when it comes to lesson planning, as there are online virtual lesson plans that can be used or modified to prepare for new lessons (Zungu, 2023). Consequently, teachers agreed that technology saves time. Teacher 1 said, "It's convenient, quicker, and efficient". By using technology, teachers and learners may communicate more effectively. For instance, teachers might submit engaging videos, articles, or other resources to the system so that anyone can view them and leave comments. Teacher 4 said that using technology in the classroom presents valuable "information at fingertips", which everyone could access instantly. Technology also allows the reduction of paperwork as teachers have all the resources needed for their lessons on a laptop or tablet. Teacher 12 stated that the value of using technology is that they no longer need to carry heavy textbooks, as technology allows them to "reduce paperwork and minimise or ensure that there are no damaged textbooks".

Teachers share the same sentiments as learners that technology is not always reliable. Teacher 19 noted that the "battery can run out" randomly, which frustrates learners' efforts to complete their tasks, especially when downloading e-textbooks. This study found that technical problems associated with using technology in the classroom frustrate teachers' and learners' plans to properly plan, especially when the challenge is easily solvable. According to earlier research, teachers deal with a number of difficulties brought on by the rise of technical issues; which, if unresolved, may result in poor learner participation (Rasmitadila et al., 2020). Technical problems mean that learners are unable to follow the lessons and instructions, thereby delaying them in completing assignments.

Another disadvantage noted was that technology could lead to an unstable classroom. Indiscipline in a classroom is dependent on the individual teacher's abilities to monitor and maintain learners' behaviour in the classroom. This view is similar to the learners'

views, as learners observe their peers engaging in social media activities during lessons. The lack of monitoring systems in the classroom causes learners to use tablets for non-academic issues. Teacher 4 mentioned that "learners may use social media on their tablet instead of just using their textbooks". In so doing, learners do not listen or are not prepared to take instructions from the teacher. Teacher 1 noted that tablets "distract learners" in many ways, and that some students are unaware of the luxury and advantage of accessing these kinds of resources for educational purposes.

5.11 Training, Access, and Learning

Training: One of the main factors influencing education today is the use of technology in the classroom. As such, schools are expected to use technology to enhance students' learning (Winter et al., 2021). Previous studies established that the integration of technology into the educational curriculum, to enhance teaching and learning, demands the availability of well-trained teachers with competency in computer operation to complement their pedagogical content knowledge (Ominowa et al., 2022). Habler et al. (2015: 11) reported that "a lack of relevant training, a shortage of technical support, and the absence of a tablet policy can prevent staff from using tablets regularly to avoid challenges of learner discipline". It is therefore important to train and support both teachers and learners when introducing new technologies in classroom settings. Similar to teachers, the study found that learners were not given any guidance on how to use tablets for education, except for downloading content from YouTube or e-textbooks, PowerPoint presentations, or instructional notes. The training students had in this regard was not very helpful in supplying information about the tool's application in education or learning. Learner 17 noted, "I have not received any training on how to use tablets for educational purposes because I taught myself to download what is needed". According to this survey, there was no training provided to teachers to help them incorporate technology into their lessons or instruction. Teacher 33 maintained that "they [the GDE] train us on how to use the programme or to access information in the programme. They did not train us on how to teach using technology". As a result, educators frequently lack self-assurance regarding the use of the new technology and instructional strategies, and are reluctant to adapt (Zungu, 2022). It is therefore up to teachers to individually decide on how best to use the available technology to teach. Previous findings confirmed that successful integration of technology in educational contexts is important and beneficial to the learner. Moreover, the findings highlighted the need to equip teachers with the necessary skill to enable

them to integrate modern technology effectively into their pedagogy (Tamim et al., 2015).

Access: In line with the above, teachers want learners to use the programmes (TYB and Moodle) effectively to enhance learning in the classroom. As noted by Teacher 9, s/he desires to see the learners "searching for information on the internet, downloading notes and textbooks" to solve problems. Teachers have noted that learners do better when they use the internet to find material relevant to their studies. However, teachers found it difficult to monitor learners in the classroom when using the internet. Teacher 17 said, "sometimes you catch learners watching unacceptable videos and I wish the system itself could block such activities or find some ways of reporting so that a learner will get de-merited". Teaching means patience and caring. As noted by Teacher 12, teachers "never give up; one day a child will realise his/her mistakes or misconceptions". For the most part, the teachers encourage learners to keep on trying and exploring new ways of solving problems using tablets. The teachers acknowledged that information from the internet could spark interest and debates, which could enable learners to work in groups, work with peers, and ask for a teacher's opinion. Learning with tablets encourages learner engagement, critical thinking, knowledge sharing, and a better understanding of concepts.

Students use tablets in the classroom to conduct information searches, which gives them the opportunity to connect with one another and the wider community. Technology inspires students to discover the world's treasures. Using technology to enhance learning in the classroom helps teachers and students to take the necessary preparations for successfully integrating what they have learned into practical settings. As a result, it is believed that utilising technology both inside and outside of the classroom significantly affects learning (Clarke & Svanaes, 2014). Learner 9 noted that what counts as learning is when learners are "doing the work and also do extra practice to understand the work given to you as a learner". With this concept, the approach to learning is changed from the traditional approach that uses hard copy textbooks to internet-based textbooks. Researchers note more options for feedback and ongoing assessment using email and messaging apps on tablets, as well as better interactions between teachers and learners (Clarke & Svanaes, 2014). Teachers' ability to communicate information electronically enhances the potential of a learner to learn.

Learning: Learning is no longer conceived to be a knowledge-producing activity, but a process of understanding abstracting concepts where learners use internet-based technology to explore and understand concepts (Naidoo, 2017). Previous findings noted that access to a personal device such as a portable tablet, which a learner can take home, allows learners to build links between school and everyday life, bridge formal and informal learning contexts, and transcend the limitations of their immediate learning (Clarke & Svanaes, 2014). Therefore, learners can engage with their study material continuously while also developing their thinking skills in the process. Learner 33 perceived that what counts as learning is if someone is "able to explain and remember what was taught". On the other hand, learning through the transfer of information, or facts from a teacher or book into the head of the learner is viewed as memorisation of existing facts. As Learner 10 said, "I think what counts as learning is to get good marks from what we have learned". Learning is perceived as the process of imparting knowledge or information from the teachers to the learners in a very organised or conducive environment such as a classroom. Learners were allowed to express their views on what counts for learning. Learner 11 explained learning as "when a teacher teaches in class and if learners listen in the classroom and not for the teacher to stop and talk to the disruptive learners in the classroom". Previous studies revealed that learning is perceived as the acquisition of facts or procedures that can be retained and/or utilised in practice (Naidoo, 2017; Govender, 2016). It has been argued that learners' perceptions of using mobile technology such as tablets will differ greatly and that teachers must incorporate mobile technology alongside other methods of teaching to reach learners (Clarke & Svanaes, 2014).

Learning is sharing information among two or more people. Learner 31 believes that what counts for learning is to see people "working together" to solve a problem. Previous findings revealed that using blogs in classrooms positively affects the teaching and learning processes. Specifically, blogs contributed to the improvement of critical thinking and writing skills while also enhancing social interaction and communication with peers (Tamim et al., 2015). This implies that learning occurs because of the interaction between the learner and the learning environment (context) or a teacher and a learner. Learners also interact with the learning context to produce changes in themselves. Tablets play a crucial role in promoting inclusive learning, as they encourage even shy learners to participate in anonymous discussions. As Teacher 2 said, what is needed is "inclusive education, regular classes, and support given to

learners so that they can learn". Teaching also entails dedication, as teachers are expected to ensure that the curriculum is implemented regardless of any challenges that may arise. Teacher 23 noted that teachers are committed to ensuring that learners learn something at the end of the day, stating that they "go an extra mile" [extra lessons, showing video clips, educational tours, etc.]. Teachers should be in class, on time and give direction to the learners on what needs to be done or how tablets can be used to achieve learning objectives. This study established that a teacher's role is to ensure that learners can understand what is needed to achieve their learning goals. Teacher 30 believes that teaching requires "embarking on the process of unpacking knowledge" until learners understand what is taught and can explain to someone what is learned, i.e., to make learning or knowledge accessible.

5.11.1 Outcomes and discussion

This study suggests that while tablets offer benefits in the classroom, effective teaching often relies on teachers' knowledge of making learning accessible. Therefore, the teacher's inability to effectively utilise technology hinders learners' ability to utilise it effectively for achieving learning goals. Mishra and Koehler (2006) stated that, at the heart of good teaching, there are three components, namely, the content, pedagogy, and technology, including their relationships, which ultimately make up the TPACK framework (Kafyulilo, 2015). Hence, TPACK has been included as a framework in this study to understand how teachers teach with tablets in classroom settings. The study highlights the potential of technology in enhancing learner engagement and critical thinking skills, emphasising the emerging relationship between phenomenographic approaches and the TPACK framework.

Stamouli et al. (2007: 182) argued that any phenomenographic research project is the object of learning and that a phenomenon is experienced by a specific group of learners and variation in the ways it is understood. Thus, a positive attitude towards learning is adopted by focusing on understanding the conceptions that people hold rather than the misconceptions. Koehler et al. (2014: 101) also claimed that "the TPACK framework emphasises how the connections among teachers' understanding of content, pedagogy, and technology interact with one another to produce effective teaching", which subsequently translates into effective learning.

Adequate planning is crucial for effective teaching and learning, as it ensures the necessary resources are available and meaningful interactions occur in classrooms. According to earlier research, teaching is complicated, since it depends on a variety of knowledge kinds, such as an awareness of the curriculum and the cognitive processes of the students (Lisene & Jita, 2018). As Teacher 31 stated, teaching means to "organise meaningful tools and information" to enhance learning. Teaching means making connections or networking with others to empower oneself with knowledge. Previous findings further indicate that learners will retain more information if they are more involved in the learning process (Zungu, 2022), especially when technology is used to facilitate group work or any form of social learning. As stated by Teacher 1, evidence of effective teaching is seen when "learners can understand and apply the content knowledge to real life". Teacher 32 emphasised that teaching "is all about demonstrating and acting". By doing so, teachers maximise the chances of helping the learner to recall what was taught and how it was explained in the classroom setting. Essentially, teaching translates in learning. Teacher 9 emphasised that "teaching means that you are learning every day and never underestimate the opinion of other learners". Therefore, continuous development is important in education, including the use of technology.

CHAPTER 6: RESULTS AND DISCUSSION PART 2: CLASSROOM OBSERVATIONS

6.1 Overview of Chapter 6

This chapter discusses the findings from classroom observations to establish the impact of using tablets on student engagement and learner success. Figure 6.1 below shows the outline of sub-topics for Chapter 6. The sub-topics are presented as follows: 1) overview of Chapter 6, 2) description of the classroom environment, 3) background on classroom observations, 4) results of classroom observations, 5) discussion of the classroom observations, 6) data analysis of classroom observations in four Grade 8 classes, 7) discussion and deductions of the observed teaching approaches in four Grade 8 classes, 8) analysis of observation in four Grade 8 classes, 9) evaluating the effective use of tablets in Grade 8, 10) discussion of classroom observations made using the seven criteria, 11) summary of the key findings discussed, 12) implications and significance of the discussed findings, and summary of the findings of chapters 5 and 6.

Chapter 6: Results and Discussion Part 2 - Classroom observations												
Overview of Chapter 6	Description of the classroom environment	Background on classroom observations	Results of classroom observations	Discussion of the classroom observations	Data analysis of classroom observations in four Grade 8 classes	Discussion and deductions of the observed teaching approaches	Analysis of observations in four Grade 8 classes	Evaluating the effective use of tablets in Grade 8	Discussion of observations made using the seven criteria	Summary of the key findings discussed	Implications and significance of the discussed findings	Summary of the findings of chapters 5 and 6

Figure 6.1: Outline of sub-topics for Chapter 6

Teachers can enhance learning by teaching from different perspectives, including addressing individual learner differences in the classroom. Consequently, teachers can allow learners to draw upon their personal experiences and to apply these experiences in their learning (Cheng et al., 2016). In the contemporary world, in the current Fourth Industrial Revolution, using technological tools such as tablets in a classroom setting

to enhancing teaching and learning to enrich educational practices has become the norm (Zhang et al., 2021). Technology is known to play a vital role in enhancing operational excellence and improving outcomes and outputs in all industries, including the education sector (Habler et al., 2015). According to Habler et al. (2015), using tablets for educational purposes enhances learning and contributes to the outcome of learning and excellence in the teaching and learning processes. Ditzler et al. (2016) also reported that tablets as educational tools have the potential to be used as a platform that can inspire learners to engage in learning. Consequently, teachers and learners need to acquire skills essential for the exploration of technological resources including internet-based technology, emails, WhatsApp, educational videos, and games (Tsai et al., 2011). To improve effective teaching and learning in the classroom by integrating tablets as learning devices, the Gauteng Department of Education launched "The Classroom of the Future" programme in pilot schools throughout the province. This effort aimed to provide educators and students with the tools they need to transition from traditional to digital classroom environments, or "The Classroom of the Future" (Lesufi, 2015: 1).

6.2 Description of the Classroom Environment

According to literature, adopting any kind of high-quality teaching and learning requires a warm and supportive classroom environment (Moolman et al., 2020). The researcher identified teaching and learning materials available to students in the classrooms used in this study, which are listed in Table 6.1. These resources create a conducive teaching and learning environment. Table 6.1 shows that classrooms with free Wi-Fi, technological tools such as tablets and laptops, and traditional support materials such as wall charts and textbooks are accessible to learners. It was established that access to Wi-Fi has both advantages and disadvantages (which will be discussed later). Most importantly, learners can use Wi-Fi to download study materials on their tablets. Learners and teachers were observed using tablets to communicate and discuss what needs to be done and how it should be done. Muller et al. (2012: 4) found that students most frequently used tablets for checking emails, social networking, games, reading books, shopping (browsing and making purchases), creating lightweight content (notes, lists, forms), weather monitoring, news reading, and watching movies, TV shows, and videos.

Classrooms with technology can stimulate learners' interest in learning. Learning with technology aligns with constructivism, as they both focus on the creation of conducive learning environments (Gilakjani et al., 2013). From a constructive perspective, "teacher-learners" engage in learning, which is "a constructive and an interactive process where a person interprets events based on existing knowledge, beliefs, and dispositions" (Hughes, 2005). With a well-planned classroom environment, the learner learns how to learn (Educational Broadcasting Corporation, 2009). Access to technology enables learners to discover spaces for learning and interaction even beyond the classroom.

Table 6.1: Summary of the teaching and learning resources accessible in the classrooms

The teaching and learning resources found within and accessible in the classrooms		
<u>1. Internet</u>	<u>2. Inventory of furniture and technological resources available in the classroom</u>	<u>3. Support materials</u>
a) Free access to Wi-Fi (learners and teachers can use search engine at any given time) b) Teachers and learners can download prescribed resources available on their laptops and tablets c) Learners can communicate easily through the use of texting, Whatsapp, Group Chat, and other social media, for example, to remind each other about homework and what needs to be done and how	a) Each learner had a chair and a table to sit on. Each teacher had a table and chair to sit on or set up the projector b) Each learner had a tablet and each teacher had a laptop c) Each classroom had a whiteboard and a projector to write on, display pictures / PowerPoint / videos and other resources	a) Wall charts are displayed showing ecosystems, biotic and non-biotic, food web and Periodic Table of Elements b) Anatomy models such as human skeleton, lungs and heart were on display in the classroom c) Learners still carry books to write notes and do classwork d) Learners still receive worksheets from teachers to complete formal activities and teachers are still marking learners' books and formal work

With the help of these classroom resources, the researcher was able to identify specific elements or potential applications for which educators may employ these materials to

encourage students to acquire and improve their critical thinking abilities. This study explored the role of classroom environment in effective teaching and learning, and the educational value of using tablets in schools, focusing on internet, furniture, and support materials.

6.3 Background on Classroom Observations

The approach to carrying out classroom observations was based on the following protocol:

Protocol 6 (see attachments) was used as a classroom observation template for data collection from Grade 8 Natural Science teachers and learners. As previously mentioned, 12 lessons were observed to establish the educational value of using tablets in the classroom. Six categories were created using Protocol 6 to collect data for analysis in this study.

These categories were arranged as follows in Protocol 6:

1. Teaching techniques
2. Meaning
3. Promotion of effective learning
4. Seven practices for effective learning
5. Promoting effective critical thinking
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework

During classroom observation, it was noted that teachers used tablets for teaching and students used tablets for learning. Four Natural Sciences teachers taught the 12 lessons observed in the eighth grade, with three lessons of each teacher observed by a non-participant observer. An observation schedule was used to collect the data. The non-participant observer noted information and recorded the lessons where necessary (Creswell, 2014). Previous research has shown that when tools such as tablets are incorporated into the classroom to support effective teaching and learning, classroom teachers take on the role of facilitators, helping students build their comprehension and proficiency in using computer technologies (Amarin & Grisham, 2013).

6.4 Results of Classroom Observations

Observations were made in the classroom to determine the effects of tablets on improving teaching and learning. Learners can use tablets to access technological resources to improve learner engagement, understanding and grasping of content taught in the classroom (Naidoo, 2017). These technological resources include access to educational software such as Moodle Software, internet-based technology, and online lessons.

Teachers and learners were observed using worksheets, hard-copy textbooks, pens to write, and pencils to practice drawing skills. This implies that “The Classroom of the Future”, which was framed as paperless, is yet to happen. Currently, the South African education system practices a hybrid or blended education approach that uses technology to enhance teaching and learning.

Learners were observed using tablets to solve problems, including complex problems, and both teachers and learners were observed using tablets as a platform to engage in different tasks such as planning, presentation, chatting, and downloading educational games to enhance learning. In this way, access to the internet using tablets not only maximised teaching and learning opportunities, but also exposed learners to different types of learner engagement.

Learners were observed interacting and helping each other to access information. By so doing, they leveraged social interaction to unlock learning barriers. The findings also revealed that tablets motivate learners to participate in learning activities. Even shy learners are engaged when tablets are used in the classroom, with some being observed raising their hands to ask the teacher to see their work. Teachers were also observed accommodating and incorporating the shy learners’ inputs to build their confidence. However, learners were not fully engaged in tablet learning activities in the classroom, indicating that they were not making the most of their class time for formal education. For example, learners were observed receiving and sending WhatsApp messages on their tablets during contact time.

Over and above the use of tablets for learning in the classroom, they also enable learning outside the classroom. Tablets were instrumental as an educational tool during, and after COVID-19, whereby learners were forced to learn remotely using online platforms such as Zoom and Google Teams.

Regardless of the merits of using tablets to enhance teaching and learning in a classroom, challenges were observed. It was found that learners were not making the most of their classroom time when it came to formal education. Among the many distractions posed by tablets, the lack of self-discipline amongst some learners impacted their ability to use contact time to seek help from the teachers, as they focussed instead on their tablets.

The observer expressed concern that the learners were not concentrating on their studies and were instead engrossed in social media activities such as Facebook and TikTok. This observation did not support the notion that using tablets in the classroom promotes effective teaching and learning. Consequently, while having tablets in the classroom can improve teaching, it is not a guarantee of effective teaching and learning. Learners need to know that deviating from formal learning during contact time may negatively affect their educational achievements. They need to complete class activities, and do their homework to develop their thinking and problem-solving skills. Learners should prioritise their education in the classroom and use social media sites only during their free time.

Another significant concern was that teachers did not have the skills to integrate technology into their pedagogy. Most teachers knew how to operate tablets, but lacked the skills to help learners use the device for learner engagement and critical thinking. “The Classroom of the Future” was implemented without a plan to train and equip teachers with skills to integrate technology into their teaching. One of the observed gaps was that “The Classroom of the Future” was introduced independently from TPACK, instead of interfacing the two. There was no consideration of establishing teachers’ knowledge of effectively integrating technology into teaching prior to the project’s implementation.

6.5 Discussion of the Classroom Observations

While having tablets in the classroom can improve teaching and learning, it is not a guarantee that effective teaching and learning takes place. Teachers need to put in effort in creating engaging lesson plans that encourage students to participate in conversations, debates, arguments, and critical thinking. Even with limitless access to information, learners still need to study to perform well in their school assignments.

Thus, the use of technology such as internet access in the classroom to improve instruction and learning can only be effective if it is paired with relevant or appropriate professional development for teachers or training on how to apply the technology in a way that best suits learners' needs. Moreover, students will benefit more from the use of technology in the classroom if teacher training for TPACK includes instruction on technology usage. This will help teachers better comprehend the potential applications of tablets.

6.5.1 Using the TPACK framework to understand the pedagogy of teaching with tablets

The TPACK framework was introduced to the educational research field as a theoretical framework for understanding teacher knowledge required for effective technology integration (Schmidt et al., 2009). Previous findings revealed that technology has powerful potential to innovate teaching and learning in various contexts and situations. However, teachers are bombarded with information about using technological innovation to enhance their teaching, but lack skills for integration of technology into teaching (Chaipidech et al., 2022). This study employed the TPACK framework to understand teacher knowledge on how teaching and learning should take place using technology to engage learners in classroom settings. The findings in Table 6.2 show that teachers know about TK, CK, PK and, to a lesser extent, PCK, as at the tertiary level they were taught how to teach (methods) and about using technological tools such as tablets, smartphones, computers, laptops and other devices. Therefore, many teachers have knowledge of using technological tools. The findings in Table 6.2 also show that teachers have little or no knowledge of how to effectively integrate technology and TCK, TPK, and TPACK in their day-to-day teaching. In their interviews, teachers insisted that they were not trained on how to use the tablets for teaching, and that their training was mainly focused on how to download information (videos on YouTube, study materials/e-textbooks on the system provided, etc.).

Table 6.2: Analysis of the observations using the seven components in the TPACK framework

Criteria	Example(s) of observation made to justify criterion	Example(s) from transcripts to support agreement	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
			Agree	Strongly Agree	Disagree	Strongly disagree	
Technological Knowledge (TK)	Teachers know of various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards, and software programs (Koehler, 2006; Schmidt, 2009).	Teachers enable learners to download lessons, textbooks, teachers' notes, and educational videos including games, diagrams, and other learning materials.	4	8	-	-	12
Content Knowledge (CK)	Teachers have sound subject matter knowledge that needs to be taught. Teachers understand the content to teach, and how this differs for different subject areas (Koehler, 2006; Schmidt, 2009).	Teachers are able to prepare PowerPoint lessons, to identify and guide learners on where to find information on the internet, and to correct learners' misconceptions.	3	9	-	-	12
Pedagogical Knowledge (PK)	Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).	Teachers are able to use technology to promote collaborative learning, discovery learning, or any form of theories of learning.	2	9	1	-	12
Pedagogical Content Knowledge (PCK)	Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and can blend both content and pedagogy, with the goal being to develop better teaching practices in	Teachers are able to use technology to give learners access to different types of information and learning materials.	-	8	3	-	12

	the area (Koehler, 2006; Schmidt, 2009).						
Technological Content Knowledge (TCK)	Teachers know how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).	By ensuring that a pure “Classroom of the Future” is implemented in the classroom settings.	-	3	9	-	12
Technological Pedagogical Content Knowledge (TPK)	Teachers know how various technologies can be used in teaching, and understand that using technology may change the way they teach (Koehler, 2006; Schmidt, 2009).	By using tablets as a learning platform, learners can access information in and outside the classroom via online learning, creating group chats, and other technological platforms.	-	2	10	1	12
Technological Pedagogical Content Knowledge (TPACK)	Teachers know how to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).	By ensuring that all learners focus on the task, and doing schoolwork when technology is used in classroom settings.	-	1	9	2	12
	Total: 5 Justified Criteria		9	40	32	3	84 Points of Likert Scale

Sources: Koehler (2006) and Schmidt (2009)

Based on the classroom observation evidence provided in Table 6.2, teacher development on TCK, TPC, and TPACK appears to be urgently required to equip them

with skills on how to integrate technology with pedagogy to engage learners effectively in and outside the classroom. Furthermore, it can be argued that as technology becomes integrated into the teaching and learning process, the role of a teacher in the classroom changes noticeably. Classroom teachers become facilitators who assist learners in constructing their understandings and capabilities in carrying out tasks on computer technologies to ensure that effective learning is taking place (Amarin & Grisham, 2013). In two lessons out of the 12 lessons observed, teachers displayed TPK when teaching in the classroom. Specifically, this study established that teachers lack the skills to deal with classroom management (PK) when using tablets as teaching and learning devices. In addition, teachers lack the skills to blend content and pedagogy (TPACK) to develop better teaching practices.

6.5.2 The role of the internet on learning and learner engagement

The main aim of the GDE concerning “The Classroom of the Future” is to gradually transform the traditional way of teaching and learning (using books, textbooks, pens, and pencils) into the digital classroom (online learning, e-learning, e-textbooks, and other forms of technological resources). This transformation can engage learners in learning and critical thinking (Goodrum, 2018). According to studies by Chan (2013), tablets are utilised in school settings to encourage learners to learn. This is because tablets provide a means for learners to access the internet (Semerci, 2018). Tablets can speed up learning, as learners are more inclined to pay attention in class (Ciampa, 2013: 82). Thus, the correct utilisation and accessibility of technology are crucial to the process of learning. The goal of using tablets in the classroom is to complement and improve teaching and learning, not to replace the teacher.

Teachers can use tablets to create interesting activities to engage learners in learning through group work, collaboration, and play in a classroom. Neumann et al. (2018: 6) noted that “studies have shown how teachers use tablets in early years classrooms as a tool for encouraging social interaction, communication, play, and creating” and that “tablets can be used independently as well as in small groups”. This approach can release learners’ potential to succeed in their studies. Teachers were observed using the internet to engage learners in tasks; for example, to research, design, and even engage in a possible dialogue to promote effective teaching and learning. Learners were also observed using tablets to solve problems in a classroom setting using the internet. It is clear that the internet is a resource used by both teachers and learners

to enhance learning and solve challenges and misconceptions. Therefore, the use of tablets in a classroom affords teachers and learners a platform to engage in different tasks to ensure that learning takes place.

Using tablets to access the internet not only maximises learning opportunities, but also places more emphasis on different types of learner engagement, such as social engagement, academic and intellectual engagement, substantive and cognitive engagement, behavioural and emotional engagement, and procedural engagement. For example, Learner 26 said, "I feel good to use the tablet in the classroom because it keeps the vibe going, like we watch educational videos and if you don't understand, you can watch it again in your free time so you can understand". This indicates that tablets allow for many learning options, as opposed to relying only on the textbook. Furthermore, the use of the internet for learning purposes promotes different types of learner engagement, thereby affording learners multiple choices and preferences to achieving their learning objectives, learning approaches, and learner engagement. Figure 6.2 illustrates the role of the internet in promoting various forms of learner engagement. For example, in the classroom settings learners were observed learning through music and videos, which teachers download for them after explaining the concept.

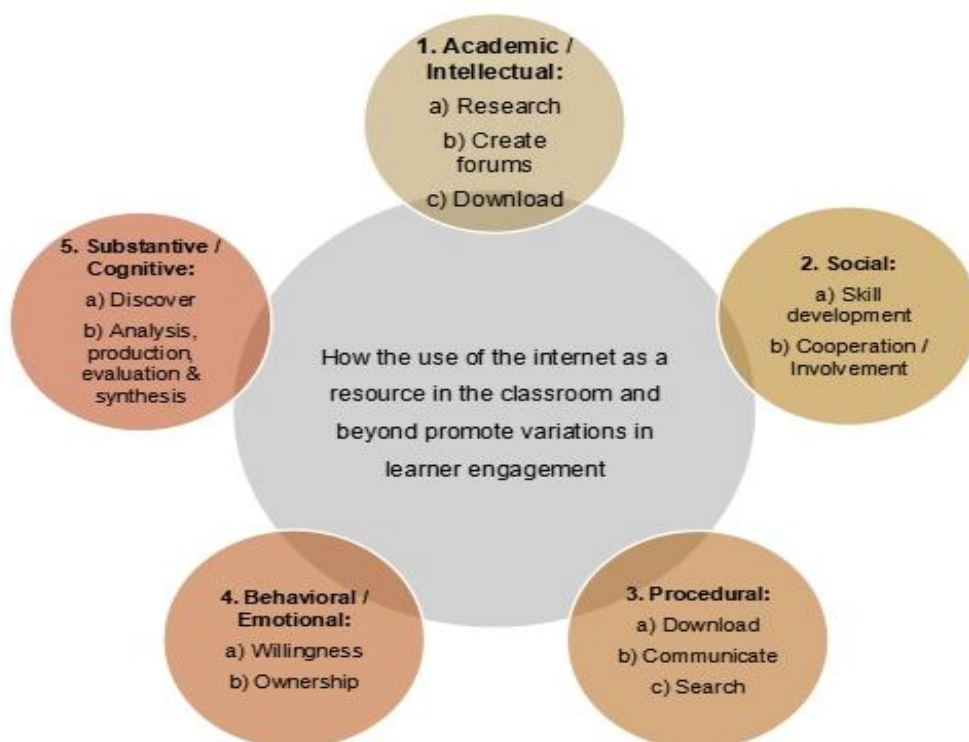


Figure 6.2: Variations in learner engagement

Technological tools also carry the potential to change learners' mindsets from fixed to growth mindsets. Using internet-based technology can motivate a learner to absorb knowledge even without the teacher's direct involvement (Maja, 2023). Learners access internet content, expand their knowledge, and accomplish learning goals using tablets, which provide resources to better understand the material being taught. However, the teacher must still plan the learning environment and the curriculum for the activities. Implementation, monitoring, and delivery of the curriculum need to be controlled and facilitated by the teacher. Cohen et al. (2003: 119) argue that while it is indisputable that the internet is a powerful tool that can promote access to information, learner engagement, and critical thinking, this is dependent on the correct use of internet-based resources.

6.5.3 Promoting academic and intellectual engagement using the internet in the classroom

The internet contains vast knowledge that can stretch a learner's cognitive skills. Learners were observed utilising tablets to browse the internet, obtain knowledge, and make connections with others worldwide. In line with this, researchers such as Ciampa (2013: 82) maintain that "tablets are used for exploration and access to information". Schnackenberg (2013: 44) advocates that "education is something that occurs wherever a learner has a question or wonders about something and possesses a device to help him or her answer a query. Mobile learning is one of the forms in which current education occurs". Tablets afford teachers and learners a mobile source of information, textbooks, interactive media, and a wealth of tools through downloadable applications frequently referred to as apps. These apps are available for activities ranging from organisation to productivity, and some allow users to apply their creativity to complete their task(s) (Ditzler et al., 2016: 183).

Important to note is that the use of tablets forces teachers to make efficient plans. While teachers can use PowerPoint presentations to project presentations on the whiteboard, for example, they can also use the internet to create engaging and interactive lesson plans. For instance, they can download educational videos from YouTube, and also access website links to models, examples, images, and diagrams that can simplify knowledge for the learners. Teacher 3 maintained that "they work well in the classroom if Wi-Fi is working because it gives them access to the internet and

learners can use it to explore information, videos, quizzes and puzzles". By so doing, the learner acquires a range of operational skills including downloading, research, and communication skills.

Therefore, the internet can create opportunities for learner engagement, as well as for improving cognitive skills, and technology operating skills. This type of learner engagement increases learner knowledge in a subject, whereby teachers may create lessons, assignments, or projects that appeal to learners' interests or stimulate their curiosity and eagerness to acquire knowledge and discover interesting things about the subject (Abbott, 2014). Learners also enjoy using search engines to find information about a subject. As noted by Learner 35, "I like to use a tablet because I do not see any reason to go to the library to look for more information as my tablet offers everything I need to learn or to know".

6.5.4 Promoting social engagement using the internet in the classroom

Teachers and learners use the internet as a tool for dialogue and to enhance learner engagement. As learners engage in their established social setting, they can impart knowledge to one another, streamline educational tasks, or work through current issues while they discuss assigned material (Grey & Macblain, 2015; Abdal-Haqq, 1998). Learner 5 maintains that, "If I have tasks to complete, projects to do, and research I use my tablet to find the necessary information on the internet. I can tell you now, that my tablet is very rich when it comes to information because it also gives me access to other examples of similar work that other people did on this topic. But keep in mind that I am holding the view that teachers must teach that information and not only show us the information and expect us to read and understand". Vygotsky believed that all aspects of a person's learning have a history based on real-life experience, much of it acquired before a child even starts formal education (Grey & Macblain, 2015; Abdal-Haqq, 1998). Vygotsky emphasised that social interaction is a major source of learning, and that both what we are taught and what we observe other people doing may be very helpful (McGregor, 2007). According to Vygotsky, knowledge is social, and what we can do is far more a matter of our upbringing and education than a result of our inborn potential. Development is predominantly a product of the child's participation in the social world (Meadows & Cashdan, 1988).

Regardless of using the internet for learning in the classroom, learning, and learner engagement are not limited to physical structures such as classrooms. Learners can chat about schoolwork even in their private spaces, such as when commuting, at home and at any hotspot areas. Hence, tablets and the internet enable learning to take place anywhere at any time.

Access to the internet also allows learners to explore different types of learner engagement. As Learner 28 stated, "The benefits of having tablets as a learning tool is that when you are studying something you can go to Google and use the dictionary and you can use a lot of things (video clips, and so forth) to enjoy what was taught because it is easier to use it". Therefore, if the instruction is well articulated by a teacher clarifying the "what" and "how" of the activity, learning and engagement can continue, formally or informally. In any form of engagement, teachers may use a variety of strategies to stimulate engagement through social interactions (Abbott, 2014). With this in mind, learning activities need to be designed in a way that encourages learners to learn from one another in a classroom setting.

6.5.5 Promoting procedural engagement using the Internet in the classroom

Procedural engagement suggests that neither teachers nor students delve deeper into the activity being participated in, nor do they have a desire to learn more about it. Put simply, they want to get through the assignment quickly so they may proceed to the next task. Nystrand and Gamoran (1991: 259) argue that "learners and teachers go through the motions of schooling; they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment". However, they may not delve deep into difficult or controversial academic work. Although most learners normally attend school, they are not always engaged in their studies (Nystrand & Gamoran, 1991). The use of tablets in the classroom stimulates learners' interests and innovative ways of learning to engage in their learning. This study found that the use of tablets in the classroom has encouraged learners to come to class every day. The results of a prior study by Zungu (2022: 22) regarding how teachers use ICT revealed that students who do not appreciate attending school may be more inclined to do so if technology is included in the learning process.

When ICT is used in the classroom, learning can become more engaging through the use of gaming, virtual field excursions, and other entertaining online programs. This

method raises student involvement, which is more difficult to attain and maintain in traditional classroom. Teacher 2 maintained that they use technology because it helps them plan their lessons better. Learners have their textbooks on their tablets and can access the lessons and PowerPoint presentations presented in class. Learners download resources they can use to learn from home. Learners confirmed that by using tablets in the classroom they are not bored anymore. In support of this, and to avoid any form of disengagement, Teacher 15 stated, "I upload interesting lessons and videos of Mathematics whereby other individuals (teachers or experts) explain the concept like fractions in different ways to the learners. Learners are benefiting [rather] than listening to me every day".

6.5.6 Using the Internet to promote behavioural and emotional engagement of peers

In this study, learners were observed interacting with teachers and their peers to access information and work on learning activities. In this way, ICT provides a conducive learning environment that enables learners to learn in a collaborative setting (Lisene & Jita, 2018). Learners are not bored in the classroom when tablets are used for educational purposes.

Researchers including Ciampa (2013: 82) and Neumann et al. (2018: 12) revealed that tablets are used to motivate learners. Learners were seen to be excited and enjoying using the tablets and the apps for learning. According to Govender (2016: 12), "modern technology is making education more accessible, potent and focused". Concerning the use of technology for educational purposes, Govender (2016: 12) noted that "numerous studies have shown that students taught correctly through technology are more engaged, learn faster, and take ownership of their education". Learner 20 said, "I enjoy using digital devices such as tablets in my class because it is faster and enables us to get access to information through the use of the internet to search for it". Govender (2016) reported that learners can step up from being passive audiences to active participants by engaging in their learning using tablets as a learning tool.

6.5.7 Promoting substantive or cognitive engagement using the Internet in the classroom

Cognitive or substantive engagement happens when the learner psychologically invests in a learning process and can solve complex problems. It is only through

cognitive engagement that learning actually happens. Cognitive engagement involves teaching, learning and evaluation.

Based on the observations in this study, teacher 33 noted that learners "work well and are probably better engaged when school Wi-Fi is working. Learners can explore some wonders of information such as videos, quizzes and puzzles on the internet". Furthermore, teacher 33 maintains, "It is exciting to have access to the internet because you can download life lessons for them (learners) and as a teacher, you talk less, and they discover knowledge on their own". Thus, learners are in line with the cognitive constructivism approach to learning, which focuses on the ability of the individual learners to interpret their own experiences of using technology to search for new knowledge (Lisene & Jita, 2018). Generally, the internet is an exceptional resource in terms of helping people to create platforms for sharing ideas, knowledge, and information. The internet therefore supports the theory of discovery learning and promotes hands-on activities, such as using manipulatives, learner tasks that challenge existing concepts and thinking processes, and encouraging examination and testing of those beliefs (Abdal-Haqq, 1998).

Furthermore, educational technology empowers teachers and learners through user-centred design. The significance of social software is that it adapts to its environment and facilitates the trend of "open content", where learners become the producers of their learning materials (Amariu & Ghisham, 2013). Previous research indicated that a learner's transition from lower-order (concrete) to higher-order (abstract) thinking can be facilitated by a variety of factors. These include the mediated roles of a teacher and peers in helping to unpack the information, the social roles of teachers and learners in using technology to share information, and the collaborative role where working together enforces teamwork and group work activities (Grey et al., 2015). Language not only elicits children's ideas but also shapes them.

This study established that learners' activities need to be unpacked and planned by the teacher to bring learners into a common understanding of the meaning of factual knowledge. As Teacher 1 revealed, when using resources such as Moodle Software, there are many baseline tests and tests in general that one can use to identify different abilities. This also means that the internet is a language that learners need to learn to know how to search for information on the internet. For example, teachers need to

create a platform for discussion after each learning experience that learners encounter, such as watching a video clip.

6.6 Data Analysis of Classroom Observations in Four Grade 8 Classes

As stated in Chapter 4, four teachers teaching Natural Sciences in Grade 8 were observed using tablets as digital devices to enhance teaching and learning. A total of 12 lessons were observed. The Natural Sciences class was chosen in this study as it aligned well with the primary aim of ascertaining how teachers blend technology with practical activities that need to be completed physically in and outside the classroom settings. The process ensured that all senses were used when teaching sciences. Learners were concurrently observed when using tablets as a learning device that enables engagement with reading material, completing classroom activities, researching, watching educational video clips, and playing educational games to promote effective learning and critical thinking.

Data was tabulated and the observation of each criterion was assessed on a four-point Likert scale. Colour codes (see Table 6.3) were used for analyses to subsequently construct an indication of how frequently each category was encountered. Dark green was used to indicate that the researcher strongly agreed with the criterion, light green indicated agreed, yellow was for disagreeing, and red for strongly disagreed. This strategy enabled analysis of the observations and assisted in the interpretation of the findings (see Table 6.3). The darkest green blocks indicated that a phenomenon was very enabling, the light green indicated an enabling phenomenon, the mostly yellow blocks indicated that a phenomenon was not enabled, and lastly, the mostly red blocks represented a phenomenon that was not taking place at all.

Table 6.3: Summary of categories

Strongly agree	Most enabling environment	
Agree	Enabling environment	
Disagree	Not an enabling environment	
Strongly disagree	Least enabling environment	

6.6.1 Focus areas of classroom observations

The classroom observations were rated according to the extent to which the participant agreed, strongly agreed, disagreed or strongly disagreed with the criteria listed in the

rubric used. The criteria were divided into six themes or categories (see Figure 6.3) that define and describe the possible types of learning that could take place when technology is used in classroom settings. Subsequently, learners would engage in learning and develop the desired critical thinking skills. The six themes or categories of teaching techniques are shown in Figure 6.3.

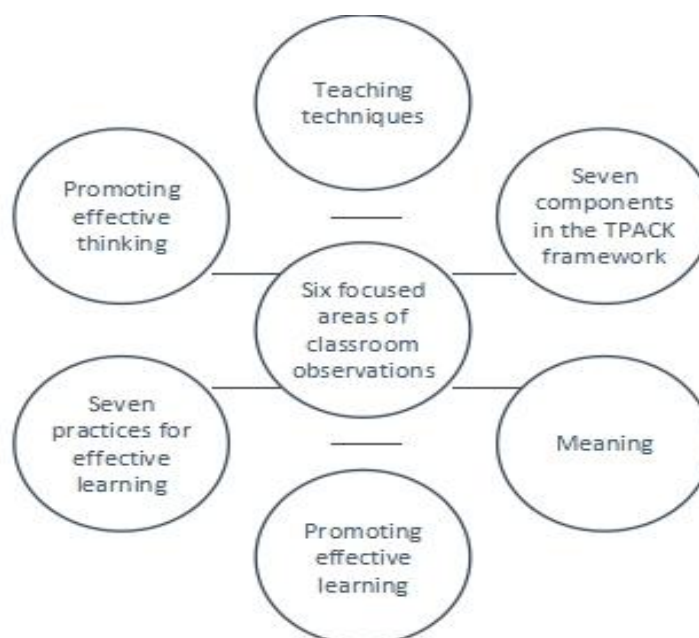


Figure 6.3: Six focus areas of the classroom observations

Data was also organised into a table and the observation of each criterion was assessed on a four-point Likert scale. Examples of observation criteria that justify the categories are included in the outcomes of the observations as illustrated in Table 6.4 and discussed in the following section.

6.6.2 Observed teaching approaches in four Grade 8 classes

Table 6.4: Analysis of teaching techniques observed in four Grade 8 classes

Item	Criteria Type of teaching	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
			Strongly Agree	Agree	Disagree	Strongly disagree	
1	Independent	Guarantee the effectiveness of a teaching and learning process.	1	9	1	1	12
		Provide little time or opportunity for learner interaction and expect learners to have mastered the	2	7	3	-	12

		information by the time of assessment.					
		Introduce concepts and their definitions.	4	6	2	-	12
		Find him/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	1	8	3	-	12
		Total: 4 Justified Criteria	8	30	9	1	48 Points of Likert Scale
2	Criteria	Example(s) of observation made to justify criterion	Strongly Agree	Agree	Disagree	Strongly disagree	Sub-Total per 12 lessons observed
	Demonstrations						
		Demonstrate how a phenomenon 'works' (e.g., how to manipulate the device or how to make meaning of information found).	-	-	11	1	12
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells).	-	5	7	-	12
		Most learners are uninvolved and still passively receive information.	1	7	4	-	12
		Learners are able to get involved and see first-hand how the phenomenon presents itself in the real world.	1	4	7	-	12
		Allow all learners to experience the phenomenon.	3	5	4	-	12
		Total: 5 Justified Criteria	5	21	33	1	60 Points of Likert Scale
	Criteria	Example(s) of observation made to justify criterion	Strongly Agree	Agree	Disagree	Strongly disagree	Sub-Total per 12 lessons observed
	Discussions						
3		A hybrid form of teaching takes place, as learners both give and receive information.	1	5	6	-	12
		Learners can explore issues of interest, opinions and ideas.	1	8	3	-	12
		Learners can listen first and understand the contributions of other learners to respond to or add to them.	-	8	3	1	12
		During discussion, learners are attentive, active, more engaged, and motivated.	-	9	3	-	12

		Total: 4 Justified Criteria	2	30	15	1	48 Points of Likert Scale
4	Criteria	Example(s) of observation made to justify criterion	Strongly Agree	Agree	Disagree	Strongly disagree	Sub-Total per 12 lessons observed
	In-class activity	All learners are involved in learning in the class, working either in groups or alone, to solve a problem or puzzle.	-	9	3	-	12
		Learners can see a phenomenon unfold and can personally manipulate and practice using the phenomenon first-hand.	2	9	1	-	12
		Learners' ability to learn is assessed by administering all six levels of Bloom's taxonomy.	-	8	4	-	12
		Total: 3 Justified Criteria	2	26	8	-	36 Points of Likert Scale
	Total						

Sources: Abdull et al. (2013), Craig et al. (1994), Davis et al. (2000), Eisenburg (1986), Jacobs (1996), Ausubel et al. (1972) and Klein (1991)

Analysis of the four teaching and learning approaches practiced when teaching the four Grade 8 classes (illustrated in Table 6.4) are discussed in the following sections. The learning approaches taught comprise independent learning, using demonstrations, learning by discussion, and learning through class activities.

Independent learning: The study found that learners are encouraged to search the internet for information independently with minimal guidance on how to use it to achieve learning outcomes and goals.

Learning by demonstrations: It was concluded that using demonstrations is an essential teaching technique. However, tablet use in teaching disrupts traditional learning processes, causing frustration for teachers and causing learners to switch platforms, raising concerns about classroom management and discipline.

Learning by discussions: Discussion is a hybrid method where teachers use face-to-face platforms to teach students, identifying their strengths and weaknesses. Teachers use traditional PowerPoint presentations for engaging learning experiences. It was

observed that the teachers did not post questions on the tablets or engage in online discussions.

Learning by activities: Using activities to learn was the most practiced teaching technique observed in the classroom. Learners were observed manipulating their tablets to search for e-textbooks, viewing video clips, downloading information, and communicating through WhatsApp.

6.7 Discussion and Deductions of the Observed Teaching Approaches in Four Grade 8 Classes

Tablets have revolutionised classroom teaching and learning by providing immersive experiences and enhancing the enthusiasm of learning processes. From the observations made (see Table 6.4), it was established that teachers made efforts to implement four different teaching strategies in the classroom, namely: 1) independent learning, 2) learning by observations, 3) learning by discussion, and 4) learning through activities.

The study revealed that teachers employ various teaching methods, including group work discussions, PowerPoint presentations, collaborative learning, and show-and-tell teaching methods. Teachers develop innovative ways to introduce concepts and definitions, encouraging learners to shift from primary school learners to high school students. For instance, students were told to use their tablets to look up definitions of words. The research found that teachers failed to teach learners effective device manipulation and information application, but partially allowed tablets for classwork, PowerPoint presentations, and uploaded lessons for accessibility. Furthermore, teachers showed learners how to access exemplary examination papers on the system through their tablets. Additionally, observations showed that teachers use tablets to enhance lesson preparation, however, this does not mean that technology can replace the teacher. The observations also confirmed that teachers require further training on how to integrate technological tools with their pedagogy to effectively enhance learning.

Most learners were observed using the tablets to engage in different learning styles, as they could source information through multiple approaches. Using tablets as learning devices in the classroom motivates the learner to focus on the task. The

multiple approaches to learning observed included working individually or in groups to solve a problem. Previous findings revealed that technology enhances in-class academic and collaborative tasks, note-taking activities, resource accessibility, communication, information sharing, and organisation (Tamim et al., 2015). Through this approach, learners were observed discussing findings with peers and discovering knowledge on various internet platforms, aiming to understand classroom concepts with or without teacher assistance.

Tablets in the classroom promote independent learning, allowing learners to discover knowledge independently. However, technology is used inadequately in classrooms, as teachers need to improve their technology skills. According to Saikat et al. (2021), teaching processes have been greatly improved due to technological advancement. Using tablets for exercises and for clarification can help students become proficient information users, but teaching remains the teacher's responsibility. Previous findings revealed that teachers could engage learners and attract their attention by using varied online tools and apps including Kahoot, Socrative, and Mentimeter (Saikat et al., 2021). Observations of PowerPoint presentations indicated that most of the lessons were teacher-centred.

Teachers believe that PowerPoint presentations are one of the best ways of delivering knowledge to learners, where learners listen passively and respond to the activity thereafter. Based on the observations discussed in this section, it can be argued that focused teaching and learning take place with PowerPoint presentations, as learners become engaged and motivated to achieve the intended goal.

The challenge in terms of keeping learners focused in the classroom was observed, as was as the lack of skills to operate the tablets, which reduces teachers' and learners' learning time. Common challenges in digital classrooms include lack of Wi-Fi, flat batteries, and technical issues. Teachers require monitoring skills and a structured management plan to discipline and control learners, over and above the other challenges in implementing tablets in classrooms.

6.8 Analysis of Observations in Four Grade 8 Classes

The focus of this study was on using technological tools such as tablets to enhance learning processes. In addition, the study focused on providing insight into the factors

that enhance learning and, consequently, to inform teachers on effective pedagogy. This chapter discusses the use of technology in alignment with teachers' pedagogy to promote effective teaching. The discussions are based on the observations and analyses made in the classrooms in this study. Table 6.5 below depicts the analysis of the observations made in the four Grade 8 classes and the four teachers who taught the grade. The discussions of these observed uses of the tablets follow thereafter.

Table 6.5: Analysis of observations in four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly disagree	
Meaning	Using new technology (tablets) meets learners' expectations (e.g., they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge sufficient for the task).	8	3	1	-	12
	Using new technology (tablets) is not meeting learners' expectations because knowledge is deficient and this distresses learners.	-	1	6	5	12
	Learners access knowledge that is highly relevant and loaded to their tablet, which simplifies and enhances their understanding.	11	-	1	-	12
	Learners show ability to discriminate one thing from another, to contrast a and b, and to differentiate.	1	10	1	-	12
	Total: 4 Justified Criteria	20	14	9	5	48 Points of Likert Scale

Sources: Abdull et al. (2013), Czerniewiez (2007) and Ausubel et al. (1972)

6.8.1 Tablets enhancing the learning environment in Grade 8

The observations shown in Table 6.5 reveal that learners' proficiency in utilising technology such as the internet effectively enhances their learning experience, as it allows them to confirm information, research, investigate, and discover knowledge with or without a teacher's help. Learners were observed using tablets and the internet to access schoolwork, expand their knowledge, and properly answer questions. They were also seen downloading video clips from other teachers. The observations reported in Table 6.5 also indicate that access to the internet can mean different things to different people and sometimes the learner's expectations are not met. In some

instances, learners were observed using the internet to select information that does not serve formal learning purposes. It can therefore be concluded that learners may be distracted by content that does not enhance their learning.

The analysis shows that most learners utilise new technology to meet their expectations, as they have a better understanding of the concept being taught as a consequence. Technology in the classroom provides learners with diverse learning opportunities, enabling them to comprehend, apply, and implement knowledge effectively. Access to the internet enables learners to correct their misconceptions and understand concepts in context. However, the effectiveness of using tablets for learning relies on a learner's capacity to distinguish between positive and negative aspects. Both teachers and learners are obligated to verify the validity of the information they obtain from the internet.

6.9 Evaluating the Effective Use of Tablets in Grade 8

Effective teaching and learning are key to enhancing a learner's learning potential. Effective learning involves active learning, exploration, learner engagement, critical thinking, discussions, and active participation in learning and individual development. This section discusses the effectiveness of tablets in teaching and learning through the analysis of seven criteria, as presented below.

Using seven criteria to evaluate the impact of tablets on enhancing effective teaching and learning: The seven criteria were identified as follows: 1) the learners' perspectives, 2) a deep approach to learning, 3) a surface approach to learning, 4) the ability of learners to teach themselves, 5) promoting learner engagement, 6) procedural engagement, and 7) substantive engagement and intellectual engagement. Table 6.6 depicts analyses of the observed responses to the seven criteria proposed for promoting effective learning in the classroom in this study.

Table 6.6: Analysis of promoting effective learning observed in four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly disagree	
The learners' perspectives	Does the teacher begin a new topic or lesson with the learners' in mind? For example, to establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?	1	10	1	-	12
	How do learners use tablets as a tool to understand the world? How do learners use tablets to go beyond an understanding of the topic to an understanding of world phenomena?	1	8	3	-	12
A deep approach to learning	The learners intend to understand ideas.	1	9	2	-	12
	They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.	1	10	1	-	12
	Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.	1	7	4	-	12
A surface approach to learning	Learners see tasks as external impositions and they have the intention to cope with these requirements.	-	10	2	-	12
	They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.	-	7	5	-	12
	They focus on unrelated parts of the task, the separate treatment of related parts, focus on what is seen as essentials, reproduce the essentials as accurately as possible, and memorise information for assessment purposes rather than for understanding.	-	8	4	-	12
The ability of learners to teach themselves	Learners demonstrate a potential to monitor, control, and regulate certain aspects of their cognition, motivation, and behaviour as well as some features of their environment.	-	4	5	3	12
	Learners were taught how to self-regulate effectively.	-	1	6	5	12
Promoting learner engagement	Learning is seen as the responsibility of everybody in society, that is, learners, parents, teachers, the Department of Education, and the community at large – i.e., a holistic approach to learning (Nystrand and Gamoran, 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	5	5	2	-	12

Procedural engagement	Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment (Nystrand and Gamoran, 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	5	7	-	-	12
	They do not grapple extensively with difficult or controversial academic work/topics (Nystrand and Gamoran, 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	2	8	1	1	12
	Although most learners regularly attend school to learn, they are less often engaged in their studies (Nystrand and Gamoran, 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	-	6	6	-	12
Substantive engagement and Intellectual engagement	There is ongoing engagement with challenging academic problems and issues (Nystrand and Gamoran, 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	1	10	1	-	12
	There is a sustained commitment to and involvement with academic work (Nystrand and Gamoran, 1991; Abbott, 2014; Stromme et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	-	-	1	-	12
	There is a contract between willing participants.	-	4	5	3	12
						204 Lessons
	Total: 4 Justified Criteria	18	125	49	12	204 Points of Likert Scale

Sources: Trigwell (2010), Biggs (1986), Eizenberg (1986) and Marton and Saljo (1984)

In the next section, the identified seven criteria used to establish how technology promotes effective learning are explained and discussed in line with the findings from this study.

Explanation of the seven criteria

1. *Assessing learner's prior knowledge*: The criterion assesses learners' prior knowledge of the subject, and how it promotes effective learning to ensure that teachers and peers can accept or dismiss this knowledge.

2. *Using the deep approach to learning:* Deep learning is a crucial strategy for enhancing effective learning, and this criterion aims to evaluate its impact on this process.
3. *Using the surface approach to learning:* Access to technological resources such as the internet helps in solving problems and promotes the surface learning approach. Therefore, this criterion was aimed at establishing how surface learning promotes effective learning.
4. *Using technology:* When learners use tablets to search for information, they teach themselves a variety of skills. Hence, the focus of this criterion was to ascertain how enhancing learning with technology promotes effective learning.
5. *Using tablets for engagement:* This criterion aimed to evaluate the effectiveness of learner engagement using tablets in a classroom setting, focusing on their interaction with teachers, peers, and content.
6. *Following the traditional teaching approach:* This criterion aimed to establish whether the traditional teaching approach to learning promotes effective learning.
7. *Through substantive and intellectual engagement:* This criterion aimed to establish the effectiveness of using tablets in enhancing learner engagement and active learning by promoting substantive and intellectual engagement through challenging activities.

6.10 Discussions of Observations Made using the Seven Criteria

1. *Learner's prior knowledge:* Connectivity enabled learners to access information through the internet, engaging in activities such as watching educational videos, displaying diagrams, and listening to information on tablets. The observations showed that learners had prior knowledge about the topic discussed and how they were going to discuss it in the classroom. Learners' prior knowledge about the topic was considered a good start in classroom discussions, with teachers using technology such as tablets to analyse and correct misconceptions.
2. *Deep approach to learning:* Technology is transforming education by providing more learning opportunities, access to study materials, and promoting deep learning methods, thereby enhancing students' learning experiences. The learners were observed engaging in discussions, arguments, and debates about their online research on the subject being studied. The learners enjoyed

doing research and used the tablet and internet to find information. Deep learning was observed when difficult or high-order questions were asked. The study found that learners utilise technology in classrooms to cater to various learning styles, including video clips, pictures, and audio. Learners utilised tablets for social media communication, including WhatsApp, Facebook, and LinkedIn, and were enthusiastic about using them for classroom study. Previous findings indicated that technology empowers learners with skills that can expand their learning opportunities to help them develop independent learning skills (Winter et al., 2021). The study revealed that learners are highly interested in understanding the concepts taught and often seek more information online about the topic.

3. *Surface approach to learning:* The study revealed that some learners did not utilise technology for learning, which resulted in a surface approach to learning. These learners would simply reproduce the information already in place (for example, downloading the textbook, to replace the hardcopy textbook).
4. *Teaching and learning with technology:* The analysis shown in Table 5.7 indicates that learners embraced the schooling requirement of using tablets to enhance learning. They understood the aim of using tablets to enhance learning both at school and at home. Learners developed tablet navigation skills for efficient study and task completion, allowing teachers and learners to teach themselves and acquire valuable skills. Previous studies indicated that users with basic level ICT skills are not likely to see mobile technologies as useful resources that can be adapted for teaching and learning (Kalogiannakis et al., 2019). Contrary findings from literature indicated there are teachers who claimed that technology increased their digital skills and enhanced a variety of teaching methodologies, which led to better educational outcome (Trust et al., 2020; Naidoo, 2017; Rahmawati et al., 2019). Moreover, virtual classrooms allow motivated learners to learn without direct teacher involvement (Maja, 2023). Technology encourages both teachers and learners to independently explore, research, and discover knowledge. However, previous research also indicates a lack of evidence on the impact of educational apps and technology on learning (Naidoo, 2017; Winter et al., 2021). The education sector therefore needs to collaborate to establish regulations that facilitate teachers in identifying beneficial content for learners (Clarke et al., 2014).

5. *Using tablets for engagement:* The school Wi-Fi provides a platform for learners to connect and communicate remotely, inspiring them to become connected, even globally. Analysis of the findings in Table 5.7 indicates that learners and teachers go through the typical schooling protocols, where they use tablets as a textbook for reading, learning and completing their day-to-day activities. Learners taught each other how to access study materials and self-regulate through various methods such as searching for images, diagrams, watching videos, and using tablets. However, mixed feelings were observed when using tablets in the classroom. Teacher 4 felt that “it’s exciting ... and distracting sometimes ...” to allow the use of tablets in the classroom, as the learners’ behaviour is unpredictable thereafter and learning is not guaranteed.

Tablets have all the necessary information for teaching and learning without looking for additional information from the library. This means that teachers and learners can use ICT to access educational resources to engage learners and promote learner engagement (Zungu, 2022). Classroom observation further revealed that despite enthusiasm about using tablets in the classroom, learners occasionally divert to non-academic information. The unintended benefits of introducing tablets in classrooms led to learners developing typing skills, sending and receiving emails, using apps such as WhatsApp, using software such as Moodle, and networking via the internet. Based on the observations made in this study, it is argued that using tablets as learning devices in the classroom can improve learner engagement.

6. *The traditional teaching approach:* During a lesson, it was observed that traditional teaching and learning took place alongside tablet-enhanced teaching and learning. Teachers and learners were observed following procedural engagement in the classroom. Learners used their tablets to search for and download textbooks, for example, to do their normal schoolwork. Most learners experienced similar challenges in using tablets and the internet (Winter et al., 2021).
7. *Learning through substantive and intellectual engagement:* The present digital world enables learners to use the internet as a key source of information. The findings shown in Table 5.7 indicate that learners show increased interest in learning when using tablets for internet access, information search, question response, and analysis to correct misconceptions. Learners are committed to

utilising tablets for accessing internet-based resources, allowing them to engage with content and engage in mind-challenging activities. With or without the help of the teacher or peers, learners can download valuable information and explore difficult topics using inquiry-based learning. Such inquiry-based learning promotes learner engagement, as learners explore and engage in problem-solving using high-level questioning; interrogating content promotes effective teaching and learning. Therefore, the inquiry approach to learning enables learners to develop substantive and intellectual engagement. It can be argued that using technology in a classroom enhances a learner's ongoing intellectual engagement with academic problems.

6.11 Summary of the Key Findings Discussed in this Chapter

This study found that good teaching depends on having good and quality teachers in the classroom and not on the availability of technology used. Thus, effective teaching and learning is about the knowledgeable, innovative, adaptable, enthusiastic, and dynamic teacher who is well-trained to implement the curriculum. It is for this reason that the training of teachers, as key players in the process of promoting effective teaching and learning and learner engagement is emphasised throughout this study. However, tablets are recognised as being important tools that enhance teaching and learning and, most importantly, learner engagement.

Chapters 5 and 6 will report and discuss the outcomes of the phenomenographic interview, the classroom observations, and the questionnaires. Outcomes of the questionnaires are integrated in Chapter 5 (the phenomenographic interview results) and Chapter 6 (the classroom observation), as some questions and answers overlap.

6.12 Implications and Significance of the Discussed Findings

The overarching aim of this study was to establish the rationale for, and the educational value of, using tablets in schools. Literature reveals that technological tools and resources such as tablets, computers, and the internet provide platforms that can enhance both teaching and learning (McDougall et al., 2018). In this chapter, the researcher used the seven criteria elaborated on earlier in the discussion section to establish how technology promotes effective learning. The findings from this study indicate that teachers and learners use tablets, in and outside the classroom to enhance both teaching and learning. This is in agreement with the work published by

Naidoo (2017), who reported that the good use of tablets for educational purposes would lead to the enhancement of learning and thus enable South African learners to improve their performance. The components of effective learning, which comprise exploring, active learning, learner engagement, discussions, and critical thinking are achievable using tablets for learning. The findings also indicate that using tablets as a teaching tool has enabled teachers to prepare interactive lessons that promote learner engagement and independent learning. In the following section, the analysis of phenomenographic data and variations in using technology to promote effective teaching and learning in classroom settings are discussed.

6.12.1 Examining the role tablets play in promoting seven effective teaching and learning practices

The varied uses of tablets to promote effective teaching and learning, which are discussed in the following sections, include the seven practices for effective teaching and learning, using internet-based technology to access rubrics for summative assessments. Table 6.7 presents analyses of the seven practices for effective learning observed when technology was used in four Grade 8 classes.

Analyses of observations on the seven practices for effective teaching and learning

These analyses are discussed as follows:

1. *Summative assessment.* Using summative assessments, teachers were observed framing realistic goals that needed to be achieved in a lesson. They explicitly informed the learners what needed to be accomplished to improve performance regarding summative assessment. Teachers stressed a greater emphasis on what needed to be studied or focused on to perform well in the summative assessment. They redirect the learners' focus on learning regardless of where the learner sourced the content. However, it was observed that not all learners were able to apply what they knew to new situations without guidance. For example, these learners still needed a teacher to clarify the intention of showing them video clips and linking them to the learning outcomes of the topic.
2. *Showing criteria and models in advance:* For the learners to understand and clarify their expectations, teachers were observed showing learners the criteria and models to achieve learning objectives in advance. For example, assessment grids for graphs were observed in the learners' books as well as

evidence of study breakdowns for tests and formal tasks. Learners were encouraged to download previous question papers and activities from Moodle Software to study and practice for examinations. For example, learners were observed watching video clips as a model example of how to conduct experiments.

3. *Pre-assessments*: Teachers were observed carrying out prior assessments in the form of formative and diagnostic assessments to ascertain the strengths and weaknesses of learners.

4. *Learners offered appropriate choices*: Teachers were observed referring and giving learners multiple choices to help them find useful information on the internet, in textbooks, and in libraries to complete tasks.

5. *Learners given early and frequent feedback*: Teachers gave learners frequent feedback in class and corrected learners' misconceptions to confirm answers. Learners were also encouraged to carry out their corrections while downloading teachers' notes to find authentic responses to questions.

6. *Learners' self-assessment and goal setting*: Depending on what the learners were busy with, they were encouraged to self-assess and set goals. For example, in the event of creating posters, learners were given a rubric to guide them on how to do it.

7. *Substantiating the old information*: It was observed that internet connectivity allows both teachers and learners to substantiate old information. The TPACK criteria indicate the observed teachers' usage of technology to enhance learning in a classroom. The need to observe teachers and learners using technology was essential to ascertain their knowledge of using technology in a classroom.

Implications and significance of the discussed findings

The findings from this study indicate that using tablets for teaching and learning promotes the discussed seven practices for effective learning. Teachers were observed informing learners about the expected and targeted standards as well as the benchmarks those learners needed to achieve on completion of the unit. Based on their prior knowledge of operating cell phones and tablets in their homes, some learners were able to easily navigate tablets. Therefore, the findings showed that learners could apply what they know to the new situation. It was also found that teachers combine traditional teaching methods with technology to achieve academic goals. For example, teachers support learners in the use of tablets as a resource for

assessment, but they are expected to write their tests on the traditional paper provided. It can therefore be concluded that the school has yet to implement "The Classroom of the Future".

Table 6.7: Analysis of seven practices for effective learning observed in four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				<u>Sub-Total</u> per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly disagree	
Use summative assessments to frame meaningful performance goal	Clarify the targeted standards and benchmarks for teachers and learners.	-	5	5	2	12
	Learners can apply what they know to the new situation.	1	8	3	-	12
	Teachers can use realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.	2	9	1	-	12
	Teachers can provide a worthy goal and help learners see a reason for their learning.	-	9	3	-	12
Show criteria and models in advance	Teachers can present evaluative criteria and models of work that illustrate different levels of quality.	5	7	-	-	12
	Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).	1	9	2	-	12
	Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?	4	5	2	1	12
Assess before teaching	A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings, and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions by using formative, diagnostic assessments to determine the strengths and weaknesses of the learners. Does the use of portable	7	2	3	-	12

	tablets enable teachers to obtain this information instantaneously?					
Offer appropriate choices	Were learners given appropriate options to demonstrate knowledge, skills, and understanding?	4	6	2	-	12
	Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.	1	11	-	-	12
	Teachers can accommodate different learning or thinking styles.	5	7	-	-	12
						132 Lessons
	Total: 4 Justified Criteria	30	78	21	3	132 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				<u>Sub-Total</u> per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly disagree	
Provide feedback early and often	Teachers can provide feedback based on formative assessments.	2	10	-	-	12
	To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.	1	11	-	-	12
	This helps learners understand both their strengths and the areas in which they can improve.	-	12	-	-	12
	Were learners given opportunities to act on feedback – to refine, revise, practice, and retry?	2	9	1	-	12
Encourage self-assessment and setting goals to achieve learning objectives	Learners were allowed to review their work against a list of explicit criteria such as a rubric.	-	5	7	-	12
	Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.	-	-	10	2	12
Allow new evidence to replace old evidence	Learners were given multiple opportunities to demonstrate their learning.	1	7	4	-	12
	Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practicing the needed skill in a given way – before embarking on their 'second chance'.	-	1	9	2	12
						96 Lessons

	Total: 4 Justified Criteria	6	55	31	4	96 Points of Likert Scale
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Sources: O' Connor and McTighe (2005)

6.12.2 Using tablets for summative assessments

Teachers were observed explaining information explicitly to the learners before and after assessments. Learners could use their tablets to access rubrics and assessment grids from their e-textbooks and the internet using tablets and the internet. Therefore, learners are usually informed about the assessment criteria and have an opportunity to expend more effort on their tasks. An example of a rubric that uses the compare and contrast, presentation, and information criteria to analyse posters is shown in Figure 6.4.

Formal Assessment: Poster		Rubric: Biotic and Abiotic Factors		Total: 12 Marks	Year: 2019
Name: _____		Grade 8: _____			
Criteria	Poor = 1 Mark	Fair = 2 Marks	Good = 3 Marks	Excellent = 4 Marks	
Compare and contrast	Learners do not compare and contrast abiotic and biotic factors within an environment, or show very minimal detail on the relationship between these factors.	Learners compare and contrast biotic and abiotic factors of an ecosystem, by listening to the relevant details.	Learners demonstrate a good level of understanding that has been briefly applied to the comparison of abiotic and biotic factors; the impact and importance of these factors are touched on with minimal details.	Learners demonstrate a high level of understanding that has been applied to the comparison of abiotic and biotic factors, acknowledging impacts on ecosystems and the importance of the factors.	
Presentation	The learner's poster is not neat and lacks creativity and any form of comprehensive flow of information.	The learner's poster is neat but minimal and lacks a comprehensive structure of information.	The learner's poster is neat and creative and demonstrates a comprehensive flow of text.	The learner's poster draws attention using visual elements and structure. The poster is neat and flows in a comprehensive direction.	
Information	Learners' information lacks relevance and is not worded.	Learners demonstrate brief knowledge of relevant information displayed on the poster, however, it lacks concise wording.	Learners demonstrate knowledge through the relevant information displayed on the poster, however, it lacks concise wording.	Learners demonstrate knowledge through concise and relevant information displayed on the poster.	

Figure 6.4: Example of a rubric to assess posters in one of the lessons observed

Rubrics were used to assess posters in one of the observed lessons, as illustrated in Figure 6.4. Learners were observed working as a group in the classroom to finish their posters; they benefited from the opportunity to learn from one another. Previous findings indicate that the creation of an environment whereby learners will be able to

work collaboratively with others enables learners to become the drivers and creators of new knowledge in the unfolding process of researching, meaning-making, information sharing, and adapting to any form of learning activities (Naicker et al., 2022). This study established that using and giving learners rubrics or assessment grids in advance enables learners to strive for submission of quality work to their teachers to achieve better rewards. Learners are also able to use rubrics to assess themselves before the teacher does.

6.12.3 Understanding the effects of using tablets on learner engagement and critical thinking

Learner participation: Tablets encourage learners to participate actively in their schoolwork. Previous studies suggested that learners would actively participate in learning if ICT were used to foster a learner-centred approach to learning, which is critical for knowledge retention (Zungu et al., 2022). Teachers were observed assessing learners' prior knowledge before teaching to ascertain their strengths and weaknesses. Teachers provided learners with formal feedback through formative assessment. The baseline assessment was utilised to gauge the students' prior knowledge of the subject, enabling teachers to devise necessary interventions for those struggling academically. Informal tests were used to prepare learners for formal exams, encouraging them to initiate debates and correct misconceptions.

Exploring multiple opportunities: Internet-based technology brings multiple choices of learning opportunities to learners. Technology in classrooms allows teachers to cater to diverse learning styles, including tablets, PowerPoint presentations, pictures, and video clips, ensuring a comprehensive learning experience for all students. The study revealed that technology in classrooms offers diverse learning options, enhancing learners' skills such as typing, information searching, and content uploading. Through technological tools such as tablets, learners are inclined to develop holistically. Teachers also occasionally upload information about conducting experiments, educational games, teachers' notes, and videos, thereby affording learners multiple ways to understand concepts taught in the classroom. However, the observations also revealed that while learners were given multiple opportunities to showcase their learning, teachers did not encourage them to take ownership of their learning, and they were not held accountable for not practicing learner-centred activities.

Evaluations: Teachers conducted assessments to identify gaps in students' prior knowledge and strengths and weaknesses, using pre-, during, and after-lecture analysis to assess learners' understanding. It was also noted that teachers utilised formative assessments to provide feedback, allowing learners to respond to questions, enabling the diagnosis of their strengths and weaknesses. Assessments featured PowerPoint corrections, teacher feedback, and learners' marking of books, allowing them to respond to and correct their answers. The teachers were also observed teaching and allowing learners to review their work against a list of explicit criteria such as the rubric (see Figure 6.4). This process enabled the learners to establish the teachers' expectations. Based on the observations made, it was established that these learners were not taught how to set personal goals or how to self-evaluate.

6.12.4 Analysis of using tablets as teaching and learning tools on effective thinking

Effective teaching and learning go hand in hand in enhancing the processes of effective thinking (Ciampa, 2013; McDougall et al., 2018). Good teaching and learning produce good critical thinkers. In this study, four ways of promoting effective thinking when technology is used in classroom settings are analysed (see Table 6.8).

1. *Obtaining varied information:* Technology allows teachers and learners to access internet-based resources, enabling them to address most questions and problems. Learners are proficient in verifying information from various perspectives and rejecting opinions by using the internet. As Teacher 11 indicated, "... if data is available or Wi-Fi, we explore different things or information on the internet ... all answers are there ... just Google". Learning through exploration using technology results in effective learning. The process subsequently leads to effective thinking, which assists learners to develop problem-solving skills.

2. *Developing deductive reasoning:* In classroom settings, deductive reasoning was observed, as learners were instructed to follow systematic descriptions when conducting research or investigations. The process involves defining the aim, purposes, methods, hypotheses, materials, apparatuses, explanations, and conclusion. Consequently, logical thinking that leads to a concrete evidence-based conclusion is developed. As learners had access to internet-based resources, they were willing to solve any problem. They enjoyed using Google to explore a topic.

3. *Developing inductive reasoning:* Inductive reasoning was observed in the classroom setting whereby learners were encouraged to use the tablets to make an informed decision on how to complete tasks. Learners can use WhatsApp to send and receive messages, for example, and remind each other of what needs to be done and how it should be done. Tablets were therefore used to enhance interactive and peer-supported learning to maximise learning opportunities for learners.

4. *Developing critical reasoning:* Critical reasoning was observed, with Teacher 24 indicating that technology is used "... to access quizzes, puzzles, videos, internet" to develop a learner's critical thinking and reasoning. Teachers come to class fully prepared, as they know that learners will use Google to verify the validity of the information, thereby strengthening understanding and fostering critical thinking about classroom content, which enhances the learning experiences. In this way, using technology creates opportunities for both teachers and learners to think critically about what is taught and learned in a classroom.

Table 6.8: Analysis of tablets promoting effective thinking observed in the four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly disagree	
Critical thinkers	Can use logic to solve problems at hand.	-	9	3	-	12
	They are open-minded and normally evaluate incoming information by determining the basis and validity of the views being expressed to make effective or informed decisions (Erickson, 2007; Hudging, 1977; Moseley et al., 2005; Gust, 1995; Van Deventer et al., 2013).	-	11	1	-	12
	They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution (Erickson, 2007; Hudging, 1977; Moseley et al., 2005; Gust, 1995; Van Deventer et al., 2013).	-	10	2	-	12
	They are concerned about "getting it right" (Erickson, 2007; Hudging, 1977; Moseley et	1	11	-	-	12

	al., 2005; Gust, 1995; Van Deventer et al., 2013).					
	They are eager to solve problems (Erickson, 2007; Hudging, 1977; Moseley et al., 2005; Gust, 1995; Van Deventer et al., 2013).	-	12	-	-	12
						60 Lessons
	Total: 4 Justified Criteria	1	58	6	-	60 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Strongly Agree	Agree	Disagree	Strongly disagree	Sub-Total per 12 lessons observed
Deductive reasoning						
	Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).	-	7	4	1	12
	Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).	2	7	3	-	12
						24 Lessons
	Total: 5 Justified Criteria	2	14	7	1	24 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Agree	Strongly Agree	Disagree	Strongly degree	Sub-Total per 12 lessons observed
Inductive reasoning						
	Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).	-	10	2	-	12
	Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).	-	9	3	-	12
						24 Lessons
	Total: 5 Justified Criteria	0	19	5	0	24 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Agree	Strongly Agree	Disagree	Strongly disagree	Sub-Total per 12 lessons observed
Critical reasoning						
	Look at all the options and various explanations for something and do not merely accept one point of view or the	3	8	1	-	12

explanation that suits you (Van Deventer et al., 2013).					
Learners have the confidence to create and safeguard a positive digital information space (Elder, 2012).	-	7	5	-	12
Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).	1	11	-	-	12
Total: 5 Justified Criteria	4	26	6	-	36 Points of Likert Scale

Implications and significance of the findings on effective thinking

The learners from 10 out of 12 lessons observed using technology in the classroom were concerned about "getting it right". Internet-based technology and resources, including tablets, are used in classrooms to test, verify, and compare knowledge, encouraging learners to evaluate information from various perspectives. As Teacher 33 indicated, it is exciting to use tablets in the classroom "... because you can download life lessons for them... as a teacher you talk less, and they discover knowledge on their own". Learners can use the internet to correct misconceptions and enhance their confidence in their thinking, answers, and arguments through live lessons. The study clarified teachers' misconceptions about internet access and demonstrated that learners utilise technology to validate answers and make informed decisions. The findings shown in Table 6.8 indicated that learners were willing to solve problems when allowed to explore new ideas on the internet. The learners' eagerness to solve problems indicates that classroom activities significantly influence their thinking ability and problem-solving skills.

Learners effectively shared information and shared internet models of work to promote deductive reasoning through social media platforms. Learner 4 indicated that "... I use the tablet for revision [to download previous papers], classwork, to read notes, and to download textbooks". Learners were observed sharing information with their classmates via their tablets, which means they were able to share their views beyond their physical space. Previous findings from literature showed that learners use tablets to assume authority and control over their learning (Naicker et al., 2022). The observations of the 12 lessons indicated that learners are enthusiastic about problem-solving using technology, following the process of finding information through internet-based platforms for their learning.

Internet-based technology enhances learners' skills to succeed in their studies, as it provides information and promotes inductive reasoning in their work. Learning is not confined to physical classrooms, but can happen anywhere at any time (Maja, 2023). Furthermore, Learner 28 indicated that the tablet is used to “obtain different skills ... that means I use it for skill development and to study”. In this study, finding answers on the internet is perceived as a skill development. Previous findings suggest that learners who have developed high-level skills in using mobile devices will be able to realise the benefits of those skills when technology is used in a classroom (Kalogiannakis et al., 2019). Experience in using technology is therefore beneficial when it comes to the adoption of tablets in schools.

The internet encourages critical thinking among learners by allowing them to critically evaluate various perspectives and opinions. As Learner 1 indicated, using tablets in a classroom setting is better “... because they are connected to the internet ... if you do not understand you search/Google and find out more about something”. Learners learn to question the knowledge and information provided before making conclusions. Using tablets enables learners to subject information they see or read to verification. Learners also debate information among themselves as they have access to various sources of information installed on their tablets. For example, when learners received an activity, they were observed exploring different options (including videos, pictures, and articles) and various explanations (life lessons taught by experts, previous test and exam papers, and Moodle Software activities) to find answers. Access to internet-based technology has therefore taught learners to check information against other possible options and not to simply accept it at face value.

6.13 Summary of the Findings of Chapters 5 and 6

Chapters 5 and 6 discussed the analysis of the phenomenographic interviews and classroom observations conducted in this study to evaluate the effects of using tablets on learner engagement and success. This study aimed to explore the potential of tablets in classrooms to enhance learner engagement and success and to investigate the government's readiness in providing support and workable policies to support and monitor the use of tablets in and outside classroom settings. The TPACK framework was used in this study to establish the connections among teachers' understanding of the content, pedagogy, and technology interface to promote effective teaching and

learning. Additionally, Martons' framework was applied in this study to examine the learning outcomes of tablets used both in and outside classrooms, focusing on the application of learned knowledge and skills. Marton's framework explains that the outcome of learning occurs when learned knowledge and skills are being applied to other situations (Cheng et al., 2016).

The study revealed that the key to unlocking the full process of learner engagement and the development of critical thinking skills is to focus on teacher development and training. The findings from the interviews with teachers, learners and officials, and the analysis of questionnaires indicated that even with the structures available at the district level to support the introduction of technology and pedagogy into classrooms, teachers are not appropriately trained on the use of tablets in a classrooms.

Based on the findings, teachers should integrate technology into pedagogy, use internet-based technology, and manage classes. Literature findings suggested that training and skills development of teachers are essential for successful integration of technology into teaching (Lie et al., 2020). The teachers' levels of technological skills and capacity to adapt both the quality and quantity of content delivery are essential for the successful use of technology in the classroom (Winter et al., 2021). The findings showed that the integration of technology into the classroom should also be supported by policies to ensure confidence in teaching. These policies should address the access of inappropriate content in class, and the restoration of classroom discipline, among other discipline-related issues. It is important to note that technology is a tool that can enhance learning but cannot replace a teacher.

The next chapter discusses the implication of using tablets in South African classrooms, focusing on the educational value of using tablets to enhance effective teaching, learner engagement and success. The chapter also provides recommendations based on the study and presents the conclusion of the study.

CHAPTER 7: IMPLICATIONS OF USING TABLETS IN SOUTH AFRICAN CLASSROOMS

7.1 Overview of Chapter 7

This study sought to ascertain the educational value of integrating tablets into South African classrooms to enhance teaching and learning, using a small sample of Gauteng schools as a prototype. Figure 7.1 present the outline of sub-topics for Chapter 7. The sub-topics for Chapter 7 are as follows: 1) overview of Chapter 7, 2) the rationale for using tablets in a classroom, 3) the educational value of using tablets in the classroom, 4) teachers' and learners' perceptions of using tablets, 5) learners' experience of using tablets for learning, 6) teachers' experience of using tablets for teaching, 7) effects of using tablets for online teaching and learning, 8) effective use of technology, 9) benefits of using tablets in the classroom, 10) challenges of using tablets in the classroom, 11) the future of using tablets in the classroom, 12) outcomes of the study, 13) limitations of the study, 14) recommendations, and conclusion.

Outline of sub-topics for Chapter 7														
Overview of Chapter 7	The rationale for using tablets in a classroom	The educational value of using tablets in the classroom	Teachers' and learners' perceptions of using tablets	Learners' experience of using tablets for learning	Teachers' experience of using tablets for teaching	Effects of using tablets for online teaching and learning	Effective use of technology	Benefits of using tablets in the classroom	Challenges of using tablets in the classroom	The future of using tablets in the classrooms	Outcomes of the study	Limitations of the study	Recommendations	Conclusion

Figure 7.1: Outline of sub-topics for Chapter 7

In 2015, the Gauteng Department of Basic Education in South Africa started a programme, commonly known as “The Paperless Classroom” that introduced the use of technology as a learning tool in classrooms, specifically in township schools. The tools included tablets, interactive boards, and laptops. The introduction of technological tools in classrooms was accelerated by challenges of the 21st century, such as the COVID-19 pandemic, which caused a strict lockdown, and continuous power outages (loadshedding). Technological tools in the classroom have inspired the development of new approaches to teaching and learning in South Africa.

During the COVID-19 pandemic, the education system implemented remote learning, where teachers focused on reforming their teaching approaches (pedagogy) and learning strategy models. The COVID-19 pandemic forced people to stay at home globally, causing schools to close and teachers to adapt pedagogical practices to reach learners in their homes (Maja et al., 2023). The education sector recognised the need to enhance technological resources in institutions and homes to assist children with schoolwork and imposed this responsibility on teachers, learners, and parents. However, the intended remote learning was compromised by the South Africa's inadequate Basic Education infrastructure that lacked technological tools in the majority of schools. Remote learning was implemented with difficulty in all learning institutions during the COVID-19 pandemic. After the pandemic ended, primary and tertiary education systems transitioned to hybrid learning, combining face-to-face and online learning. This approach necessitated the use of technology to achieve online learning. Fortunately, the Gauteng Department of Basic Education had already implemented systems to facilitate online learning through "the paperless classroom". Literature studies examining the impact of tablets on the learning and development of learners have not focused on township schools. According to Haßler et al. (2015), the current knowledge base and the inadequacy of rigorous studies make it difficult to conclude that tablets improve learner engagement and enhance learning. Therefore, this study aimed to evaluate the educational benefits and rationale behind the use of tablets in classrooms in the Gauteng province.

7.2 The Rationale for using Tablets in a Classroom

Tablets were introduced in the Gauteng province schools to enhance teaching and learning, information accessibility, learner engagement, and critical thinking, thereby implementing "The Classroom of the Future" intervention strategy.

7.2.1 Enhancing teaching and learning

The study investigated the rationale behind introducing tablets in South African schools, focusing on their role in enhancing learning by replacing traditional hard-copy textbooks with e-textbooks. It was anticipated that using tablets in and outside the classrooms would enhance students' learning and growth by fostering internet and global connectedness and enabling them to access resources outside of the classroom, especially in township schools. Tablet use in classrooms is believed to enhance cognitive skills, increase learner engagement, and promote deep learning

among learners. Cognitive skills such as visual processing, memory, attention, and problem-solving are the fundamental components of learning. Tamim et al. (2015) highlighted recent technological advancements, including tablets and smart mobile devices, as a significant tool for improving teaching and learning processes. To facilitate tablet use for learning, teachers supported learners in creating WhatsApp groups and relevant social media profiles where they could submit assignments and respond to queries.

The findings of this study revealed that learners utilised technological resources such as articles, video clips, online lessons, educational software, and educational games to enhance their understanding of complex questions. Using tablets in the classroom significantly improved cognitive skills, as learners often sought information online to substantiate what they were taught. Access to technological resources such as the internet enhanced learners' independence, making tablets uses in the classroom more relevant for the Fourth Industrial Revolution. Teaching in the Fourth Industrial Revolution necessitates a shift in teaching practices to encourage students to apply, evaluate, and create knowledge beyond mere comprehension.

7.2.2 Implementation of “The Classroom of the Future”

The implementation of “The Classroom of the Future” was anchored on the infrastructure, partnerships, and collaborations as the necessary support structures. Introducing tablets to schools as an intervention strategy to improve teaching and learning to significantly improve the results of Grade 12 learners was a collective effort where stakeholders contributed through their different roles. The DDES’ role entailed installing smartboards and tablets in all schools to streamline e-content, assessment, and e-books processes, collaborating with “#wireforlife” to provide support and training for teachers, aiming to create a learner-centred classroom. In addition, district administrators aimed to improve learner-centred learning by allowing learners to assess course materials and actively participate in the learning process using web-based tools and resources.

This study established that the textbook-free programme, known as “The Classroom of the Future”, simplifies learning by providing access to technological resources in the classroom that reduce the need for textbooks. Tablets revolutionised learning, enabling access to information anytime, anywhere, reducing the need to carry books, and

making learning more accessible. Zungu (2022) reported that Information and Communication Technology (ICT) can enhance learner collaboration and communication, offer flexibility, and help learners better understand their teachers. Based on the findings, combining e-textbooks, exercises, apps, and software such as WhatsApp and Moodle resources onto a single tablet offered many learning options and opportunities to boost student success and improve Grade 12 results. The study's findings demonstrated that student interaction on social media, the internet, WhatsApp, and other platforms enabled cooperative learning to take place.

As the introduction of technology into schools also aimed to close the digital divide that exists between individual learners and schools, the findings illustrated that teachers adapted learning styles to help learners adapt to using technology to enhance their learning, learner engagement, and cognitive development. Teachers demonstrated the shift towards multimedia classrooms to enhance the teaching and learning quality, accommodating all learners, regardless of their background or learning disabilities. Even shy learners could communicate and interact with peers and teachers using tablets. Learners reported that they used technological resources to expand learning beyond traditional classroom settings. "The Classroom of the Future" aimed to simplify learning by providing access to technology such as the internet, reducing the need for books, and enabling valuable information to be used outside the classroom. The introduction of apps, video clips, games, and software in schools helped learners overcome learning barriers. The MEC representative explained in their interview with the researcher that introducing tablets in schools consolidated learning resources into one device and enabled learners to "share information" and maximise their chances of acquiring valuable knowledge. In the next section, findings of the educational value of using tablets in a classroom are summarised.

7.3 The Educational Value of using Tablets in the Classroom

One of the primary aims of this study was to explore and establish the educational value of using tablets in the classroom. All learners in piloted schools utilised tablets to enhance learning and engagement in classroom settings. However, access to technology did not guarantee effective teaching and learning in the classroom. Instead, organised computer-based activities with proper guidelines were needed to enhance learner engagement and critical thinking skills, facilitate personalised learning, build

vital 21st-century digital skills, and benefit teachers in lesson planning. The educational value of using tablets in this regard is discussed in the following sections.

7.3.1 Accessing educational resources

This study established that using tablets in classrooms enhanced internet-based technology accessibility for teachers and learners, providing easy access to valuable information for problem solving and information discovery. Learners who utilised tablets were keen to use search engines such as Google to learn more about the subject. Tablets enhanced classroom teaching and learning by improving communication between teachers and learners, enhancing information access, and adding educational value to both teachers and learners. By replacing traditional textbooks with e-textbooks accessible on tablets, the need for heavy textbooks was eliminated. Furthermore, this study indicates that learner engagement is multidimensional when learners use tablets to seek varied information, including video clips to enhance their understanding of classroom tasks. They can also communicate about school events, both inside and outside of the classroom, using tablets. According to the results of a prior study (Maja, 2023, 99) regarding teachers' opinions of incorporating technology into rural primary schools to improve the teaching of English First Additional Language, teachers exhibited a positive attitude toward adopting technology and were open to incorporating it into instructions.

7.3.2 Enhancing learner engagement and critical thinking

In this study, teachers and learners utilised tablets in the classroom to determine the role tablets play in the progression of critical thinking, learning, and teaching. According to Vygotsky's social constructivist theory of learning, children learn best in the digital classroom through active listening and response to others' ideas, enhancing their comprehension of the subject matter (Vygotsky, 1978). The internet in classrooms offers learners an enhanced opportunity to comprehend concepts through various learning methods, including videos, diagrams, and images. The rapid integration of social networking and mobile technology offers an excellent opportunity to enhance and shape learners' innate learning capacities (Elder, 2012: 10). Taylor (1999: 89) suggests that effective classroom learning requires learners to go beyond mere recalling, recognition, and reproduction to evaluation, analysis, synthesising, producing, and applying information. Teachers and learners emphasised that when tablets are used in the classroom, learning never stops and there are other educational

benefits to bringing tablets into the classroom. According to Hu et al. (2011), learner engagement is crucial for high grades, satisfaction, and perseverance in classroom settings, indicating effective teaching and learning.

The use of technological resources can support the development of learning skills needed to motivate educators, problem solvers, critical thinkers, knowledge constructors, and wise decision-makers to surpass international benchmark standards in the future (Hurd, 2004; Willingham, 2013). Learners used tablets to understand concepts better and apply knowledge effectively. They used the internet to access their schoolwork, to increase their knowledge and to answer questions. Tablets in classrooms utilise internet-based technology to challenge misconceptions, correct teachers' and learners' errors, and enable students to validate answers, and make informed decisions. Learners worry about "getting it right" because they know that their knowledge will be tested, validated, and compared online regardless of what a teacher does or tries to teach in the classroom.

Learners' comprehension of the world was improved by the internet's assistance in identifying reliable information and dispelling myths. Therefore, tablets increased the value of education by allowing students to explore on their own. However, their effectiveness depended on the skills of both teachers and students, which were shaped by their experiences. Tablets in classrooms enabled learners to navigate and find valuable information, fulfilling constructivism's core of active participation in constructing knowledge and meaning from their experiences using technological resources (Attwel et al., 2010). Furthermore, the findings of this study align with social constructivism, which asserts that learning is a social process (Vygotsky, 1978). The study by Grey and Maclain (2015) suggests that mediated, social, and collaborative activities can bridge a child's transition from lower-order concrete thinking to higher-order abstract thinking through technology.

7.3.3 Tablets benefiting teachers in lesson planning

This study found that integrating technology into pedagogy, managing classes with technology, and developing policies and monitoring systems for confident teaching and learning could add value to education. Effective learning relies on teachers' subject knowledge and technology integration, promoting critical thinking and deep learning through digital learning and enhancing the learner experience (Fredric et al., 2013). It

was noted that teachers could adapt various teaching thought patterns in the classroom by utilising the likes of PowerPoint presentations, images, and video clips. PowerPoint presentations enhanced teacher control, student engagement, and motivation, as they help achieve the intended goal and provide a more effective learning environment. Teachers used tablets to enhance learner engagement and critical thinking, using rubrics and assessment grids; teachers explained them to learners both before and after the assessment. Therefore, learners had the opportunity to work harder on assignments and were aware of the assessment criteria. Previous studies affirmed that technology access enhances teaching and learning, but learning relies on teachers' skills in making it accessible to learners and that technology alone has limited scale in sustained impact on learning (Cohen et al., 2003: 119; Honey, Culp & Carrigg, 2000: 2). Moreover, this study suggests that providing advanced technological resources without proper training is insufficient for maximising the potential of teachers and learners. This means that teachers' technological skills and ability to adapt curriculum quality and quantity are crucial for success and learner engagement, enhancing critical thinking (Winter et al., 2021). Previous studies emphasise the significance of teachers integrating technology into their professional settings, focusing on the synergy between pedagogy and technology, and implementing it within specific content areas (Ominouwa, 2022; Zungu, 2022; Maja, 2023).

7.3.4 Facilitation of personalised learning

Learners used tablets for assignments, projects, and to research independently. Through the promotion of diverse teaching methods and the exploration of novel ideas, this study demonstrated how using technology such as tablets in the classroom could enhance personalised learning and improve effective learning. Previous research suggested that effective learning occurs when learners engage in deep learning, critical thinking, problem-solving, and other forms of learning (Hackathorn et al., 2011). This can be achieved through internet-based technology, access to multiple sources of information, and using search engines such as Google for further information (Hackathorn et al., 2011). Utilising tablets enhances learners' involvement in learning, promoting a learner-centred approach crucial for knowledge retention (Zungu, 2022). It was established that learners investigated a variety of options and explanations available online, such as images, videos, articles, expert classes, test questions, and Moodle Software activities. The study also revealed that using tablets enabled

teachers and learners to use search engines in the classroom to find immediate solutions to problems. Access to the internet encouraged learners to question and challenge information, stimulate debates, and question the validity of opinions, thereby promoting critical thinking. This study supports the notion by Elder (2012) that technological resources help learners scrutinise and examine digital technologies, enabling informed decision-making to select and analyse appropriate information for enhanced learning.

7.3.5 Building vital 21st-century digital skills

Teachers and learners utilised internet-based technologies to download e-textbooks, videos, and other teaching resources onto their tablets, thereby enhancing their study material access. Tablets were utilised by teachers and learners to connect to the internet, access resources such as emails, apps, and send or receive messages, and complete assignments, enhancing interpersonal intelligence in connected classrooms, regardless of location. The study shows how teachers and learners worked together to generate quick presentations and do online research by utilising PowerPoint presentations and the internet. Learners could successfully apply existing knowledge to new situations, easily navigating tablets and using them as resources to achieve academic goals. It was also found that teachers blended teaching styles, using tablets for learning and worksheets for assessment, indicating that schools had not fully implemented these methods in “The Classroom of the Future”. Albiladi and Alshareef (2018) suggested that tablets enhance creativity, innovation, and collaboration in learning by providing opportunities for interaction and interaction among learners. This study confirmed that learners utilise tablets for social interaction, enhancing learning and engagement processes through the analysis and discussion of facts and problem-solving techniques. The use of ICT assists to create such an atmosphere by allowing learners to study in groups where they may communicate with one another and subject matter experts to ensure that instruction is given effectively (Lisene & Jita, 2018).

7.4 Teachers’ and Learners’ Perceptions of using Tablets

This study established that teachers and learners perceived the use of tablets as a vehicle that stimulates learners’ interest in participating in schoolwork. Learners showed intrinsic interest in tasks when tablets are used in classrooms, seeking information online to understand the concepts taught. Furthermore, it was established that learners are enthusiastic about using their tablets for classroom learning,

demonstrating a surface approach to learning, as they effectively manage schooling requirements and use the system at home and school. However, the study further revealed that learners sometimes tended to focus on unrelated tasks rather than comprehending the intended learning or tablet activities. Previous research suggested that abstract thought is preceded by imagined play. Children learn about objects through play, form relationships, imitate adult behaviour, and take on imaginary roles (Grey & Associates, 2015). The findings support the theory of Vygotsky (1987: 28), which described play as "self-education". The study indicates that the integration of tablets in schools necessitates a shift in mindset among stakeholders, particularly teachers, from the traditional classroom setting. For example, to enhance classroom learning, it may be beneficial to download and upload games that are more educational for learners to access and play on a system.

7.5 Learners' Experiences of using Tablets for Learning

This study revealed that learners perceive teachers as influential in facilitating their understanding of technology-based education, requiring them to demonstrate, elaborate, and unpack concepts and experience multiple ways to understand the subject matter. Tablets were utilised by learners to connect with the internet, access resources such as emails, apps, and send or receive messages, and complete assignments. Previous research shows that mobile learning enhances vocabulary recognition, with mobile learners showing greater vocabulary gains than paper-based lessons, as they increase motivation to read and learn (Albiladi et al., 2018; Maja et al., 2023). Albiladi et al. (2018) established that mobile phone mini-lessons enhance learners' self-efficacy, facilitate teaching, and provide an engaging learning experience.

Learners experienced flexibility and adaptability, embracing tablets to foster a culture of multitasking and a dynamic-oriented personality. Using technology, learners had the freedom to work independently, answer private questions, and share their thoughts with teachers, who then marked their work without disclosing their identity. Tablets in classrooms enhanced learners' reading and problem-solving skills by promoting direct communication, creativity, and inclusion through digital note-taking, task management, and easy access to digital notes. Furthermore, this study found that incorporating tablets in schools could boost engagement among shy learners by enabling them to work alone in their own time and space (Fredric & McDowell, 2013).

In addition, tablets helped learners save time by providing them with all the information they required, eliminating the need to search for resources in the library, and allowing them to focus and work effectively. Learners also reported that using tablets in schools reduces storage space requirements and removes the need for many textbooks. They found tablets to be lightweight and convenient, offering access to multiple textbooks on one device, compared to the weight and bulk of traditional textbooks. Clark et al. (2014) reported that the portable nature of tablets and internet accessibility make them ideal for “anytime, anywhere, learning” outside the classroom.

Through real-time chat and multi-user virtual worlds, internet-based technology enhances synchronous communication between teachers and learners by facilitating information exchange without the need for in-person interaction. McKenzie (2005) found the hallmark of synchronous communication to take place in "real-time" when technological resources are used for teaching and learning. For instance, a message posted is read immediately after publication, and one can quickly view the responses from other people (McKenzie, 2005). Literature findings also reported that ICTs offer a collaborative learning environment for learners, allowing interaction with subject experts and amongst themselves (Lisene & Jita, 2018; Voogt et al., 2017). Moreover, Clarke et al. (2014) found that mobile devices facilitate easy access to emails and messaging applications, improving communication, regular feedback, and continuous assessment between teachers and learners. However, learners reported that teachers often failed to explain tasks when using technology, leading to some learners who may struggle with the task.

The study further revealed that learners were enthusiastic and motivated when their tablets were brought to the lesson. Maja et al. (2023) revealed that utilising technology in teaching enhances learners' positive thinking, motivation, and teacher effectiveness, thereby maximising their learning potential. Learners used chat or WhatsApp groups to solve problems, enhancing educational goals. Tablets provide immediate access to knowledge, promoting continuous and unrestricted learning. Using tablets enhances learners' independent working skills and collaboration, while other mobile technology enhances learning through collaboration (Habler et al., 2015).

7.6 Teachers' Experience of using Tablets for Teaching

Teachers expressed that learners use tablets for information searches due to free Wi-Fi access, but are at risk of wrongdoing due to unregulated internet access. Teachers also utilised classroom technology to engage learners by pairing them or grouping them for discussions and feedback, utilising available resources to enhance learning experiences. According to Maja et al. (2023), teachers reported that technology improved their usage of a range of approaches and improved their digital abilities, which improved learner-learning outcomes (Maja et al., 2023: 97). Teachers encouraged learners to use technological resources such as emails and WhatsApp for classroom discussions, allowing shy learners to ask questions without fear of classmates. Teachers have the difficult task of ensuring that the technology used in the classroom matches or complements their teaching strategies. The complex nature of integrating ICT into the classroom may be explained by TPACK, which also enables teachers to evaluate their work for professional growth and to increase the educational benefit of utilising technology in the classroom (Kafyulilo et al., 2015). The phenomenographic approach and TPACK framework are interconnected, with phenomenographic research projects focusing on learning experiences and understanding variations among specific groups of learners (Stamouli et al., 2007: 182). Zungu (2022) found that teachers often lack proper training to address technical issues that may arise when using technology in classrooms. The study found that teachers still hold personal beliefs about traditional learning methods, despite receiving training on downloading educational materials. Traditional teaching methods are teacher-centred and classroom-bounded, limiting the active role of learners and the benefits of peer or independent learning (Rikala, 2013). Teachers and learners fear that technological resources in classrooms threaten their rights to teach and learn effectively due to the associated disruptions. According to this study, using technology in the classroom validates the idea that learners also learn through play.

7.7 Effects of using Tablets for Online Teaching and Learning

South Africa's COVID-19 pandemic and lockdown accelerated the implementation of the virtual classroom, where communication, teaching and learning took place online. Online classrooms improved learning accessibility by allowing learners to learn without teacher involvement, but their content utilisation skills were limited due to limited technology knowledge. However, their view of technology as being novel inspired them

and kept them motivated. Tamim et al. (2015) established that while learners are digital natives, their intuitive use of technology in education is not always seamless.

Despite being instructed on how to download and store resources, learners did not receive sufficient training on how to use tablets for learning purposes, even though effective use of the technology was crucial to achieving the learning objectives. Mishra and Koehler's TPACK framework of teacher knowledge offers a lens through which teachers' knowledge can be analysed and compared (Mishra & Koehler, 2006). TPACK was accepted as a theoretical framework for this research, as it entails a distinct type of knowledge that differs to that of a technological expert and a teacher's general pedagogical knowledge. Knowledge aids teachers in effectively teaching a specific topic using specific technology, ensuring effective learning and teaching (Bibi et al., 2017).

Tablets in and outside classrooms enhanced a teaching and learning culture by allowing learners to form social groups and discuss schoolwork, assignments, and other school-related matters. Social engagement advocates state that teachers are expected to use a variety of strategies to stimulate engagement through social interactions (Abbott, 2014). Learners' development or learning is not an individual process, but the result of an aggregate of social relations embodied within the individual's development (Grey & Macblain, 2015). Researchers suggest that classroom learning activities should foster collaborative learning, such as pairing or grouping learners for collaborative projects, to enhance teaching and learning effectiveness (Abbott, 2014).

7.8 Effective use of Technology

This study found that technological resources are not being utilised effectively for peer learning, collaborative learning, small group work, or classroom interaction, thereby limiting learning opportunities. Elder (2012) reported that effective use of technology for learning involved selecting digital tools that enrich but do not dominate the learning environment and significantly improve the learning process (Elder, 2012). The "show and do" technique used by teachers, which consists of projecting videos and tasks without providing context, is ineffective in stimulating students' critical thinking or supporting good classroom instruction. The study links search engines in classrooms to Hudgins' assertion that critical thinking relies on "get it right" and "present positions

honestly and clearly", highlighting the potential of tablets in schools for information retrieval, and the use of search engines in the classroom to find meaningful educational material (Hudgins, 1977: 179).

The integration of mobile technology in the classrooms transformed the role of teachers and influenced the acquisition of knowledge. However, according to Guri-Rosenblit (2005), machines cannot replace the "magic" that occurs when bright, creative young people live and learn together in classroom settings. Technology can enhance classroom interaction or substitute teaching and learning activities, but it should not replace them, as per Guri-Rosenblit's 2005 research.

7.9. Benefits of using Tablets in the Classroom

The adoption of mobile devices as teaching and learning tools was influenced by the teachers' and learners' perception of their usefulness and ease of use in achieving learning objectives. This study highlighted the benefits of using tablets for learning and problem-solving, especially when utilising programs such as Google Classroom, Zoom, and Microsoft Teams (Stecula & Wolniak, 2022). Because of their vast storage capacity, tablets can replace textbooks and help students study and do their schoolwork at home.

7.9.1 Easy access to information

According to this research, teachers and learners used tablets and the internet to improve communication, accessibility to learning, and foster connections in and outside of the classroom. Digital technology offers numerous opportunities for sustainable learning connections and transcending various boundaries, although the quality of these connections varies. Because of their large storage capacity, tablets can replace textbooks, help students study, and do their schoolwork at home. The ability of teachers to upload learning material saves time and reduces the need for learners to note down everything in their books. These web-based tools and resources enabled learners to evaluate course materials and participate in the learning process. The introduction of tablets has transformed learners' lives by eliminating the need for heavy school bags. Personal devices and portable mobile technology enabled learners to connect to schoolwork and everyday life, transcend immediate environmental limitations, and facilitate learning regardless of space and time (Clarke et al., 2014). Furthermore, the study found that teachers appreciate the use of technology in

enhancing teaching and learning, as learners use tablets for problem solving and information gathering. Tamin et al. (2015) reported that the benefits of technology in teaching and learning emphasise the need to utilise ICT for educational advancement.

7.9.2 Promoting independent learning and learner engagement

The study established that learners appreciate the use of tablets in the classroom, as they learn independently by discovering new knowledge on the internet. This study also found that educators and learners use websites such as YouTube to acquire resources to improve learning in the classroom. Some learners were often ahead of their teachers as they were able to access new information through the internet. Learners were able to independently discover knowledge, engage in discovery learning activities, and communicate with others via the internet. The study supports the report by Hackathorn et al. (2011) that active learning techniques promote deeper thinking and better information encoding, storage, and retrieval. The Educational Broadcasting Corporation (2009) suggests that learners learn in a well-structured classroom environment and through using tablets to discover knowledge independently. This study confirms other research that suggests learners can create their learning environments with mobile devices, leading to more self-directed learning (Clarke et al., 2014). According to the study's findings, the utilisation of technology improved teaching and learning by enabling users to learn at their convenience. Tablets improve social interaction, teaching choices, and learning experiences by enabling learners to engage anytime, anywhere, and share information. However, they do not replace teachers, especially in Natural Sciences where learners still need to use their senses for practical tasks or experiments. These findings are supported by Albiladi et al. (2018), who claimed that tablets and other mobile technologies are perfect for promoting learner autonomy and universal learning in informal contexts, as long as their technological affordances are well understood and made evident to learners.

7.9.3 Skills development

Through repeated usage, learners used tablets to facilitate skills transfer among themselves, including typing, PowerPoint presentations, organisation, design, emailing, chatting, information searching, and administrative verbal and writing skills. Albiladi et al. (2018) reported that using technology such as tablets helps learners develop personal skills including grammar, vocabulary, listening, speaking, reading, and writing. Learners learning from one another by sharing experiences in operating

devices and information retrieval could enhance life skills applicable in the workplace. Proficiency with mobile devices allows students to take full advantage of their educational benefits, highlighting the importance of technology experience for future adaptation. Kalogiannakis et al. (2019) emphasise the importance of mobile technology knowledge for learners to advance and prepare for the workplace, while highlighting its benefits in teaching. Teachers can successfully communicate required norms and benchmarks to students using tablets, which are easier to use than textbooks. Albiladi et al. also posited that learners can study and use English outside of the classroom with the use of mobile phones, which allows them to learn English anywhere and at any time (2018: 284).

7.9.4 Lesson preparation

The study established that teachers used multimedia components in their lesson preparations and presentations, including video clips, diagrams, pictures, live online lessons, and music, to enhance their teaching strategies. Teachers were required to be fully prepared and aware that learners may conduct advanced research before the classroom topic is taught. It was established that teachers uploaded educational material to their laptops, which they used to enhance their teaching. Attwell et al. (2010) reported that knowledgeable teachers could effectively integrate technology into their lessons, promoting effective learner engagement and benefiting learners. Additionally, Elder (2012) suggests that teachers should create frequent learning opportunities that foster quality knowledge contributions, allowing learners to create and maintain a positive digital information space. This study's findings also indicate that the learners benefited from "The Classroom of the Future" as they utilised tablets for various purposes, including private calls, emails, texting, and downloading study materials, enhancing learning processes.

7.10 Challenges of using Tablets in the Classroom

Teaching is complicated as it is based on various types of knowledge, including understanding the educational programme and the learner's way of thinking and learning in classroom settings. Learning occurs when learners are motivated to change and successfully integrate technology into learning through practical application. The next sections report on the challenges teachers and learners faced when using tablets for educational purposes.

7.10.1 Lack of technological skills

The findings of this study suggest that aligning technological resources with pedagogy would enhance learner engagement when learning. However, inadequate teacher development in the integration of technology into their teaching hindered effective learning experiences. Moreover, tablets require enhanced reading skills which not all students possess, potentially hindering the development of improved learning and critical thinking abilities. The power of using technology in some lessons relied on the premise that technology is integrated into existing pedagogy to enhance teaching (Kalogiannakis et al., 2019). The study revealed that teachers and learners were not adequately trained in using technology for teaching and learning; they mostly focused on downloading e-textbooks or using tablet programs. Researchers including Erickson (2007), Albilandi (2018), Zungu (2022) and Habler (2015) discovered that teachers lack the necessary training to effectively use technology resources to enhance their teaching and encourage learners to think critically, creatively, conceptually, and at a higher level. Similarly, this study discovered that the sole training provided to teachers and learners was on how to use tablets to access e-textbooks or learning programs and how to use the system to download YouTube videos or other internet content. However, it is difficult to determine how technology such as tablets affects teaching when utilised in classrooms, as there are insufficient measures to evaluate the effects of such technology on teaching and learning (Attwell et al., 2010).

7.10.2 Lack of discipline in the classroom

Keeping students' behaviour under control and organising the classroom are two challenges that teachers and learners encounter when utilising tablets for instruction. Therefore, the technological pedagogical content knowledge (TPACK) model was used, as it has processes in place that teachers can use to integrate ICT into their teaching. The model was also used to examine and identify the opportunities and challenges related to ICT implementation (Lye, 2013) in classroom settings. The study revealed that teachers lack a system to monitor learners' engagement using tablets in their classrooms. The teacher's constant monitoring in the classroom was insufficient to ensure that learners were searching only for educational content on the internet. They lacked tangible tools to hold learners accountable for deviations from formal learning, loss or damage to tablets, or actions that discourage engagement in tasks. They lacked ICT software to control learners' access to non-educational internet activities, despite constant classroom monitoring. Zungu (2022) indicated that teachers

lack effective technical problem-solving training, ICT skills, motivation, confidence, and appropriate teacher training regarding technology. However, the spirit of teaching and learning was enhanced when educators and learners used technology tools as intended. It was established that tablets are used for communication, retrieval, searching, multimedia, and email checking by teachers and learners, but not for serious formal learning. Therefore, many learners were not using time optimally for formal learning, and they were not fully engaged in learning activities when using tablets in the classroom. Learning activities should be organised, monitored, and designed to encourage learners to discover knowledge and acquire skills including investigation, design, analysis, self-discipline, and other academic and life skills using technology effectively.

7.10.3 Lack of engagement in practical laboratory activities

This study established that learners in Natural Science classes lost the inherent aspect of solving problems on their own while watching someone demonstrate practical laboratory activities using a video. Lie et al. (2020) reported that teachers and learners lack resources for online learning, internet access, and necessary gadgets, resulting in a lack of competence and technology experimentation (Voogt et al., 2017). Thus, using technology did not allow learners to engage their senses when doing practical activities. This indicates that when using technology to mimic lessons in the classroom, educators and learners often overlook the importance of using the senses, particularly in practical work. A study on teachers' ICT integration revealed that in situations where direct interaction with complex science phenomena is not possible due to location, danger, or complexity, simulation software is often utilised (Zungu, 2022).

7.11 The future of using Tablets Classrooms in South African Schools

Even after the end of the apartheid era, the South African educational system, which segregated people based on gender, race, class, and geographical location, did not enable equitable distribution of technology resources. In several regions of the nation, schools and learners in particular lack internet connections. Only a few teachers and learners are able to access the internet via the costly data approach, especially in rural areas. Therefore, until all schools have the same technology and teachers are properly educated to incorporate this into teaching and pedagogy, hybrid or blended learning may be a more acceptable approach to implementing “The Classroom of the Future”. Blended learning aligns well with the goal of integrating technology into the classroom,

which is to improve the current teaching and learning approaches, and the learning environment. The goal should be to use technology to enhance and improve students' achievement in the classroom, not to replace traditional techniques or transform the teacher into a facilitator. In line with this, it may be impractical for the GDE to envision "The Classroom of the Future" given that learners still complete their formal assignments, such as their Grade 12 standardised test without using tablets.

Additionally, COVID-19 and the stringent lockdowns brought on by the pandemic further fuelled the desire for online education, which requires internet-based technology to access online classes and activities, and for home education. The government needs to consider and keep an eye on rules pertaining to equality and the just distribution of resources to guarantee that the usage of tablets is adopted throughout South African schools. These regulations should be followed when distributing tablets and resources such as the internet. It is also necessary to implement specific criteria for measuring learner performance and tablet use in classrooms. However, it should be noted that this study did not aim to hold policymakers accountable for creating guidelines or formulating policies for integrating tablets in teaching and learning. Nevertheless, the study's findings may have an impact on policy and the future of using tablets in South African schools, as the education systems in South Africa continuously change and evolve.

7.12 Outcomes of the Study

Internet-based technology has revolutionised teaching and learning, enhancing student engagement and making learning more accessible both in and outside the classroom. The world is experiencing a significant technological revolution, primarily centred on ICT, such as smartphones, tablets, computers, and television, to improve teaching and learning. Using tablets in the classroom enhances student engagement, communication, and information exchange, including both the spoken and nonverbal learning experiences by encouraging asynchronous contact, unstructured communication, and email projects. Previous studies have shown that mobile learning, which mostly involves smartphones and tablets, has grown in popularity as an alternative means of distributing educational content both inside and outside of traditional classroom settings (Kalogiannakis et al., 2019). According to this study, tablets enhance discovery learning, which supports a learner-centred strategy to promote self-directedness and accountability. This technology-based approach

motivated learners to actively apply what they had learned to create new knowledge. Tablets are essential for giving all users equal access to information. Govender (2016) argues that modern technology is improving the effectiveness, focus, and accessibility of education. Tablets in the classroom enhanced learner engagement, however, teachers and learners needed to understand their goals and search strategies to minimise time wastage and maximise the efficient use of technology for learning objectives. Appleton (2008: 369) suggests that learner engagement is influenced by learner effort, which can vary depending on the nature of the curriculum and instructional activities. Hu et al. (2011: 7) suggest that learner engagement is based on the relationship between learners' activity, involvement, and efforts in their learning tasks and their academic achievement.

While teachers used PowerPoint to provide learners feedback on their work, learners actively participated in class activities on their tablets. By integrating technology into formal activities and classwork, teachers allowed learners to understand what was expected of them and work toward meeting those goals. Teachers assisted learners in developing independent critical research skills, which are crucial for the 21st century, transforming the traditional direct transfer between teachers and learners. Therefore, it can be argued that tablets in the classroom are inspiring tools, motivating learners to complete tasks while fostering a positive learning environment. Previous findings suggested that laptop and tablet use might increase technology integration in learning while improving learners' attitudes toward technology and increasing their engagement and motivation (Tamim, 2015).

Furthermore, the findings showed that learners had more learning options to improve their learning using technology in the classroom, as it allowed them to access and download a wide range of topic-related information. Learners used tablets to solve classroom problems, leading to increased learner engagement, faster learning, and increased ownership of their education. In the process of downloading information, learners acquired various skills such as typing and uploading, which enabled their holistic development. Tablets were utilised in and outside the classroom for accessing multimedia resources including software, programs, video clips, emails, apps, and educational games, aiding learners in exploring new topics and encouraging innovative thinking about the world's meaning; they added education value and improved interaction among teachers and learners. Educational technology in classrooms can

enhance learner motivation, attitude, and interest by allowing them to understand problems, maximise experience, and share their work with peers.

The study revealed that technology has transformed teachers' role as facilitators of learning, promoting various forms of learner engagement through the unlimited use of the internet. The internet is exceptional in facilitating the sharing of ideas, knowledge, and information, offering diverse learning methods, including music and videos, and allowing learners to achieve their learning objectives. However, this study also posits that teachers should not become facilitators, as good teachers are dynamic, lifelong learners, adaptable, flexible, innovative, and adaptable in various situations. Therefore, more investment should be allocated towards teacher development, including using technological resources or teaching with technology (Mishra & Koehler, 2006). The study revealed that tablets have significant educational value and can positively affect learning. It is worth noting, however, that all learners are impacted by power outages, as they disrupt their studies, especially at night. Previous research revealed that because ICT classes primarily rely on power, the quality of ICT teaching and learning tends to be negatively affected by power interruptions, as experienced by South Africa over the past years (Umar & Gubareva, 2021; Lie et al., 2020).

The study underscores the significance of pedagogy in technology integration, emphasising the need for professional support for effective teaching and learning environments. Quality teaching necessitates teachers' expertise and guidance in making learning accessible, including utilising technology to enhance learning and enabling learners to effectively utilise internet-based resources. Tamim et al. (2015) emphasised the necessity of professional development for teachers to effectively integrate technology into teaching and create meaningful learning environments. The study revealed that technological resources save time, money, and space by providing online materials, eliminating the need for local libraries and multiple textbooks, thereby enhancing teaching and learning.

7.13 Limitations of the Study

The study revealed that learners are not taught to set personal goals, use strategies, and improve their tasks. Despite multiple opportunities to demonstrate understanding, teachers often fail to provide corrective action or engage in peer coaching. Schools adapted to using technology in classrooms to reach all learners, but many teachers

were unprepared to handle the demands of this new approach. It was evident that the lack of basic knowledge about using web-based resources such as YouTube for lesson downloads and connectivity hampered the use of tablets for educational purposes. Teachers request learners to download lessons online using unfamiliar technologies and unreliable internet access and resources in schools and homes. The consistent power outages made it difficult for teachers and learners to use tablets, as they required power to be charged. This study's limitation also lies in its data collection, which was hampered by the COVID-19 pandemic, lockdown, and severe loadshedding in South Africa, where access to the participants was not possible. Moreover, South Africa's educational sector is unprepared due to a lack of alternative power sources including generators, solar panels, and wind energy, prompting teachers to return to traditional methods during power interruptions.

7.14 Recommendations

Based on the findings of this study, the following recommendations are made.

- For “The Classroom of the Future” to be a success, teachers need to be equipped with skills that can enhance the integration of pedagogy and technology in classroom settings to improve learner engagement and enhance teaching and learning when using tablets.
- The government should support teacher preparation programmes for TPACK integration and issue policy directives on tablet usage to enhance student accessibility in classroom settings.
- Learners should be educated on using tablets for educational purposes, understanding that they can be used for socialisation, entertainment, teaching, and learning, and respecting contact and study time.
- Policy directives are required to support educators and learners in addressing concerns related to behaviour, interruption, and other difficulties that have a detrimental effect on learning. Research indicates that successful teaching and learning occur in the classroom when the usage of technical resources is aligned with teacher development (Mishra & Koehler, 2006).

7.15 Conclusion

In response to the main research question, which aimed to establish the effectiveness of using tablets in classrooms, the study established that teachers are committed to

improving teaching and learning. This study utilised interviews, classroom observations, and questionnaires to establish that tablets enhance learner engagement in classrooms. However, the study's findings did not meet the expectations of observing teachers and learners using technological resources for deep learning, critical thinking, and learner engagement, as most learners were passive in classrooms. Teachers primarily used PowerPoint presentations for teaching and learning, and therefore promoted a teacher-centred approach. It was concluded that utilising technological resources in schools improves teaching and learning, which aligns with universal theories such as constructivism, social constructivism, and behaviourism. Furthermore, the findings support the notion that tablets offer teachers and learners opportunities to acquire new knowledge and information, even though their educational value could not be quantified. The significance of incorporating tablets in classrooms for internet-based knowledge access is emphasised, while highlighting the internet's potential to enhance effective teaching and learning.

Teachers believed that using tablets in classrooms improves lesson preparation and presentation, allowing for better multi-information presentation and stimulation of learners' interest, compared to traditional methods and textbooks. Technology, particularly internet access, has significantly transformed classrooms, enabling teachers to transition from traditional learning methods to digital methods (Taylor, 2002). Govender (2016: 12) asserts that modern technology is enhancing the accessibility, potency, and focus of education. Teachers reported improved management of learning materials and Wi-Fi access for students, despite not yet being paperless, allowing for more efficient assignments and feedback. Participation in academic and co-curricular activities, active attendance, assignments, and homework completion are essential for achieving positive academic outcomes and enhancing learning (Hu et al., 2011: 72). The internet allowed teachers and learners to quickly verify and confirm factual knowledge, ensuring that classroom discussions were open for scrutiny and confirmation. Technology is more effective and efficient in providing instant answers when learners use internet-based technology to enhance learning (Chen, 2013).

The findings support the idea that mobile technology promotes self-directed learning by allowing learners to design their learning contexts, thereby boosting interest and curiosity. Teachers and learners experienced tablets as valuable educational resources

for enhancing learner engagement. With PowerPoint presentations and conveniently available notes for learners to review and learn from, tablets have completely changed the way that content is imparted and learned by learners. Agyei (2014) highlights ICT as a crucial tool for knowledge society participation, offering educational institutions opportunities to utilise technology to enhance teaching and learning processes. Consequently, the study links tablet use to government initiatives for improved educational standards.

The MEC representative who was interviewed noted that young teachers were more adept at utilising new technology than experienced teachers, who sometimes took longer to adapt. Gauteng teachers appreciated GDE's decision to prioritise tablet use in classrooms for enhanced teaching and learning, recognising the potential of technology in "The Classroom of the Future". However, the DDES highlighted the diversity of teachers' attitudes towards the introduction of tablets, with some resisting change, indicating both conservative and innovative ICT champions. According to Rees (1996), technology enhances learning by enabling faster, independent, and collaborative learning in classroom settings.

It is important to note here that power outages (loadshedding) pose a threat to the country's education system, affecting teaching and learning, especially for home and school learners. Teachers have to adjust to power outages, which forces schools to think about blended learning or implement energy-saving options including solar panels or generators if they are to succeed in incorporating technology into their teaching approaches. Although loadshedding has been suspended for the past few months as at the time of writing (2024), there is a strong possibility that it will return in future, hence the need to prepare and plan accordingly.

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ATTACHMENTS

Protocol 1: Teachers' Interviews (NS Teachers)

1.1 How long have you been teaching?

Teacher 1: ... 23 years, since 1996

Teacher 2: ... 2007, 12 years

Teacher 3: ... 5 years, 2014

Teacher 4: ... 2002, 16 years

1.2 Could you give me some background on why you decided to become a teacher and when and why you came to this school?

Teacher 1: ... because learning is not going to stop ... I joined this school this year ...

Teacher 2: ... brings you close to the learner / children ... you can influence the world ... that's what I am intending to do all the time ...

Teacher 3: ... you grow as a person every day ... you explore interesting and challenging situations ...

Teacher 4: ... I find myself to this profession ... and I enjoy ...

1.3 When were tablets introduced into this school?

Teacher 1: ... 2013

Teacher 2: ... 2013

Teacher 3: ... 2013

Teacher 4: ... 2013

1.4 How were you informed about the new policy of using tablets for teaching?

Teacher 1: ... never ... I never enquire about policies ...

Teacher 2: ... no, no ... there is no policy at all about using tablets for teaching ...

Teacher 3: ... no policy ...

Teacher 4: ... I will find out ... as I speak there is no policy ...

1.5 How did you feel about using tablets for teaching in your school?

Teacher 1: ... it is so good to use them in class ... there are so many things to show learners – videos, pictures and so forth ... learners have a better understanding and can save time in the delivering of the lesson ... are exposed to more explanation if using these devices ...

Teacher 2: ... so special, because other schools in the province do not have this privilege ... to have internet access in the classroom, projectors for PowerPoint presentation and so forth.

Teacher 3: ... very honoured because I can design my lesson the way I wish ...

Teacher 4: ... it's exciting ... and distracting sometimes ...

1.6 When did you first start teaching with tablets?

Teacher 1: ... see 1.1

Teacher 2: ... see 1.1

Teacher 3: ... see 1.1

Teacher 4: ... see 1.1

1.7 What kind of support in using tablets for teaching did you receive from the Department of Basic Education? Did you get training? What kind? Technical only? Who provided the support?

Teacher 1: ... we had one workshop thus far ... taught us how to download videos in YouTube, how to enter de-merit on the system, entering model. That workshop was organised by the Gauteng Department of Education. They gave me an opportunity to observe experienced teacher unpacking the lesson using technology...

Teacher 2: ... an IT specialist / teacher in the school used to assist and in-service us.

Teacher 3: ... there are in-service training happening in the school ...

Teacher 4: ... there are ongoing in-house training ...

1.8 Did you receive any training in the pedagogical aspects of using tablets in the classroom?

Teacher 1: ... no ...

Teacher 2: ... no ...

Teacher 3: ... not at all

Teacher 4: ... never ...

1.9 Please comment on the training. Was it useful?

Teacher 1: ... yes ... because I know now how to download ...

Teacher 2: ... very helpful ... they trained us how to use the programme ...

Teacher 3: ... yes ... indeed ... to know how to implement the programme ...

Teacher 4: ... yes ... it is vital to enrich ourselves with knowledge and skills.

1.10 Please describe your experience of using tablets.

Teacher 1: ... I am still learning and interested to know more ... learners too are eager to learn ...

Teacher 2: ... this system is new and challenging ... sometimes we come across with technical problems ... battery runs out ... it freezes ... all the time you must have plan "B"

Teacher 3: ... Learners benefit because they are exposed in all forms of learning, I show them pictures, PowerPoint presentation, videos, etc.

Teacher 4: ... contain all electronic textbooks, pictures are clearer, etc.

1.11 Do the tablets add value to your teaching? If so, in what ways?

Teacher 1: ... yes ... internet make miracles or wonders ... they explore more knowledge ...

Teacher 2: ... yes ... textbooks are in order or good condition as they are in the system and always available

Teacher 3: ... yes ... they change the life of the learner ... they do not carry many textbooks.

Teacher 4: ... yes ... they can Google at school or in the classroom ...

1.12 How do you use the tablets in the classroom?

Teacher 1: ... they can put earphones if they are using it so that they cannot disrupt each other. They can do activities in the devices ...

Teacher 2: ... they open the relevant page and complete their work ...

Teacher 3: ... they download ...

Teacher 4: ... they put on their earphones if the sound is not clear and / or open the textbooks.

1.13 Are tablets used to find answers to questions?

Teacher 1: ... yes ... some are fast ... can use Wi-Fi to find trading material ... test papers and memos are also loaded in the system ...

Teacher 2: ... all previous test and exam papers and memos are uploaded in the system for revision purposes.

Teacher 3: ... learners have access to free Wi-Fi to Google or search for information.

Teacher 4: ... previous papers and memos are in the system ...

1.14 The introduction of tablets was explained in terms of the "paperless classroom". In what respect have they replaced paper? Or do you feel that they have replaced paper?

Teacher 1: ... the school is not 100% 'paperless' ... they are no longer carrying textbooks but still writing using pen, pencil and paper ... learners are encouraged to use Moodle Software ... to complete activities available there ...

Teacher 2: ... we are not 100% 'paperless' ... we are blending ...

Teacher 3: ... it is not paperless only ... we are still using paper for activities and formal tasks.

Teacher 4: ... no ... we are not 100% paperless ... we are still using traditional way of learning ... paper and pen / pencil.

1.15 Please describe a typical lesson and explain how it differs from the same lesson that you would have given without the use of this technology.

Teacher 1: ... technology save a lot of time ... I do not feel I can go back to the old way of teaching ... now whatever I am teaching ... I organise video or websites to reinforce what I said in class ... previously it wasn't like that ... I used to give the examples only.

Teacher 2: ... not all my lessons are in PowerPoint including pictures and diagrams, so all types of learners / learning styles are accommodated than before ...

Teacher 3: ... nothing much has changed ... I still explain ... the difference is that at times they search for information on the internet.

Teacher 4: ... internet changes everything ... I encourage them to Google and use YouTube.

1.16 How has your teaching changed since the introduction of tablets?

Teacher 1: ... I display videos and diagrams in the PowerPoint.

Teacher 2: ... now I incorporate internet ...

Teacher 3: ... come to class fully prepared, some learners Google in advance and raise questions ...

Teacher 4: ... as I said (see 1.15) I use YouTube to enhance learning ...

1.17 Do you think that tablets help learners learn better? If so, how? If not, what do you think would help learners to learn better?

Teacher 1: ... yes ... especially in NS experiments ... you may not do it practically you may show them a video, that's it.

Teacher 2: ... yes ... through the help of internet ... learners can search for information ...

Teacher 3: ... yes, I've got all video clips of NS experiments to share with my learners ... so they benefit.

Teacher 4: ... yes ... we can Google ...

1.18 Have you noticed any difference in the learners' engagement in the classroom when they use tablets?

Teacher 1: ... learning a lot and ask them to comment after watching videos and start discussing ...

Teacher 2: ... by using videos to stimulate interest ... then we interact ...

Teacher 3: ... they start asking questions after watching experiments for example and that where I start engaging them or correcting misconceptions.

Teacher 4: ... I give them activities to do, and I am expecting them to answer and I also give them feedback.

1.19 Do you think that using tablets has encouraged the learners to think critically? How?

Teacher 1: ... I am not sure ...

Teacher 2: ... yes, by knowing that they must search for factual knowledge on the internet and other textbooks before accepting answers ...

Teacher 3: ... no ... it is the type of questions asked that may help a learner to think critically ...

Teacher 4: ... no ...

1. 20 How have the learners responded to using tablets?

Teacher 1: ...positive ... and trying to explore how to find the textbooks ...

Teacher 2: ... excited ... the majority learn quickly how to find the textbooks ...

Teacher 3: ... excited ... they wanted to access free Wi-Fi.

Teacher 4: ... excited ... because they are not going to carry textbooks

1.21 Do you think that using tablets has increased learners' enthusiasm for learning?
Please elaborate.

Teacher 1: ... yes ... they are eager to find out more about something ... they Google ...

Teacher 2: ... yes ... it is something new to them, they are overexcited about it ...

Teacher 3: ... yes ... they have no choice; their textbooks are in the tablet ...

Teacher 4: ... yes ... it is quicker and easy to use ...

1.22 Has using tablets assisted you to identify different abilities in the class?

Teacher 1: ... yes ... in Moodle Software there are many baseline tests and tests in general that one can use to identify different abilities.

Teacher 2: ... no ...

Teacher 3: ... no...

Teacher 4: ... yes ...

1.23 Do you allow each learner to work at their own pace or does the whole class do activities together?

Teacher 1: ... I allow them to work in their own pace ... others are doing work in advance / at home, they do not wait for the teacher; others need teachers' assistance ...

Teacher 2: ... yes ... their pace is not the same ...

Teacher 3: ... yes ... they are always in different pages ...

Teacher 4: ... yes ...

1.24 Can you mention features that have made a difference to teaching and learning using tablets?

Teacher 1: ... internet use made the difference ...

Teacher 2: ... internet ...

Teacher 3: ... videos, music, etc.

Teacher 4: ... PowerPoints, videos, pictures, etc.

Protocol 2: Questionnaire for Learners' Interviews

2.1 You are in a class that uses tablets in the classroom. Tell me a little about your experience of tablets. Do you enjoy using them? Why? Why not?

Learner 1: ... yes, because it makes life much easier. I can download videos. I learnt better if I see videos than listening to him or teachers.

Learner 2: ... started hard to use it. I never experience it. It was my first time ever to touch it. However, I enjoy using it.

Learner 3: ... the main advantage of using the tablet is that we are not taking notes, we only download what we need.

Learner 4: ... okay ... but there are advantages and disadvantages – you do not waste papers and carry big school bags. In contrast, learners are using tablets for other purposes like playing games, etc.

Learner 5: ... I do not enjoy using it because it is harder to study, you always search for page.

Learner 6: ... tablets are faster and more efficient than textbook because you can access more resources in the tablet.

Learner 7: ... yes ... these are years of technological advancements ... then it is cool to start now to use tablets or to catch up with time and technology.

Learner 8: ... I enjoy using tablet because it's a new way of learning or accessing textbook.

Learner 9: ... learning is learning no matter whether you are using technology or real hard copy of the textbook.

Learner 10: ... I feel motivated because I like to touch devices all the time ...

Learner 11: ... you can explore more information if there is internet, you are not relying on one source of information ...

Learner 12: ... it's fun. You can show or send information to your friends ...

Learner 13: ... I enjoy it because is a new environment and a new way of learning ...

Learner 14: ... it's difficult when yours is broken ... you are always behind with work.

Learner 15: ... it kills my eyes ... I do not want to read on devices ...

Learner 16: ... everyone got excited when using tablets ... we feel special because many schools do not have this privilege ... we are unique.

Learner 17: ... it's a privilege to have all textbooks in one device ... can you think if you carry all those textbooks to school and back home ... tablets made life easier ...

Learner 18: ... I got excited when I get access to free Wi-Fi ... I enjoy Googling ... I like it.

Learner 19: ... I enjoy using tablets in the classroom ... it is evident that we are moving with time ... now is time for technology in class ... let's enjoy it.

Learner 20: ... I feel excited ... now we can download lot of things that we can use to learn.

Learner 21: ... I am happy ... and patient to see if my marks will improve at the end of the year as I am using a well-resourced tablet.

Learner 22: ... I am scared ... because it's like we are playing in class ... we do not take teachers seriously ... we might fail at the end of the year.

Learner 23: ... it is a challenge ... more especial when the battery is low ... at times it freezes ... it brings frustration in many ways.

Learner 24: ... I like tablets ... all you need is in the tablet ... just download and relax.

Learner 25: ... I like to use tablet ... I google whatever I want ... I have a tool to play with ...

Learner 26: ... it makes learning easier as we use internet as well.

Learner 27: ... for the fact that I no not write notes in class, I download teacher's notes in the tablets ... I like it ... it makes life easier.

Learner 28: ... it is a magic on fingertip ... you google and find answers ...

Learner 29: ... tablets are helping hand if there is Wi-Fi ... you search and solve any problem.

Learner 30: ... you work smart with tablets ... you download what you need.

Learner 31: ... I enjoy using tablet ... it is a new thing to my life ...

Learner 32: ... for the fact that you do not need to carry lot of textbooks to school ... I appreciate the introduction of tablets in this school ...

Learner 33: ... you can download everything you need, study materials and videos.

Learner 34: ... it is exciting to use tablets in class than textbooks, you get access to videos and more diagrams are available to illustrate what was taught.

Learner 35: ... I like to use a tablet ... as a result, I do not see any reason to go to library to look for more information ... tablets offer everything.

Learner 36: ... access to internet is amazing ... you search more until you find a correct answer.

Learner 37: ... all textbooks I need are in one device ... this is super ...

Learner 39: ... I am happy to use tablet in the classroom because you download information you need.

Learner 40: ... I like to use technology in the classroom ... it is more efficient than anything else.

2.2 When did you first start using tablets at school?

Learner 1: ... this year

Learner 2: ... this year.

Learner 3: ... this year.
Learner 4: ... this year.
Learner 5: ... this year.
Learner 6: ... this year.
Learner 7: ... this year.
Learner 8: ... this year.
Learner 9: ... this year.
Learner 10: ... this year.
Learner 11: ... this year.
Learner 12: ... this year.
Learner 13: ... this year.
Learner 14: ... this year.
Learner 15: ... this year.
Learner 16: ... this year.
Learner 17: ... this year.
Learner 18: ... this year.
Learner 19: ... this year.
Learner 20: ... this year.
Learner 21: ... this year.
Learner 22: ... this year.
Learner 23: ... this year.
Learner 24: ... this year.
Learner 25: ... this year.
Learner 26: ... this year.
Learner 27: ... this year.
Learner 28: ... this year.
Learner 29: ... this year.
Learner 30: ... this year.
Learner 31: ... this year.
Learner 32: ... this year.
Learner 33: ... this year.
Learner 34: ... this year.
Learner 35: ... this year.
Learner 36: ... this year.

Learner 37: ... this year.

Learner 39: ... this year.

Learner 40: ... this year.

2.3 Had you ever used one (or seen one) before?

Learner 1: ... yes, my parents have tablets.

Learner 2: ... I saw it before. Some of my friends have tablets.

Learner 3: ... yes.

Learner 4: ... yes.

Learner 5: ... yes.

Learner 6: ... yes.

Learner 7: ... yes.

Learner 8: ... yes.

Learner 9: ... yes. Members of my family has tablets.

Learner 10: ... yes.

Learner 11: ... yes.

Learner 12: ... yes.

Learner 13: ... yes.

Learner 14: ... yes.

Learner 15: ... yes.

Learner 16: ... yes.

Learner 17: ... yes.

Learner 18: ... yes.

Learner 19: ... yes.

Learner 20: ... yes.

Learner 21: ... yes.

Learner 22: ... yes.

Learner 23: ... yes.

Learner 24: ... yes.

Learner 25: ... yes.

Learner 26: ... yes.

Learner 27: ... yes.

Learner 28: ... yes.

Learner 29: ... yes.

Learner 30: ... yes.

Learner 31: ... yes.

Learner 32: ... yes.

Learner 33: ... yes.

Learner 34: ... yes.

Learner 35: ... yes.

Learner 36: ... yes.

Learner 37: ... yes.

Learner 39: ... yes.

Learner 40: ... yes.

2.4 Do you have/use any other technology (like a computer) at home?

Learner 1: ... yes, I use laptop at home.

Learner 2: ... yes ... I have a smartphone and my parents too also allow me to use their laptop.

Learner 3: ... yes ... I have a laptop at home.

Learner 4: ... laptop.

Learner 5: ... laptop.

Learner 6: ... yes.

Learner 7: ... yes.

Learner 8: ... yes ... for games.

Learner 9: ... yes.

Learner 10: ... yes.

Learner 11: ... yes.

Learner 12: ... yes.

Learner 13: ... yes.

Learner 14: ... yes.

Learner 15: ... yes.

Learner 16: ... yes.

Learner 17: ... yes.

Learner 18: ... yes.

Learner 19: ... yes.

Learner 20: ... yes.

Learner 21: ... yes.

Learner 22: ... yes.

Learner 23: ... yes.

Learner 24: ... yes.

Learner 25: ... yes.

Learner 26: ... yes.

Learner 27: ... yes.

Learner 28: ... yes.

Learner 29: ... yes.

Learner 30: ... yes.

Learner 31: ... yes.

Learner 32: ... yes.

Learner 33: ... yes.

Learner 34: ... yes.

Learner 35: ... yes.

Learner 36: ... yes.

Learner 37: ... yes.

Learner 39: ... yes.

Learner 40: ... yes.

2.5 Do you have a smartphone? If so: have you ever used it for learning?

Learner 1: ... yes, I do have one ... and I use it to access reading materials or to research.

Learner 2: ... yes.

Learner 3: ... yes.

Learner 4: ... yes ... but I am not using it for learning. I use tablet for learning.

Learner 5: ... yes ... I use it for communication purposes (not for learning).

Learner 6: ... yes, I do ... I use it for my personal things...

Learner 7: ... yes ... but I am not using it for schoolwork.

Learner 8: ... yes... to receive calls.

Learner 9: ... yes ... not for learning.

Learner 10: ... yes ... for other reasons.

Learner 11: ... not at all.

Learner 12: ... yes ... to Google and download songs, if I have data.

Learner 13: ... no.

Learner 14: ... yes ... I am not using it for learning.

Learner 15: ... yes. But not for learning ...

Learner 16: ... yes ... I am not using it for learning.

Learner 17: ... no.

Learner 18: ... yes ... it is for personal use ...

Learner 19: ... yes ... to download music for personal usage ...

Learner 20: ... yes ... I am not using it for learning.

Learner 21: ... yes ... but I am not using it for my studies as I do with tablets.

Learner 22: ... yes ... I am not using it for learning.

Learner 23: ... yes ... now I know it's possible to use it for my studies ... at primary school, we were not allowed to bring cellphones at school, at all ...

Learner 24: ... no

Learner 25: ... yes ... I am not using it for learning.

Learner 26: ... no.

Learner 27: ... no.

Learner 28: ... yes ... but I do not have money to buy data... in order to search what I want on the internet.

Learner 29: ... yes ... not for learning ...

Learner 30: ... no.

Learner 31: ... yes ... however, I am not using it for learning.

Learner 32: ... yes ... I am using it for personal things ...

Learner 33: ... yes ... but not for learning ...

Learner 34: ... no ...

Learner 35: ... no ...

Learner 36: ... yes ... I am not using it for learning.

Learner 37: ... yes ... but not for learning.

Learner 39: ... yes ... not for learning.

Learner 40: ... yes ... I am using it as a personal tool ...

2.6 What do you use your tablet for – anywhere – in the classroom and outside?

Learner 1: ... to download videos, to research and to access reading / learning materials.

Learner 2: ... I use tablets for learning purposes to access notes and school materials not for games. I also use it to access internet.

Learner 3: ... I used tablets for a) downloading textbooks and notes, b) study, c) projects, d) school code of conduct, and e) for exam scope.

Learner 4: ... I use tablet for revision (to download previous papers), classwork, read notes, and to download textbooks.

Learner 5: ... for doing lessons, reading, and textbooks.

Learner 6: ... to download notes or any study materials.

Learner 7: ... I use it to access my textbooks and teachers notes or activities.

Learner 8: ... to receive calls and to do homework, projects, textbooks and notes.

Learner 9: ... to study and to complete schoolwork.

Learner 10: ... I use it to do what teachers asked me to do ...

Learner 11: ... to read textbooks.

Learner 12: ... to download what I need ...

Learner 13: ... I use it to download and save important information.

Learner 14: ... to download information ...

Learner 15: ... to study ...

Learner 16: ... I use tablet to download school study materials.

Learner 17: ... to study and to WhatsApp ...

Learner 18: ... it has study materials, so we always download it ...

Learner 19: ... to chat with friends, to play games and to study.

Learner 20: ... I use it to make important calls ... and to download ...

Learner 21: ... I play games, music, videos, download textbooks and notes.

Learner 22: ... I download ...

Learner 23: ... I take photos, download, and send information to friends.

Learner 24: ... I use it to access study materials.

Learner 25: ... to download all the information that I will use to study.

Learner 26: ... eventually I use it for study purposes, I download at school ... using school Wi-Fi and study at home.

Learner 27: ... to study ...

Learner 28: ... to obtain different skills to navigate a tablet ... that means I use it for skill development and to study of which is part of the skill.

Learner 29: ... to study ...

Learner 30: ... to do schoolwork ...

Learner 31: ... I use it for my studies or to download study materials.

Learner 32: ... I download textbooks and teacher's PowerPoint presentation.

Learner 33: ... to study because all my textbooks are loaded into it.

Learner 34: ... calling my friend, parents and to study.

Learner 35: ... when necessary, I call people I need to talk to, and to access my textbooks.

Learner 36: ... study purposes...

Learner 37: ... to obtain my study materials...

Learner 39: ... to communicate with friends and parents as well as to study.

Learner 40: ... to study...

2.7 Does using tablets in the classroom help your learning? If so, how?

Learner 1: ... yes, because it is much easier to understand something when you see it in the video.

Learner 2: ... yes ... but then it takes a long time to download. We have no plan "B" because all our study materials, e.g., notes, etc. are found in our tablets.

Learner 3: ... yes ... we access textbooks.

Learner 4: ... it is easier to access information you need rather than carrying a lot of heavy textbooks.

Learner 5: ... yes ... for searching online / getting access to internet.

Learner 6: ... without it we do not have textbooks to learn.

Learner 7: ... no ... are very distracting the process of learning.

Learner 8: ... yes ... because at times we do have access to the internet to search more information.

Learner 9: ... yes ... we download what we need for our studies.

Learner 10: ... no ... you do not understand thing automatically. You still need to study.

Learner 11: ... no ... sometimes teacher restrict us or not allowing us to use tablets in class and use their PowerPoint notes to teach.

Learner 12: ... yes ... there are so many valuable information on the internet.

Learner 13: ... no ... it takes time to download ...

Learner 14: ... yes ... by using different study materials there ...

Learner 15: ... yes ... because we find diagrams, pictures and videos in our tablets as we have internet access most of the time.

Learner 16: ... yes ... because we search for information and meaning of words. This means we also use it as a dictionary ...

Learner 17: ... yes ... I use it for reading.

Learner 18: ... yes ... I use it for studying purpose and to play games if I done with my schoolwork.

Learner 19: ... no ... teacher's guidance will help us to learn ... s/he will tell us what to do and how to do it.

Learner 20: ... yes ... I open a textbook and study / read.

Learner 21: ... yes ... we watch videos and download.

Learner 22: ... yes ... at times we can use internet for research purposes.

Learner 23: ... no ... tablets give us access to information ... as a person you must study ...

Learner 24: ... no ... teachers make us understand, by so doing we are learning ... tablets make us ignore them and their instruction ... in fact being disrespectfully in classroom ... playing games ... and watching adult videos.

Learner 25: ... yes ... we see different diagrams and access different explanation of something.

Learner 26: ... yes ... for reading materials.

Learner 27: ... yes ... to download study materials.

Learner 28: ... yes ... to use textbooks, activities and teachers' notes for study reasons.

Learner 29: ... no.

Learner 30: ... yes ... I use it for reading ...

Learner 31: ... yes ... it is easy to find reading material ...

Learner 32: ... you play video clip if there is something that you didn't understand in class.

Learner 33: ... no ... I would like to hear teacher's voice so that I will remember ...

Learner 34: ... no.

Learner 35: ... no ... we are doing things that we do not supposed to do with tablets ... like playing music and games.

Learner 36: ... yes ... we watch school related videos if we have data.

Learner 37: ... yes ... tablets are replacing textbooks then I am using it to study instead of a textbook.

Learner 39: ... yes ... I access textbooks there ...

Learner 40: ... yes ... if I have data, I use it to download videos and textbooks.

2.8 Do you think you could learn better if you used books instead of tablets and relied on the teacher? Why do you say that?

Learner 1: ... tablets are better because are connected to the internet ... if you do not understand you search / Google and find out more about something ...

Learner 2: ... not sure ... but tablets are more efficient than books and easy to use.

Learner 3: ... no ... because not everyone will focus when a teacher is teaching in the classroom.

Learner 4: ... yes ... you will focus to your schoolwork only and with tablet it is easy to switch to other things ... like after noticing that you have received WhatsApp message, you stop studying and attend the message ...

Learner 5: ... tablets can overheat and are very expensive to replace. Textbooks can last longer / durable as compared to tablets.

Learner 6: ... it is the same ... both (tablets and textbooks) has activities, project and assignment to do.

Learner 7: ... some learners are overexcited and uncontrollable if they can use tablets in class. They do not give teachers a chance to explain what needs to be done.

Learner 8: ... it is better to use both books and tablets because we can download notes, pictures and that save time ...

Learner 9: ... it takes time to be on the same page when using tablets than the textbooks. Some learners are faster than others to find a page.

Learner 10: ... tablets take time to download ...

Learner 11: ... books are better ... we need to learn how to write ... in Grade 12 we will be expected to write faster to complete our exams on time ... we are not going to use tablets there for exam purposes. These tablets are promoting laziness to all learners.

Learner 12: ... you spend once with books and textbooks unlike tablets, you need data, it can be broken easily, can freeze and this means that instead of focusing to your studies, you are focusing on technical problems of the tablet.

Learner 13: ... you can Google with your tablet to confirm certain knowledge ...

Learner 14: ... I want to be hands-on with technology ... I like it ... it is effective and efficient than books.

Learner 15: ... books are better, are durable ...

Learner 16: ... books are more reliable ... tablets can freeze, and its battery can be low ...

Learner 17: ... it is better to rely on the teacher because s/he can give you tips on how to study / understand something ... tablet is full of information ... you must select by yourself what is important.

Learner 18: ... books are better ... the more you re-write the better you understand ...

Learner 19: ... all answers in the world are on the internet ... so you need tablet and Wi-Fi to get answers ... Google.

Learner 20: ... it's better to combine everything that is useful: tablets / technology, books and teachers to learn better.

Learner 21: ... I am used to books and teachers as a source of information ... I am trying to understand now the role of tablet to my education ...

Learner 22: ... books are better ... with tablets ... learners are getting worse with discipline.

Learner 23: ... I always want to try something new in life ... I think tablets are intending to change the way we used to learn ... to the better ... they have better solutions like internet and multiple textbooks online.

Learner 24: ... tablets are better if you use them for the correct reasons ...

Learner 25: ... tablet is better than books because they are connected to the internet ...

Learner 26: ... let's use everything available if we will get better marks ...

Learner 27: ... books are better because teachers can mark and tell you if your answer is correct or wrong rather than telling you to search and answer or download corrections. To download is a process ... rather say the answer then ... I am learning from my mistakes.

Learner 28: ... tablets because technology is here ... we want to be part of it.

Learner 29: ... both tablet and books because you must take your own note on the separate book from the tablets in order to learn.

Learner 30: ... tablets you learn in a fun way ... no stress ... just look for diagrams, stories, textbooks and so on as long as you have data.

Learner 31: ... teachers must explain the content to us so that we will understand ...

Learner 32: ... we don't carry textbooks ... all we use at school is in the tablet. Therefore, tablets are more efficient in terms of time.

Learner 33: ... in our tablets we access internet to search and learn more about something.

Learner 34: ... textbooks are better because to take out your textbook is less distracting as compared to tablets.

Learner 35: ... is enjoyable to use tablet because you also get an opportunity to play games and music if you have data.

Learner 36: ... tablets are better because you access more pictures, diagram and information than a textbook.

Learner 37: ... you can highlight important points in the textbook, and you can't in the tablet. For that reason, textbooks are better.

Learner 39: ... both are the same if you as a person you will be able to take your own notes to study.

Learner 40: ... tablets because you can use internet to get more and more information.

2.9 How does your teacher use the tablets in class to teach you? What do you use them for?

Learner 1: ... explain through pictures and even show us video clips.

Learner 2: ... teachers are using laptop not tablet. They explain notes using PowerPoint slides and videos.

Learner 3: ... by displaying PowerPoint presentation on the smartboard and explain notes, projects, etc.

Learner 4: ... all his/her presentations, videos, diagrams / pictures are in his / her laptop (not tablet). He/she just display it in the smartboard and explain.

Learner 5: ... open a certain page in a textbook and download a lesson.

Learner 6: ... all my teachers use laptops, however, all the programmes we have in our tablets are also install in their laptop. They show us videos, notes, music, study materials and other form of multimedia.

Learner 7: ... they rely on PowerPoint presentation, and they also download textbooks as well.

Learner 8: ... they use their laptop to teach.

Learner 9: ... they use laptops to show us slides to discuss or explain.

Learner 10: ... they connect their laptop to the smartboard and show us notes, pictures / diagrams for discussion.

Learner 11: ... they show us notes and activities ... they also encourage us to download all learning materials.

Learner 12: ... they download textbooks and start teaching.

Learner 13: ... they create notes and upload it to the system so that we can access them.

Learner 14: ... they teach using PowerPoint ...

Learner 15: ... they tell us what to download in our tablets and use that information to do our homework.

Learner 16: ... teachers use their laptop and tell us to download lesson of the day, homework, and / or activities.

Learner 17: ... they display PowerPoint and teach ... we will find their notes in our tablets.

Learner 18: ... they prepare PowerPoint presentation for teaching purposes ...

Learner 19: ... all the information or teaching materials are in their laptop, they just display it in the whiteboard and teach.

Learner 20: ... in fact they are not using tablets ... they are using their laptops ... they also download information, activities, videos and diagrams as we do ...

Learner 21: ... they download textbooks and activities as well ...

Learner 22: ... we all use tablets to access textbooks, videos and notes ...

Learner 23: ... teachers and learners use tablets to study and to prepare for the next lesson.

Learner 24: ... is the tool that is used in the school to access textbooks and all other study materials...

Learner 25: ... to download ...

Learner 26: ... for PowerPoint presentation.

Learner 27: ... they use their laptop to present their lessons ... all study material is in their laptop.

Learner 28: ... they download videos, textbooks and for the PowerPoint presentation.

Learner 29: ... to present their lessons..., to download their textbooks, notes and videos ...

Learner 30: ... in order to download their textbooks ...

Learner 31: ... using laptops and give us instruction to download ...

Learner 32: ... they connect projectors to project their PowerPoint notes.

Learner 33: ... everything is installed in their laptop, they also download, and upload notes, videos, and diagrams and so forth ...

Learner 34: ... they are using laptop for PowerPoint presentation.

Learner 35: ... they show us videos, and teacher's notes ...

Learner 36: ... they download textbooks ... and teach ...

Learner 37: ... they guide us as to on which page we can open into our tablets ...

Learner 39: ... they sometimes request us to search for something on the internet ...

Learner 40: ... they also download textbooks and other school material.

2.10 Do you think that using tablets improves your knowledge and understanding of the subject taught? Why do you think this?

Learner 1: ... yes, if I have a project, I will Google and find a lot of information.

Learner 2: ... no ... the teacher must explain everything ... then I will understand. Sometimes they referred us to videos, pictures / diagrams and expect us to understand them.

Learner 3: ... by learning more thing about technology.

Learner 4: ... no ... tablets are more distracting than a normal book or way of learning.

Learner 5: ... no ... because teachers turned to rely on it instead of teaching ...

Learner 6: ... if we have internet, we will be able to see different diagrams, and more information to add on what teachers taught us.

Learner 7: ... yes ... because you can expand your understanding by using information on the internet.

Learner 8: ... yes ... sometimes teachers do not mention everything when they teach then you have to make a follow-up on the internet – to Google more information.

Learner 9: ... no ... I play games and some of them are not school related. However, I also download textbooks to study / do homework as well ...

Learner 10: ... yes ... it is very interesting watch videos and Google ...

Learner 11: ... yes ... you can download amazing diagrams, pictures and articles to supplement your official textbooks, teachers' notes and other study materials.

Learner 12: ... no ... you end up not concentrating in the classroom ... playing with tablet ...

Learner 13: ... no ... I still need someone to explain meaning of downloaded materials so that I will understand ...

Learner 14: ... not tablets ... I enjoy the voice of the teacher ... because they tell us what is important for formal activities and so on ...

Learner 15: ... yes ... internet is a problem solver ... just Google ...

Learner 16: ... yes ... now I know how to download or to find information in the tablet.

Learner 17: ... yes ... especially if I have data or Wi-Fi to search more information about something.

Learner 18: ... yes ... it is very interesting to use tablets because you find lot of information in it ...

Learner 19: ... yes ... all textbooks I need are in it ... then it is my responsibility to study ...

Learner 20: ... yes ... tablets are very efficient ... you do not need to travel / spend money to go to the library for additional information ... tablet has it all.

Learner 21: ... yes ... videos can explain things better ...

Learner 22: ... yes ... by sharing information with friend ... they also help you to find information ...

Learner 23: ... yes ... by access different diagrams and pictures that illustrate things better on the internet.

Learner 24: ... no ... I think teacher's role is more effective ... tablets make learners to not listen to teachers ...

Learner 25: ... yes ... internet access is powerful ... if you do not know just Google ...

Learner 26: ... no ...

Learner 27: ... yes ... if learners can play games that will help them to learn ... teachers must select those games ... they must block games in our tablets ... learners don't listen to teachers.

Learner 28: ... no ...

Learner 29: ... yes ... tablets are well-resourced or rich when it comes to information. It is the responsibility of the learner to use it effectively.

Learner 30: ... yes ... through internet you can obtain more knowledge ...

Learner 31: ... if data is available ... you can obtain lot of knowledge from the internet.

Learner 32: ... yes ... because if you use it at school ... there is free Wi-Fi that you can use for internet.

Learner 33: ... yes ... tablet have a lot of information ... than a textbook ...

Learner 34: ... yes ... one tablet has all information you need to study ... as a person you need to study.

Learner 35: ... no ... teachers must teach so that we will understand ...

Learner 36: ... we need somebody or teachers to explain the information we got to us ...

Learner 37: ... we want to discuss the information with the teacher in order to understand ...

Learner 39: ... no.

Learner 40: ... yes ... we can get access to internet ...

2.11 Do they (tablets) add value (contribute) to your learning experience? If so, explain why. If not, suggest possible alternatives / resources that could be used or suggest how you think that they could add value.

Learner 1: ... yes, using internet, you can access lot of information.

Learner 2: ... yes ... we learn in a relaxed way as if we are playing.

Learner 3: ... we learn better when we have access to technology especially the internet.

Learner 4: ... I feel that learners do things that they do not supposed to be doing such as playing games and other "stuff".

Learner 5: ... yes ... because you can use internet as a source of information.

Learner 6: ... yes ... enough information is available in the tablet that you can use to learn without spending time to go to the library to do research. Just use tablet.

Learner 7: ... you learn in a fun way through tablets ...

Learner 8: ... No ... learners are crazy about having tablets and tend to not listen to teachers' instructions.

Learner 9: ... yes ... because they are effective and efficient ... you can study even if you are in your transport back home.

Learner 10: ... yes ... if you download music that is relevant to your topic like song of the phases of the Moon are good ... and help me to understand this topic better. I feel bad if other learners misuse tablets and download irrelevant stuff ...

Learner 11: ... we WhatsApp each other when we do homework ...

Learner 12: ... technology is the master of everything ... it makes life amazing ... you carry one tablets ... in it ... there are many textbooks than carrying huge bag of heavy textbooks.

Learner 13: ... yes ... enjoy navigating on the device ...

Learner 14: ... no ... teachers are struggling to maintain discipline in class ... they spent lot of time on this issue (discipline) instead of teaching ... I think, we must go back to hard copies to minimise the problem of discipline ...

Learner 15: ... I am moving with technology ... I like to use everything related to technology ... in order to survive out there ...

Learner 16: ... yes ... our school bags are not heavy anymore ... all textbooks are in the tablet.

Learner 17: ... yes ... it's a pleasure to use technology in the classroom ... we search for truth on the internet ...

Learner 18: ... yes ... tablets are "all-in-one" package – textbooks, notes, videos and many more.

Learner 19: ... no ... learners are playing unnecessary games in the classroom.

Learner 20: ... yes ... because you download whatever you want ... such as games, videos, and school materials ...

Learner 21: ... yes ... for us to use prescribed textbooks.

Learner 22: ... yes ... to interact with friends and parents ... we call one another.

Learner 23: ... no ... I prefer textbooks and books because it helps you to concentrate ...

Learner 24: ... yes ... videos illustrate better ...

Learner 25: ... yes ... there are additional information in the tablets like videos.

Learner 26: ... no ... classrooms are not under control because learners are not doing what they supposed to do in their tablets ... they are watching wrong videos and sending each other wrong pictures and giggling through the lesson. Tablets are for the matured learners ... not Grade 8.

Learner 27: ... yes ... less textbooks to carry ...

Learner 28: ... yes ... there is no need to go to the library if you use your tablet effectively ... it is rich in information.

Learner 29: ... yes ... all teachers' notes are saved in the tablet ... you do not need to write notes.

Learner 30: ... yes ... access to the internet can add value...

Learner 31: ... they add value because you can use multiple ways of finding information rather than going to the library to find more information ...

Learner 32: ... it is efficient because we are now carrying less books to school.

Learner 33: ... yes ... we are now connected to the world ...

Learner 34: ... we are special by having everything we need in one device.

Learner 35: ... tablets are faster in finding information.

Learner 36: ... we have access to internet that alone is valuable.

Learner 37: ... tablets add value because we are taught differently ... we are exploring new way of learning.

Learner 39: ... we always enjoy being told to use our tablets in the classroom ...

Learner 40: ... the use of internet add value in our learning because we can explore more ... pictures, ideas, methods of understanding sums, research and so forth.

2.12 Are you monitored when using tablets in class? If yes, how?

Learner 1: ... not really, sometimes it blocks, and you can't have access to the websites or end up being frustrated ...

Learner 2: ... no. We only use Wi-Fi for download.

Learner 3: ... no.

Learner 4: ... not at all ...

Learner 5: ... teachers control us ... by telling us to put away our tablets ... or to take out our tablets to look for something, etc.

Learner 6: ... no.

Learner 7: ... no ... because some learners are playing games in the presence of the teacher.

Learner 8: ... no.

Learner 9: ... no.

Learner 10: ... no.

Learner 11: ... no ... because lot of things are happening without the knowledge of the teacher ...

Learner 12: ... yes ... the teacher is moving around to check if we are in the correct page or not.

Learner 13: ... no.

Learner 14: ... no.

Learner 15: ... no.

Learner 16: ... no.

Learner 17: ... no

Learner 18: ... my parent does check my tablet ...

Learner 19: ... no.

Learner 20: ... no.

Learner 21: ... no.

Learner 22: ... no.

Learner 23: ... no

Learner 24: ... no ... we are expected to take ownership of it.

Learner 25: ... no.

Learner 26: ... no.

Learner 27: ... no.

Learner 28: ... no.

Learner 29: ... no.

Learner 30: ... no.

Learner 31: ... no.

Learner 32: ... no.

Learner 33: ... no.

Learner 34: ... no.

Learner 35: ... no.

Learner 36: ... no.

Learner 37: ... no.

Learner 39: ... no

Learner 40: ... no.

2.13 Do you take the tablets home? Do you use them there? If so, what do you use them for at home?

Learner 1: ... yes, I do ... and use it at home. I download everything I need at school because sometimes I do not have data at home.

Learner 2: ... yes. I use it for homework and studying because my textbooks are in the tablet.

Learner 3: ... yes ... I need it for homework, study and for catching up with my work.

Learner 4: ... yes ... for studying purposes.

Learner 5: ... yes ... and do homework and use textbooks for study purposes.

Learner 6: ... yes ... and I use it for normal schoolwork ...

Learner 7: ... yes ... I WhatsApp and call my friends of family members ...

Learner 8: ... yes ... to call and study ...

Learner 9: ... yes ... to study ...

Learner 10: ... yes ... in order to do homework, activities and to study.

Learner 11: ... yes ... for study purposes.

Learner 12: ... yes ... to study and to play games.

Learner 13: ... yes ... I download at school because there is a Wi-Fi and study at home using my tablets.

Learner 14: ... yes ... to study and download if I have data.

Learner 15: ... yes ... to do my homework and activities.

Learner 16: ... yes ... to do schoolwork.

Learner 17: ... yes ... for studying / homework.

Learner 18: ... yes ... we can take the tablet home ... in order to study.

Learner 19: ... yes ... for study purposes.

Learner 20: ... yes ... to do homework.

Learner 21: ... yes ... to study.

Learner 22: ... yes ... to study ... when I am done with schoolwork, I also play games ...

Learner 23: ... yes ... to download work if I have data.

Learner 24: ... yes ... for reading and internet if I have data at home ...

Learner 25: ... yes ... to study...

Learner 26: ... yes ... to do schoolwork.

Learner 27: ... yes ... to watch videos and to play games after doing schoolwork.

Learner 28: ... yes ... to download games using my personal data and to do schoolwork

Learner 29: ... yes ... to watch videos, play games and to study. To make life fun ...

Learner 30: ... yes ... for study purposes.

Learner 31: ... yes ... by study what I downloaded at school.

Learner 32: ... yes ... to communicate with friends ... and to study ...

Learner 33: ... yes ... for study purposes ... and no one else is using it except me ...

Learner 34: ... yes ... to study ...

Learner 35: ... yes ... to do homework and outstanding activities ...

Learner 36: ... yes ... to study ...

Learner 37: ... yes ... to access my textbooks.

Learner 39: ... yes to study ...

Learner 40: ... yes ... to study ...

2.14 Does anyone else in your family use your tablet? If so what for? Do they ever start discussions about subjects at home?

Learner 1: ... no.

Learner 2: ... no.

Learner 3: ... no.

Learner 4: ... Yes. My parent assists me with my schoolwork.

Learner 5: ... no. My parents have their own devices.

Learner 6: ... no.

Learner 7: ... no.

Learner 8: ... no.

Learner 9: ... no.

Learner 10: ... no.

Learner 11: ... no.

Learner 12: ... no.

Learner 13: ... no.

Learner 14: ... no.

Learner 15: ... no.

Learner 16: ... no.

Learner 17: ... no.

Learner 18: ... no.

Learner 19: ... no.

Learner 20: ... no.

Learner 21: ... no.

Learner 22: ... no.

Learner 23: ... no.

Learner 24: ... no.

Learner 25: ... no.

Learner 26: ... no.

Learner 27: ... no.

Learner 28: ... no.

Learner 29: ... no.

Learner 30: ... no.

Learner 31: ... no.

Learner 32: ... no.

Learner 33: ... no.

Learner 34: ... no.

Learner 35: ... no.

Learner 36: ... no.

Learner 37: ... no.

Learner 39: ... no.

Learner 40: ... no.

2.15 Do you use your tablet to find information by yourself?

Learner 1: ... yes ... by searching information on the internet or research.

Learner 2: ... when I'm doing research.

Learner 3: ... yes.

Learner 4: ... yes ... I search meaning of words, spelling, and research more about topics.

Learner 5: ... yes... if I have tasks to complete, projects to do and research ... I use my tablet to find information ... I can tell you know it is very rich when it comes to information. But I am holding a view that teachers must teach that information ... not only showing us the information and expect us to read and understand.

Learner 6: ... depending on data ... if is available ... I do search for information.

Learner 7: ... yes ... Wi-Fi is the key ... because I need internet to find out more about something ...

Learner 8: ... yes ... to download school information and the Code of Conduct.

Learner 9: ... yes ... it is one and the same as the smartphone ...

Learner 10: ... yes ...

Learner 11: ... yes ...

Learner 12: ... yes ... to confirm facts by Googling ...

Learner 13: ... yes.

Learner 14: ... yes.

Learner 15: ... yes.

Learner 16: ... yes.

Learner 17: ... yes.

Learner 18: ... yes.

Learner 19: ... yes.

Learner 20: ... yes.

Learner 21: ... yes.

Learner 22: ... yes.

Learner 23: ... yes.

Learner 24: ... yes.

Learner 25: ... yes.

Learner 26: ... yes.

Learner 27: ... yes.

Learner 28: ... yes.

Learner 29: ... yes.

Learner 30: ... yes.

Learner 31: ... yes ... to find meanings of the word.

Learner 32: ... yes ...

Learner 33: ... yes ... to research ...

Learner 34: ... yes ...

Learner 35: ... yes ...

Learner 36: ... yes ... search for information ...

Learner 37: ... yes ...

Learner 39: ... yes ...

Learner 40: ... yes ...

2.16 Are the tablets used for content creation or content receiving (e.g., to upload articles, learners' activities and questions to be discussed or feedback from the teacher / peers) in the classroom?

Learner 1: ... yes ... we share videos and pictures with friends ...

Learner 2: ... I share information with friends by telling them or showing them what I found interesting there.

Learner 3: ... yes ... we download activities, etc.

Learner 4: ... I download information for discussion purposes.

Learner 5: ... yes ... we can download and save different diagrams, pictures, videos, definitions, abstracts and so on for study purposes in future.

Learner 6: ... yes ... we receive activities, questions and notes from the teacher.

Learner 7: ... yes ... I can download correction and other activities in the tablet.

Learner 8: ... yes ... I sent pictures / diagrams to my friends.

Learner 9: ... yes ... by downloading all I need ... I think I am creating something to study ...

Learner 10: ... yes ... by sharing videos ...

Learner 11: ... yes ... I use tablet to discuss schoolwork with my friends – through WhatsApp and other social media.

Learner 12: ... yes ... all learning materials are in my tablet.

Learner 13: ... yes ... study materials is in one place ... in the tablet.

Learner 14: ... yes ... we do use tablets for discussion purposes.

Learner 15: ... yes ... I access study materials in the tablet.

Learner 16: ... yes ... I use it to download activities, homework and textbook.

Learner 17: ... yes, at times I upload videos, and diagrams to study at home.

Learner 18: ... yes ... to complete my homework at home and other activities.

Learner 19: ... yes ... to create / download my study material at school because there is free Wi-Fi and study at home ...

Learner 20: ... yes ... we can share information as friends ... like videos, and so on ...

Learner 21: ... yes ... by downloading questions and activities ...

Learner 22: ... yes ... we can WhatsApp each other and discuss schoolwork.

Learner 23: ... yes ... as group of friends we work together and discuss schoolwork in our group that we have created ...

Learner 24: ... yes ... as we download information, we also save it in our tablet ... by so doing we are creating our own information.

Learner 25: ... yes ... I download all questions and save it to my tablets so that I will use them for revision.

Learner 26: ... yes ... I have many videos that I downloaded thus far ...

Learner 27: ... yes ... by sharing all information with friends ...

Learner 28: ... yes ... my friend helped me to download and save all activities and questions available for study purposes.

Learner 29: ... yes ... for sharing purposes ...

Learner 30: ... yes ... for sharing and discussing schoolwork.

Learner 31: ... after getting access to internet, I make my notes ...

Learner 32: ... I find information, textbooks on the internet and make my notes ...

Learner 33: ... via WhatsApp group we can discuss schoolwork ...

Learner 34: ... yes ... we help each other on what and how to download articles or any information.

Learner 35: ... yes ...

Learner 36: ... yes ... we show each other how to complete a task or an activity.

Learner 37: ... yes ... we learn together ...

Learner 39: ... yes ... all learning materials are in my tablet.

Learner 40: ... yes ...

2.17 Do you only use your tablet in your classroom, or do you use paper as well?

Learner 1: ... both.

Learner 2: ... both.

Learner 3: ... both.

Learner 4: ... both.

Learner 5: ... both.

Learner 6: ... both.

Learner 7: ... both.

Learner 8: ... both.

Learner 9: ... both.

Learner 10: ... both.

Learner 11: ... both.

Learner 12: ... both.

Learner 13: ... both.

Learner 14: ... both.

Learner 15: ... both.

Learner 16: ... both.

Learner 17: ... both.

Learner 18: ... both.

Learner 19: ... both.

Learner 20: ... both.

Learner 21: ... both.

Learner 22: ... both.

Learner 23: ... both.

Learner 24: ... both.

Learner 25: ... both.

Learner 26: ... both.

Learner 27: ... both.

Learner 28: ... both.

Learner 29: ... both.

Learner 30: ... both.

Learner 31: ... both.

Learner 32: ... both.

Learner 33: ... both.

Learner 34: ... both.

Learner 35: ... both.

Learner 36: ... both.

Learner 37: ... both.

Learner 39: ... both.

Learner 40: ... both.

2.18 How do your teachers assess your work (class activities, assignments, etc.) when you use tablets?

Learner 1: ... they mark our workbooks, exam / test papers.

Learner 2: ... they check homework in our workbooks and mark activities.

Learner 3: ... they refer you to different pages / activities to complete in your workbook and guide you how to complete it.

Learner 4: ... by checking books.

Learner 5: ... they display memo on the screen (PowerPoint) and expect us to do corrections and sign our workbooks.

Learner 6: ... they can't in the tablet, they only mark our workbook, and we still write formal activities in exam pad or workbook.

Learner 7: ... they check if we have downloaded activities, textbooks or notes.

Learner 8: ... they help us with technical downloading problems and encourage us to do our homework in the workbook.

Learner 9: ... they check if we are in the correct page ... or know how to use it.

Learner 10: ... they mark written work.

Learner 11: ... they collect hand-written work for marking purposes and that's how they assess our work.

Learner 12: ... they do not take tablets to mark, there is nothing there except activities and textbooks, they only take workbook, test paper or hand-written assignment, etc. for monitoring or controlling purposes.

Learner 13: ... by checking workbooks ...

Learner 14: ... tablet is a private use ... no one is checking it ... teachers mark the books.

Learner 15: ... they give us feedback by uploading corrections in their PowerPoint presentation.

Learner 16: ... by giving us class work, test and other formal activities.

Learner 17: ... they give us feedback / corrections.

Learner 18: ... they mark our workbook and test papers.

Learner 19: ... they mark and expect us to do corrections / download corrections.

Learner 20: ... they ask us questions in the classroom ...

Learner 21: ... through marking our worksheets ...

Learner 22: ... they upload corrections in our tablets.

Learner 23: ...they mark ...

Learner 24: ... they mark ...

Learner 25: ... they give us feedback ...

Learner 26: ... through marking ...

Learner 27: ... they mark our workbook.

Learner 28: ... they mark ...

Learner 29: ... they mark and give us corrections ...

Learner 30: ... they mark and give us corrections ...

Learner 31: ... we write activities in our books, and they mark our books.

Learner 32: ... they mark and give us feedback / upload corrections to the system.

Learner 33: ... they mark our test papers and assignments.

Learner 34: ... they mark ...

Learner 35: ... they give us feedback and ask us to mark with a pencil ...

Learner 36: ... by marking books ...

Learner 37: ... they mark our worksheets ...

Learner 39: ... by marking ...

Learner 40: ... they mark ...

2.19 Do you use your tablet to share your learning experience with others (like having discussion forums, debates, group discussions, announcements, assignments, uploading interesting articles, etc.)? If so, please tell me what you do?

Learner 1: ... we help one another to access videos and all other information ...

Learner 2: ... yes ... as stated in number 2.16.

Learner 3: ... yes ... we are able to discuss schoolwork online through WhatsApp and other social media.

Learner 4: ... by sending articles, questions and answers to my friends.

Learner 5: ... no.

Learner 6: ... no ... except WhatsApp to ask for something to my friends if I do not know.

Learner 7: ... no.

Learner 8: ... no.

Learner 9: ... no.

Learner 10: ... yes ... we do share some information ...

Learner 11: ... no.

Learner 12: ... no.

Learner 13: ... no.

Learner 14: ... we debate in class ... we are not using tablets for that matter ...

Learner 15: ... no.

Learner 16: ... no.

Learner 17: ... no.

Learner 18: ... no.

Learner 19: ... no.

Learner 20: ... no.

Learner 21: ... no.

Learner 22: ... no.

Learner 23: ... not at all ...

Learner 24: ... no.

Learner 25: ... no.

Learner 26: ... no.

Learner 27: ... no.

Learner 28: ... no.

Learner 29: ... no.

Learner 30: ... no.

Learner 31: ... no.

Learner 32: ... no.

Learner 33: ... yes ... I WhatsApp my friends if I misunderstand something so that they will explain to me.

Learner 34: ... no.

Learner 35: ... no.

Learner 36: ... no.

Learner 37: ... no.

Learner 39: ... no.

Learner 40: ... no.

2.20 Do you use your tablet to solve problems (like conducting research, and investigations)? How?

Learner 1: ... yes ... Googling about the topic at hand.

Learner 2: ... yes ... more especially if internet is working ... I search for information and verify if something said is true or not.

Learner 3: ... yes ... as we do investigations and research that teachers gave us.

Learner 4: ... I'm using internet to find out more information.

Learner 5: ... yes ... by going online to find truth.

Learner 6: ... yes ... more especially if I have data / direct access to the internet.

Learner 7: ... yes ... most of the questions that teachers asked answers are in the online textbooks.

Learner 8: ... yes ... in our school we have Wi-Fi ... so we Google.

Learner 9: ... yes ... I use textbook in it to answer questions.

Learner 10: ... yes ... by accessing textbooks and internet.

Learner 11: ... yes ... for downloading what I want at any given time.

Learner 12: ... yes ... as we use it for learning ... textbooks are there to give us answers.

Learner 13: ... yes ... at times we can use internet to search certain information.

Learner 14: ... yes ... as we are studying, we solve problems of misunderstanding.

Learner 15: ... yes ... knowledge is in the tablets now not in books ...

Learner 16: ... no ... if I do not understand I asked my parents ... we research together.

Learner 17: ... yes ... using internet ...

Learner 18: ... yes ... I use it for downloading information from the internet to solve any problem.

Learner 19: ... no ...

Learner 20: ... yes ... internet can give you answers to solve problems ...

Learner 21: ... no ... I personally search for information if there is something that I do not understand.

Learner 22: ... yes ... in some projects teachers said we must use internet to find pictures, or any other information.

Learner 23: ... yes ... they allow us to use internet to look for information ...

Learner 24: ... yes ... that's where we find our textbooks ...

Learner 25: ... yes ... by Googling ...

Learner 26: ... yes ... using the internet ...

Learner 27: ... no ...

Learner 28: ... yes ... if we have projects ... we use internet ...

Learner 29: ... yes ... we were asked to use internet where possible ...

Learner 30: ... no ...

Learner 31: ... yes ... to investigate or search for something if I have data.

Learner 32: ... yes ... to research / to complete our projects and assignments.

Learner 33: ... no.

Learner 34: ... yes ... by Googling information ...

Learner 35: ... yes ... by Googling if we have Wi-Fi ...

Learner 36: ... yes ... to complete our math tasks.

Learner 37: ... Yes ... to research ...

Learner 39: ... no.

Learner 40: ... yes to find out more about something ...

2.21 Are you worried that your tablet might be stolen? Have you ever felt unsafe because you are carrying a tablet? Do you know of anyone in your class/year whose tablet has been stolen?

Learner 1: ... yes ...

Learner 2: ... yes ... if wearing this school uniform everyone in the community knows that you have a tablet then you are not safe.

Learner 3: ... Yes ... they said they will not take any responsibility if is lost or broken and tablets are very expensive.

Learner 4: ... yes ... older student does ...

Learner 5: ... yes ... some learners that I know are victims already ...

Learner 6: ... yes ... you must keep it safe ...

Learner 7: ... yes ... most of the time are reported stolen ... and there is no way you can get it back.

Learner 8: ... yes ... safety is not guaranteed.

Learner 9: ... yes ... I am not safe ...

Learner 10: ... yes ... even outsides can target you because they know you have one tablet.

Learner 11: ... yes ... you must be in the safe place until your transport / parents came to fetch you.

Learner 12: ... yes ... you must walk back home as a group.

Learner 13: ... yes ... the school said it is not their responsibility if is lost ... no insurances ... nothing.

Learner 14: ... yes ... you need to have a plan to keep it safe ... carry your bags all the time.

Learner 15: ... yes ... safety is a concern.

Learner 16: ... yes ... safety is not guaranteed ...

Learner 17: ... yes ... I have a friend who lost his tablet already ...

Learner 18: ... yes ... it is your own responsibility to look after it ...

Learner 19: ... no ...

Learner 20: ... yes ... because everyone knows that if you are wearing this uniform you have a tablet ...

Learner 21: ... yes ... it is not safe ... specially to walk alone with it ...

Learner 22: ... yes ... never leave your school bag unattended ... they will search for it ...

Learner 23: ... yes ... I am insecure and scared that someone can target me because s/he knew I have a tablet...

Learner 24: ... yes ... I am not safe ...

Learner 25: ... yes ... I am concern about my safety because school take no responsibility of it if is lost.

Learner 26: ... yes ... I do not trust anyone ...

Learner 27: ... yes ... it is not guaranteed ...

Learner 28: ... yes ... it is a concern ...

Learner 29: ... yes ... I am not safe ...

Learner 30: ... yes ... it is true that safety is a concern ...

Learner 31: ... yes ...

Learner 32: ... yes ... I must go straight home ...

Learner 33: ... yes ... it is concerning ...

Learner 34: ... yes ... I am not secured ...

Learner 35: ... yes ...

Learner 36: ... yes, I am not ...

Learner 37: ... yes ... I am ...

Learner 39: ... yes ...

Learner 40: ... yes ... I am not ...

2.22 Is there anything else that you would like to tell me about your experience of using tablets in the classroom/at school?

Learner 1: ... no ...

Learner 2: ... no ...

Learner 3: ... for other purposes ... you can download games.

Learner 4: ... no ...

Learner 5: ... learners are distracting the process of teaching and learning by playing games while the lesson is in progress.

Learner 6: ... no ...

Learner 7: ... no ...

Learner 8: ... no ...

Learner 9: ... no ...

Learner 10: ... no ...

Learner 11: ... no ...

Learner 12: ... no ...

Learner 13: ... no ...

Learner 14: ... no ...

Learner 15: ... no ...

Learner 16: ... no ...

Learner 17: ... no ...

Learner 18: ... no ...

Learner 19: ... no ... you've asked me everything ...

Learner 20: ... no ...

Learner 21: ... no ...

Learner 22: ... no ...

Learner 23: ... no ...

Learner 24: ... no ...

Learner 25: ... no ...

Learner 26: ... no ...

Learner 27: ... no ...

Learner 28: ... no ...

Learner 29: ... no ...

Learner 30: ... no ...

Learner 31: ... no ...

Learner 32: ... no ...

Learner 33: ... no ...

Learner 34: ... no ...

Learner 35: ... no ...

Learner 36: ... no ...

Learner 37: ... no ...

Learner 39: ... no ...

Learner 40: ... no ...

Protocol 3: Interviews with the Representative of Gauteng Department of Basic Education MECs

3.1 The Gauteng Department of Basic Education has shown a keen interest in using technology for learning in schools since 2001 when Gauteng Online was implemented, until now with the introduction of the textbook-free programme (the paperless classroom). What was the motivation behind these initiatives?

MEC representative: ... to keep up with technology is vital to us as we are approaching the 4th Industrial revolution, therefore maximum utilisation of technology as an enabler in a classroom environment for teaching and learning is necessary. We are looking forward to building the classrooms of the future which are paperless, and technology driven as stated in our E-learning vision.

MEC representative ... to bridge digital divide / gap between privilege schools and disadvantaged schools.

MEC representative: ... all learners in our schools must progress with the same skill to the next level of their education.

3.2 How do you envisage that the use of tablets will assist in improving the level of education in the country?

MEC representative ... as I speak, Gauteng is number one in South Africa (Grade 12 results) and that means we are doing everything in our power to provide services to our learners.

MEC representative: ... Grade 12 is the key to determine our standard. Based on our previous results, our average is 75% (2018) and this year we are aiming 88% average. Investing in technology in our province makes us grow and produce quality education for all ...

3.3 What was the reason(s) for the introduction of tablets? Why tablets specifically?

MEC representative ... in order to upload learning resources to one device.

MEC representative: ... to save learners' time.

MEC representative: ... to ensure that learning is taking place anywhere. They must learn in their conducive environment at any given moment.

MEC representative: ... to ensure that information is accessible to all.

MEC representative: ... learners must share information.

3.4 In which schools have they been introduced?

MEC representative ... we decided to start with previously disadvantaged schools in our province and now we are rolling out tablets and smartboard to all Grades 10 – 12 and next year we will roll out the same technological resources to all Grades 8 – 9.

3.5 How were the schools chosen?

MEC representative ... mainly focusing to the previously disadvantaged schools ...

3.6 How do you think teachers responded to the directive that they should use tablets in the classroom?

MEC representative ... young teachers seem to respond very well to this new technology as compared to the old / experienced teachers who might take time to catch up with technology.

3.7 Were teachers trained in the use of tablets? Who provided the training? What did the training consist of?

MEC representative ... Teacher Development Units in each district are responsible to train teachers in their districts.

3.8 Are there evaluation strategies in place to assess whether tablets are proving successful in improving teaching and learning?

MEC representative ... yes ... each level of government institution has a committee responsible for ICT.

3.9 Has there been any noticeable improvement in the quality of teaching and learning since the introduction of tablets?

MEC representative ... as I stated before, Grade 12 results in Gauteng are remarkable. We are doing well.

3.10 Is there any indication that learner performance has improved? Or whether learner engagement and motivation to learn has improved since the introduction of tablets?

MEC representative ... yes ... they are sharing information.

3.11 Your plan is that every high school learner in Gauteng will have a tablet by the end of 2017. Is this realistic?

MEC representative ... Grade 10 – 12 they have ... sooner or later we will roll out these to other grades.

3.12 What challenges or limitations (if any) have been faced by the schools since the mobile technology (tablets) was introduced in their classrooms and how have the challenges been addressed?

MEC representative ... lack of policy about the use of technological resource. It is impossible to punish a learner who lost or damaged the devices. They have the rights to education, regardless of their conduct.

MEC representative ... learners are targeted by criminals / outsiders / schoolmates because they know that they carry tablets to school.

MEC representative: ... some learners delete schoolwork and load music or foreign content and some they want to use it for entertainment.

MEC representative ... Licensing of installing e-textbook to tablets is an issue because it is too expensive. Some schools want to go back to the traditional textbooks because of money involved around the issue of renewing the license every year.

3.13 Do you think the availability of resources (like tablets) in schools can add value or make a difference in terms of improving teachers' practice and learners' ability to learn? If so, how? If not, what do you think would bring about more effective teaching and learning in schools?

MEC representative: Yes ... for sharing, access to internet and for making them responsible for their learning.

3.14 How is the use of the tablets monitored?

MEC representative ... device audit is done twice per month ...

MEC representative: ... it is the DHs' (Departmental Heads) responsibility to monitor the curriculum delivery/pedagogy.

3.15 What do you perceive as the merits/benefits of using tablets in teaching and learning?

MEC representative: ... sharing of information ...

3.16 Is there anything I have not asked or am unaware of that I should know about the introduction of these tablets or the initiatives in general?

MEC representative ... there are so many cases in schools that are reported to us regarding misuse of devices / stolen devices.

MEC representative: ... parents sign the concern forms to assist schools in managing these devices.

MEC representative: ... hardware theft is a main concern.

Protocol 4: Interviews with the Representative of the District Director of Ekurhuleni South Department of Basic Education

4.1 The Gauteng Department of Basic Education has shown a keen interest in using technology for learning in schools since 2001 when Gauteng Online was implemented until now with the introduction of the textbook-free programme (the paperless classroom). What was the motivation behind these initiatives?

DDES... it is important to describe or distinguish between Gauteng Online and the textbook-free programme or paperless classroom as you said or call it: Gauteng Online was a centre. There was a timetable in schools for learners to visit the centre to access and learn basic computer skills like typing, downloading and searching for the information. This means that learners had to wait until their turn comes to visit the centre in order to try and find information. Whereas the textbook free-programme / paperless classroom makes life easier in many ways for the learners: 1) through tablets learners can access technology like the internet in their classroom, 2) reduced the number of books to carry to school as all the information they need is in their tablets, 3) they use and access valuable information even outside the classroom (it is guaranteed that they learn something new anywhere and not in one centre). As the district we are very proud about this initiative because it makes learning more accessible to all.

DDES ... we want to ensure that all schools in the district have smartboards and tablets in order to be simple for us to facilitate processes in place regarding e-content, e-assessment and e-books to our schools. We have partnership with #wireforlife to put smartboards in schools and to support and train teachers in our schools regarding the use of smartboards for learning purposes.

4.2 What was the reason(s) for the introduction of tablets? Why tablets specifically?

DDES ... we want to create a learner-centred environment in our school and reduce the dependency of a learner to the teacher...

DDES ... we want to ensure that audiovisual learners are fully accommodated in the school settings ...

DDES ... they learn better with the set of devices ... because many of them have access to it in their communities / families ...

DDES ... we brought this type of technology to our school because we are intending to bridge the digital divide amongst schools and individual learners. They must go to the next level of their education / carrier possessing the same skills.

DDES ... we want to promote cooperative learning using available technology ...

4.3 How do you envisage that the use of tablets will assist in improving the level of education in the district?

DDES ... information is shared easily at any time / anywhere ...

DDES ... learners can learn in their own environment / time ...

DDES ... using tablets or any technological resources, reserved learners can be engaged easily...

DDES ... Grade 12 results improve ...

DDES ... Gauteng was number one in 2018 ... we are doing well nationally.

4.4 In which schools have they been introduced?

DDES ... in our district we have 44 ICT schools ...

DDES ... we ensured that all Grade 10 – 12 have smartboards. These smartboards have a micro server (small device that allows the user to access wireless internet).

4.5 How were the schools chosen?

DDES ... we were targeting previously disadvantaged schools ...

4.6 How do you think teachers responded to the directive that they should use tablets in the classroom?

DDES ... depends on the individual teacher ... some of them resist to change / to adapt to the new technology. This means that we have got conservatives, innovators / ICT champions.

DDES ... diversity of teaching staff is also a problem, for example, age; it is difficult to change the mindset of older / experienced teachers to adapt to the new system of teaching ... whereas Funza Lushaka newly appointed teachers are more likely to adapt ...

4.7 Were teachers trained in the use of tablets? Who provided the training? What did the training consist of?

DDES ... yes ... by Teacher Development Unit / Mathew Goniwe and E-Learning Unit ...

DDES ... they were trained on 1) E-content mediation, and 2) navigation of and other multimedia content loaded in the tablets.

4.8 Are there evaluation strategies in place to assess whether tablets are proving successful in improving teaching and learning?

DDES ... yes ... by twinning school and compared the result before and after the process of twinning schools. The outcome shows a tremendous improvement.

DDES ... we also have structures in place, 1) SBICT (School-Based Information and Computer Technology) Committee and its function is to monitor and evaluate the implementation of ICT in schools and score teachers in their IQMS (School Quality Management System). This committee is chaired by the ICT Champion at school level and at district level there is a full functional ICT committee to monitor and evaluate schools.

4.9 Has there been any noticeable improvement in the quality of teaching and learning since the introduction of tablets?

DDES ... we are gradually moving towards multimedia classroom.

DDES ... we no longer have schools performing below 60% average in our district.

DDES ... we want to make sure now that all schools are above 88% average in our district.

DDES ... since the introduction of the technological resources to school, learners are enjoying coming to school and take responsibility for their learning.

4.10 Is there any indication that learner performance has improved? Or whether learner engagement and motivation to learn has improved since the introduction of tablets?

DDES ... None.

Protocol 5: Letter from the GDE to Request Permission to Conduct Research in Public Schools



GAUTENG PROVINCE

Department of Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	27 February 2017
Validity of Research Approval:	06 February 2017 – 29 September 2017 2017/07
Name of Researcher:	Nyembe S.K
Address of Researcher:	P O Box 7 444 Dannhauser 3080
Telephone Number:	074 111 0753
Email address:	stanleynyembe@gmail.com
Research Topic:	How are technological resources used in the promotion of effective teaching and learning in High Schools?
Number and type of schools:	One Secondary School
District/s/HO	Ekurhuleni South, GDE and DBE

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

[Signature] 27/02/2017
The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted: 1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management

7th Floor, 17 Simmonds Street, Johannesburg, 2001

Tel: (011) 355 0488

Email: Faith.Tshabalala@gauteng.gov.za

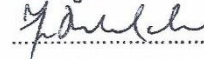
Website: www.education.gpg.gov.za

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.
2. The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.
3. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.
4. A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.
5. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.
6. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
7. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.
8. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
9. It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.
10. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.
11. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.
12. On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.
13. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.
14. Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards



Ms Faith Tshabalala
CES: Education Research and Knowledge Management

DATE: 27/02/2017

2

Making education a societal priority

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Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 1

Name of the lesson: Conservation

Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion	
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).	
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.	
		Introduce concepts and their definitions.	
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	
Demonstrations		Demonstrate how a phenomenon ‘works’ (how to manipulate the device or how to make meaning of information found, etc.).	
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).	
		Most learners are uninvolved and still passively receive information.	
		Learners are able to get involved and see first-hand how the phenomenon presents itself in the real world.	
		Allow all learners to experience the phenomenon.	
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.	
		Learners can explore issues of interest, opinions and ideas.	
		Learners are able to listen first and understand the contributions of other learners in order to respond or add to them.	
		During discussion learners are attentive, active, more engaged, and motivated.	
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.	
		Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.	
		Learners’ learning is assessed by administering all six levels of Bloom’s taxonomy.	
2. Meaning		Example/s of observations made to justify the rating of each criterion	
		Using new technology (tablets) meets learners’ expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is enough for the task, etc.).	
		Using new technology (tablets) is definitely not meeting learners’ expectations, as knowledge has been shown to be deficient and it distresses learners.	

		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.
		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible, and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.

		Learners are able to apply what they know to the new situation.
		Teachers can set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers are able to provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers can present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Can use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.

		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.
Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners can make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using

		technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 2

Name of the lesson: Importance of conservation

Grade 8: All inclusive

Strongly agree		Agree		Disagree		Strongly disagree	
Criteria							
1. Teaching techniques				Example/s of observations made to justify the rating of each criterion			
Type of Teaching					Present specific information for the majority of class time (e.g., where to find information).		
					Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.		
					Introduce concepts and their definitions.		
					Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.		
Demonstrations					Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).		
					Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).		
					Most learners are uninvolved and still passively receive information.		
					Learners can get involved and see first-hand how the phenomenon presents itself in the real world.		
					Allow all learners to experience the phenomenon.		
Discussion					A hybrid form of teaching takes place, as learners both give and receive information.		
					Learners can explore issues of interest, opinions and ideas.		
					Learners can listen first and understand the contributions of other learners in order to respond or add to them.		
					During discussion learners are attentive, active, more engaged, and motivated.		
In-class activity					All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.		
					Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.		
					Learners' learning is assessed by administering all six levels of Bloom's taxonomy.		
2. Meaning				Example/s of observations made to justify the rating of each criterion			
					Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).		
					Using new technology (tablets) is not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.		
					They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.		
					Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.		

3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners can apply what they know to the new situation.
		Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers are able to provide a worthy goal and help learners see a reason for their learning.

Show criteria and models in advance		Teachers can present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers can provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Are able to use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.
Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).

		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 3

Name of the lesson: Conservation

Grade 8: All inclusive

Strongly agree		Agree		Disagree		Strongly disagree	
Criteria							
1. Teaching techniques				Example/s of observations made to justify the rating of each criterion			
Type of Teaching					Present specific information for the majority of class time (e.g., where to find information).		
					Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.		
					Introduce concepts and their definitions.		
					Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.		
Demonstrations					Demonstrate how a phenomenon ‘works’ (how to manipulate the device or how to make meaning of information found, etc.).		
					Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).		
					Most learners are uninvolved and still passively receive information.		
					Learners can get involved and see first-hand how the phenomenon presents itself in the real world.		
					Allow all learners to experience the phenomenon.		
Discussion					A hybrid form of teaching takes place, as learners both give and receive information.		
					Learners can explore issues of interest, opinions and ideas.		
					Learners can listen first and understand the contributions of other learners in order to respond or add to them.		
					During discussion learners are attentive, active, more engaged, and motivated.		
In-class activity					All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.		
					Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.		
					Learners' learning is assessed by administering all six levels of Bloom's taxonomy.		
2. Meaning				Example/s of observations made to justify the rating of each criterion			
					Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).		
					Using new technology (tablets) is not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.		
					They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.		
					Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.		

3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners are able to apply what they know to the new situation.
		Teachers can set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.

		Teachers can provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers can present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Are able to use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.

Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 4

Name of the lesson: Revision – Conservation

Grade 8: All inclusive

Strongly agree		Agree	Disagree	Strongly disagree
Criteria				
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion		
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).		
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.		
		Introduce concepts and their definitions.		
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.		
Demonstrations		Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).		
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).		
		Most learners are uninvolved and still passively receive information.		
		Learners can get involved and see first-hand how the phenomenon presents itself in the real world.		
		Allow all learners to experience the phenomenon.		
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.		
		Learners can explore issues of interest, opinions and ideas.		
		Learners can listen first and understand the contributions of other learners in order to respond or add to them.		
		During discussion learners are attentive, active, more engaged, and motivated.		
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.		
		Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.		
		Learners' learning is assessed by administering all six levels of Bloom's taxonomy.		
2. Meaning		Example/s of observations made to justify the rating of each criterion		
		Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).		
		Using new technology (tablets) is definitely not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.		
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.		

		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners are able to apply what they know to the new situation.
		Teachers can set up realistic, authentic contexts for assessment that enable learners to apply their learning

		thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers can provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers can present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers can provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Can use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.

Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 5

Name of the lesson: Adaptation

Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion	
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).	
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.	
		Introduce concepts and their definitions.	
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	
Demonstrations		Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).	
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).	
		Most learners are uninvolved and still passively receive information.	
		Learners are able to get involved and see first-hand how the phenomenon presents itself in the real world.	
		Allow all learners to experience the phenomenon.	
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.	
		Learners can explore issues of interest, opinions and ideas.	
		Learners can listen first and understand the contributions of other learners in order to respond or add to them.	
		During discussion learners are attentive, active, more engaged, and motivated.	
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.	
		Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.	
		Learners' learning is assessed by administering all six levels of Bloom's taxonomy.	
2. Meaning		Example/s of observations made to justify the rating of each criterion	
		Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).	
		Using new technology (tablets) is not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.	
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.	
		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.	

3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners are able to apply what they know to the new situation.
		Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.

		Teachers are able to provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers are able to present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Are able to use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.

Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 6

Name of the lesson: Adaptation

Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion	
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).	
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.	
		Introduce concepts and their definitions.	
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	
Demonstrations		Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).	
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).	
		Most learners are uninvolved and still passively receive information.	
		Learners are able to get involved and see first-hand how the phenomenon presents itself in the real world.	
		Allow all learners to experience the phenomenon.	
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.	
		Learners can explore issues of interest, opinions and ideas.	
		Learners can listen first and understand the contributions of other learners in order to respond or add to them.	
		During discussion learners are attentive, active, more engaged, and motivated.	
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.	
		Learners are able to see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.	
		Learners' learning is assessed by administering all six levels of Bloom's taxonomy.	
2. Meaning		Example/s of observations made to justify the rating of each criterion	
		Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).	
		Using new technology (tablets) is not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.	
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.	

		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners are able to apply what they know to the new situation.
		Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning

		thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers are able to provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers are able to present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Can use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.

Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al.; 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners can make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 7

Name of the lesson: Adaptation

Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion	
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).	
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.	
		Introduce concepts and their definitions.	
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	
Demonstrations		Demonstrate how a phenomenon ‘works’ (how to manipulate the device or how to make meaning of information found, etc.).	
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).	
		Most learners are uninvolved and still passively receive information.	
		Learners can get involved and see first-hand how the phenomenon presents itself in the real world.	
		Allow all learners to experience the phenomenon.	
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.	
		Learners are able to explore issues of interest, opinions and ideas.	
		Learners can listen first and understand the contributions of other learners in order to respond or add to them.	
		During discussion learners are attentive, active, more engaged, and motivated.	
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.	
		Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.	
		Learners' learning is assessed by administering all six levels of Bloom’s taxonomy.	
2. Meaning		Example/s of observations made to justify the rating of each criterion	
		Using new technology (tablets) meets learners’ expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).	
		Using new technology (tablets) is definitely not meeting learners’ expectations because knowledge has been shown to be deficient and it distresses learners.	
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.	

		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners can apply what they know to the new situation.
		Teachers can set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.

		Teachers can provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers are able to present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers can provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Can use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.

Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners can make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 8

Name of the lesson: Adaptation

Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques			Example/s of observations made to justify the rating of each criterion
Type of Teaching			Present specific information for most of the class time (e.g., where to find information).
			Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.
			Introduce concepts and their definitions.
			Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.
Demonstrations			Demonstrate how a phenomenon ‘works’ (how to manipulate the device or how to make meaning of information found, etc.).
			Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).
			Most learners are uninvolved and still passively receive information.
			Learners can get involved and see first-hand how the phenomenon presents itself in the real world.
			Allow all learners to experience the phenomenon.
Discussion			A hybrid form of teaching takes place, as learners both give and receive information.
			Learners can explore issues of interest, opinions and ideas.
			Learners can listen first and understand the contributions of other learners in order to respond or add to them.
			During discussion learners are attentive, active, more engaged, and motivated.
In-class activity			All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.
			Learners are able to see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.
			Learners' learning is assessed by administering all six levels of Bloom’s taxonomy.
2. Meaning			Example/s of observations made to justify the rating of each criterion
			Using new technology (tablets) meets learners’ expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is enough for the task, etc.).
			Using new technology (tablets) is not meeting learners’ expectations because knowledge has been shown to be deficient and it distresses learners.
			They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.
			Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.

3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners can apply what they know to the new situation.
		Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers can provide a worthy goal and help learners see a reason for their learning.

Show criteria and models in advance		Teachers are able to present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers can provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Can use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.
Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).

		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners can make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 9

Name of the lesson: Abiotic Components of an Ecosystem Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion	
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).	
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.	
		Introduce concepts and their definitions.	
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	
Demonstrations		Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).	
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).	
		Most learners are uninvolved and still passively receive information.	
		Learners can get involved and see first-hand how the phenomenon presents itself in the real world.	
		Allow all learners to experience the phenomenon.	
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.	
		Learners can explore issues of interest, opinions and ideas.	
		Learners can listen first and understand the contributions of other learners in order to respond or add to them.	
		During discussion learners are attentive, active, more engaged, and motivated.	
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.	
		Learners are able to see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.	
		Learners' learning is assessed by administering all six levels of Bloom's taxonomy.	
2. Meaning		Example/s of observations made to justify the rating of each criterion	
		Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is enough for the task, etc.).	

		Using new technology (tablets) is not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.
		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion

Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners can apply what they know to the new situation.
		Teachers can set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers can provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers can present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Can use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.

		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about “getting it right”.
		They are eager to solve problems.
Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners can make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners’ practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an

		intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).
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Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 10

Name of the lesson: Abiotic Components of an Ecosystem Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques			Example/s of observations made to justify the rating of each criterion
Type of Teaching			Present specific information for most of the class time (e.g., where to find information).
			Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.
			Introduce concepts and their definitions.
			Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.
Demonstrations			Demonstrate how a phenomenon ‘works’ (how to manipulate the device or how to make meaning of information found, etc.).
			Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).
			Most learners are uninvolved and still passively receive information.
			Learners can get involved and see first-hand how the phenomenon presents itself in the real world.
			Allow all learners to experience the phenomenon.
Discussion			A hybrid form of teaching takes place, as learners both give and receive information.
			Learners can explore issues of interest, opinions and ideas.
			Learners can listen first and understand the contributions of other learners in order to respond or add to them.
			During discussion learners are attentive, active, more engaged, and motivated.
In-class activity			All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.
			Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.
			Learners’ learning is assessed by administering all six levels of Bloom’s taxonomy.
2. Meaning			Example/s of observations made to justify the rating of each criterion
			Using new technology (tablets) meets learners’ expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it

		makes sense, they obtain knowledge that is sufficient for the task, etc.).
		Using new technology (tablets) is definitely not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.
		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.

4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners are able to apply what they know to the new situation.
		Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers are able to provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers are able to present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Are able to use logic to solve problems at hand.

		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.
Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using

		technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade Natural Science Teachers and Learners

Lesson 11

Name of the lesson: Abiotic Components of an Ecosystem Grade 8: All inclusive

Strongly agree	Agree	Disagree	Strongly disagree
Criteria			
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion	
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).	
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.	
		Introduce concepts and their definitions.	
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	
Demonstrations		Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).	
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).	
		Most learners are uninvolved and still passively receive information.	
		Learners can get involved and see first-hand how the phenomenon presents itself in the real world.	
		Allow all learners to experience the phenomenon.	
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.	
		Learners are able to explore issues of interest, opinions and ideas.	
		Learners are able to listen first and understand the contributions of other learners in order to respond or add to them.	
		During discussion learners are attentive, active, more engaged, and motivated.	
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.	
		Learners are able to see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.	
		Learners' learning is assessed by administering all six levels of Bloom's taxonomy.	
2. Meaning		Example/s of observations made to justify the rating of each criterion	
		Using new technology (tablets) meets learners' expectations (they understand the concept better; they know how to apply knowledge and put it into practice, it	

		makes sense, they obtain knowledge that is sufficient for the task, etc.).
		Using new technology (tablets) is definitely not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.
		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.
Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.

4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners are able to apply what they know to the new situation.
		Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers are able to provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers are able to present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.
5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Are able to use logic to solve problems at hand.

		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.
Deductive reasoning		Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).
		Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).
Inductive reasoning		Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).
		Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).
Critical reasoning		Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).
		Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).
		Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using

		technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 6: Classroom Observation for Grade 8 Natural Science Teachers and Learners

Lesson 12

Name of the lesson: Abiotic Components of an Ecosystem Grade 8: All inclusive

Strongly agree		Agree	Disagree	Strongly disagree
Criteria				
1. Teaching techniques		Example/s of observations made to justify the rating of each criterion		
Type of Teaching		Present specific information for most of the class time (e.g., where to find information).		
		Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.		
		Introduce concepts and their definitions.		
		Find himself/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.		
Demonstrations		Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).		
		Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).		
		Most learners are uninvolved and still passively receive information.		
		Learners can get involved and see first-hand how the phenomenon presents itself in the real world.		
		Allow all learners to experience the phenomenon.		
Discussion		A hybrid form of teaching takes place, as learners both give and receive information.		
		Learners can explore issues of interest, opinions and ideas.		
		Learners are able to listen first and understand the contributions of other learners in order to respond or add to them.		
		During discussion learners are attentive, active, more engaged, and motivated.		
In-class activity		All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.		
		Learners can see a phenomenon unfold and are able to personally manipulate and practise using the phenomenon first-hand.		

		Learners' learning is assessed by administering all six levels of Bloom's taxonomy.
2. Meaning		Example/s of observations made to justify the rating of each criterion
		Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).
		Using new technology (tablets) is not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.
		They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.
		Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.
3. Promoting effective learning		Example/s of observations made to justify the rating of each criterion
The learners' perspectives		Does the teacher begin a new topic or lesson with the learners' own view of things? (For example, establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?)
		How do they (learners) use tablets as a tool to understand the world? (How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?)
A deep approach to learning		The learners' intention is to understand ideas and seek meanings.
		They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.
		Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.
A surface approach to learning		Learners see tasks as external impositions and they have the intention to cope with these requirements.
		They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.
		They focus on unrelated parts of the task, separate treatment of related parts, focus on what are essentials, reproduce the essentials as accurately as possible and memorise information for assessment purposes rather than for understanding.
Ability to teach themselves		Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.
		Learners were taught to be more effective self-regulators of their learning.
Promoting learner engagement		Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large (holistic approach to learning).
Procedural engagement		Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment.
		They do not grapple extensively with difficult or controversial academic work/topics.
		Although most learners regularly attend school to learn, they are less often engaged in their studies.

Substantive engagement		There is ongoing engagement with challenging academic problems and issues.
		There is a sustained commitment to and involvement with academic work.
		There is a contract between willing participants.
4. Seven practices for effective learning		Example/s of observations made to justify the rating of each criterion
Use summative assessments to frame meaningful performance goal		Clarify the targeted standards and benchmarks for teachers and learners.
		Learners are able to apply what they know to the new situation.
		Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.
		Teachers are able to provide a worthy goal and help learners see a reason for their learning.
Show criteria and models in advance		Teachers are able to present evaluative criteria and models of work that illustrate different levels of quality.
		Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).
		Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?
Assess before teaching		A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions (for example, by using a short, non-graded true-false diagnostic quiz that includes several misconceptions related to the targeted learning). Does the use of portable tablets enable teachers to obtain this information instantaneously?
Offer appropriate choices		Were learners given appropriate options to demonstrate knowledge, skills and understanding?
		Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.
		Teachers can accommodate different learning or thinking styles.
Provide feedback early and often		Teachers are able to provide feedback based on formative assessments.
		To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.
		This helps learners understand both their strengths and the areas in which they can improve.
		Were learners given opportunities to act on feedback – to refine, revise, practise and retry?
Encourage self-assessment and setting goals		Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.
		Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.
Allow new evidence to replace old evidence		Learners were given multiple opportunities to demonstrate their learning.
		Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practising the needed skill in a given way – before embarking on their 'second chance'.

5. Promoting effective critical thinking		Example/s of observations made to justify the rating of each criterion
Critical thinkers		Are able to use logic to solve problems at hand.
		They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions.
		They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution.
		They are concerned about "getting it right".
		They are eager to solve problems.
6. Seven components in the Technological Pedagogical Content Knowledge (TPACK) framework		Example/s of observations made to justify the rating of each criterion
Technological Knowledge (TK)		Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).
Content Knowledge (CK)		Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).
Pedagogical Knowledge (PK)		Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).
Pedagogical Content Knowledge (PCK)		Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).
Technological Content Knowledge (TCK)		Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPK)		Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).
Technological Pedagogical Content Knowledge (TPACK)		Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).

Protocol 7: Questionnaires for all Grade 8 Teachers

7.1 How long you have been using / integrating technology in your lessons?

Teacher 1: ... It's been 5 years now ...

Teacher 2: ... Since I started at Sunward Park High School, three (3) years ago ...

Teacher 3: ... Since 2014 – to – date ...

Teacher 4: ... More than 7 years ...

Teacher 5: ... 5 years...

Teacher 6: ... For the past 6 years ...

Teacher 7: ... Since I started at Sunward ...

Teacher 8: ... 3 years ago ...

Teacher 9: ... 8 years ago ...

Teacher 10: ... This year at Sunward ...

Teacher 11: ... 4 years back ...

Teacher 12: ... More than 8 years ...

Teacher 13: ... 2 years back ...

Teacher 14: ... 10 years ago ...

Teacher 15: ... 1 year, as I joined Sunward late last year ...

Teacher 16: ... 3 years back ...

Teacher 17: ... Since, I joined Sunward, 5 years ago ...

Teacher 18: ... Since 2015 ...

Teacher 19: ... 4 years back ...

Teacher 20: ... 11 years ago, using projectors and laptop for PowerPoint presentation ...

Teacher 21: ... This year, because it is my first year of teaching ...

Teacher 22: ... 8 years back ...

Teacher 23: ... 4 years back ...

Teacher 24: ... 2 years ago ...

Teacher 25: ... Since I started teaching, in 2012, 7 years ago ...

Teacher 26: ... 6 years ago ...

Teacher 27: ... 15 years ...

Teacher 28: ... 1 year ...

Teacher 29: ... 3 years ago ...

Teacher 30: ... 11 years ago ...

Teacher 31: ... 2 years back ...

Teacher 32: ... 6 years ago ...

Teacher 33: ... 9 years ...

Teacher 34: ... 3 years ...

7.2 Can you tell me about how you use tablets for teaching purposes in your classroom?

Teacher 1: ... They can download lessons, activities, videos and access to their textbooks.

Teacher 2: ... Very effective. Learners have their textbooks on their tablets. Learners can access the lessons, PowerPoint presentations that are presented in class on their tablets. Learners do activities (class activities) and download resources for the subject.

Teacher 3: ... Learners use tablets to download lessons e.g., PowerPoint presentation / video's etc. and also to complete short quiz / test on topic.

Teacher 4: ... As a textbook (interactive).

Teacher 5: ... I use the laptop. Learners use their tablets. They download lessons and textbooks. They download notes into their tablets from the school portal.

Teacher 6: ... a) Textbooks, b) questions (pre and post), c) notes and d) activities.

Teacher 7: ... By enabling learners to access textbooks, teachers' notes or PowerPoint notes, and downloading activities, videos, etc.

Teacher 8: ... I ask them to find or to open a certain page and explain the content. They use it as a textbook.

Teacher 9: ... These tablets intend to replace textbook, I asked the learners to read poems, literature / stories, in their tablets.

Teacher 10: ... Learners have an opportunity to use different textbooks to simplify information, then I give them activities or questions to be answered.

Teacher 11: ... If data is available or Wi-Fi, we explore different things or information on the Internet ... all answers are there ... just Google.

Teacher 12: ... I ask learners to download a page / textbooks, videos or diagram to enhance their learning. I prepare PowerPoint presentation and upload everything to the system so that they will download it.

Teacher 13: ... I use it as a reference or textbook, that's it.

Teacher 14: ... They read information in their tablet as per instruction and I display diagrams and play videos for them in the overhead projector.

Teacher 15: ... I upload interesting lesson and videos of Mathematics whereby other individuals (teacher) explain the concept like fractions in different ways as I do. I think learners are benefiting than listen to me every day.

Teacher 16: ... The school has a system with all study materials, whether you are using tablet or laptop, everything is installed. I ask learners to download the lesson of the day and videos that are relevant in what I am teaching for enrichment.

Teacher 17: ... Textbooks are there in the tablet, our task both teachers and learners is to download what we need.

Teacher 18: ... Most of the time I prepare PowerPoint presentation and upload notes for them.

Teacher 19: ... Readers are installed in their tablets, so they download them and read in the classroom or at any given time.

Teacher 20: ... Learners have a responsibility to find or download a textbook. Thereafter, we continue with the normal lesson. I also give them activities.

Teacher 21: ... I enjoy asking learners to do research on the internet rather than playing games all the time.

Teacher 22: ... It's another form of textbook ... I use it as I am using a textbook ... I ask them to find page so and so ... and start explaining ...

Teacher 23: ... Learners' textbooks are installed in their tablets ... we all download ...

Teacher 24: ... I use it to access quiz, puzzle, videos, internet and learners enjoy learning in that way ...

Teacher 25: ... I download textbooks and learners' activities.

Teacher 26: ... I use it for PowerPoint presentation and upload all my notes to the system so that learners will access it.

Teacher 27: ... It is essential to have Wi-Fi or data to explore interesting videos to reinforce what is taught in class.

Teacher 28: ... For reading purposes ...

Teacher 29: ... I use laptop for PowerPoint presentation.

Teacher 30: ... I want them to search for information on the internet and discuss that information in the classroom.

Teacher 31: ... I use them as a resource because all learning materials are in the system.

Teacher 32: ... As reference ...

Teacher 33: ... They work well if Wi-Fi is working ... for learners to explore some wonders of information, videos, quiz and puzzle on the internet.

Teacher 34: ... are replacing textbooks ... so I use it as a textbook.

7.3 Can you tell me more about the benefits and challenges of using tablets as a teaching tool or resource of teaching and learning?

Teacher 1: ... **Benefits** – it's convenient, quicker and efficient. **Challenges** – distracts learners and low battery.

Teacher 2: ... It makes it easier for the learners as they will have all resources needed and they are able to interact with you as an educator, it is a very resourceful teaching tool. The only challenge would be if child's tablets are battery low or if a learner does not have one.

Teacher 3: ... **Benefits** – makes teaching / transmission of lessons / information easier. **Challenges** – learners may experience technical difficulties with tablets.

Teacher 4: ... **Benefits** – information at fingertips. **Challenges** – learners may use other social media on their tablet instead of just using their textbooks.

Teacher 5: ... **Challenges** – a) tablets can freeze, b) tablets can run out of power, c) tablets can be easily broken and d) tablets are highly sought by thieves.

Teacher 6: ... Instant communication and downloading of notes – learners don't have to copy notes. Important work highlighted and notes added (**benefit**).

Teacher 7: ... **Benefits** – it is quicker to use tablet and save time. **Challenges** – learners miss out important skill ... writing skills ... as they are navigating on tablets ... almost every day.

Teacher 8: ... **Benefits** – learners do not take notes as they know that they will download teachers' notes at the later stage. They are supposed to listen and contribute to the debate in the classroom. **Challenges** – unfortunately, some learners are not focusing on class, they are addicted to tablets, distracting or use it for other purposes during contact time.

Teacher 9: ... **Benefits** – all information or resources has been put together and is easy to access it. **Challenges** – it's as if we will produce lazy learners ... they refuse to write ...

Teacher 10: ... **Benefits** – are efficient ... **Challenges** – at some points, learners are playing games that are not helpful for learning.

Teacher 11: ... **Benefits** – access to internet makes the difference. **Challenges** – not reliable ... battery gets flats and thereafter, it will be difficult to work.

Teacher 12: ... **Benefits** – by reducing paperwork, no damaged textbooks ...

Teacher 13: ... **Benefits** – quicker and make life easier because learners need to download learning resources in their tablets – **Challenges** – handwriting will be the challenge ... they are reluctant to write ...

Teacher 14: ... **Benefits** – it's excellent and efficient when it comes to communication and access to information, but a teacher must teach, unpack knowledge – **Challenges** – can freeze ...

Teacher 15: ... **Benefits** – save time ... **Challenges** – technical problems ...

Teacher 16: ... **Benefits** – has ample information ... **Challenges** – break easily ...

Teacher 17: ... **Challenges** – can be stolen ... it takes time to be replaced ... the learner will be behind with his / her work.

Teacher 18: ... **Challenges** – tablets are the main cause of ill-discipline in the classroom ... learners do not care of what the teacher is saying ... they play with their tablets.

Teacher 19: ... **Benefits** – you do more with less time especially if the Wi-Fi is working. **Challenges** – battery can run out / go off ...

Teacher 20: ... **Benefits** – it's a good tool for communication. Teachers must teach ...

Teacher 21: ... **Benefits** – all we need for teaching is in the tablet ... just download. The system is functioning well ... **Challenges** – learners do not pay attention to the teacher ... some of them are playing games ...

Teacher 22: ... **Benefits** – no need for referring learners to the libraries ... they have enough textbooks or resources in their tablets. **Challenges** – some of them are not yet matured to use it for the right reason ...

Teacher 23: ... **Challenges** – discipline in the classroom is a major challenge since tablets were introduced ... the majority of learners do not listen ...

Teacher 24: ... **Benefits** – easy to use and to follow instructions on how to use it ...

Teacher 25: ... **Benefits** – easy to access information or study material ... **Challenges** – learners do not make their own notes ...

Teacher 26: ... **Benefits** – textbooks at fingertips ... **Challenges** – still believe in the traditional way of teaching and learning.

Teacher 27: ... **Benefits** – each learner has adequate information to study ... **Challenges** – some of them are using it for other purposes other than learning.

Teacher 28: ... **Benefits** – has information ...

Teacher 29: ... **Challenges** – the culture of writing or completing tasks at hand is missing. Some learners are struggling to complete formal assessment / test on time ... they are used in navigating.

Teacher 30: ... **Benefits** – it's a good resource of information and at time it is easy to be connected if internet is working.

Teacher 31: ... **Benefits** – easy to access information ... **Challenges** – battery runs out

Teacher 32: ... **Benefits** – textbooks are accessible and are in order and no page missing.

Teacher 33: ... **Benefits** – learners can assist each other by sending each other information or downloaded information ... **Challenges** – games ...

Teacher 34: ... **Benefits** make learning and teaching easy ... you upload notes and activities for them – **Challenges** – they do not study ...

7.4 How do you feel about using tablets as a teaching tool in your classroom?

Teacher 1: ... I personally don't like it.

Teacher 2: ... I am happy with the use of tablets as a teaching tool in my classroom. It also makes life easier for learners than having to carry around textbooks.

Teacher 3: ... I enjoy the use of tablets as I view it as a good tool for teaching and learning.

Teacher 4: ... Confident.

Teacher 5: ... They are good gadgets (devices).

Teacher 6: ... It has assisted me a lot – but I do feel it can be used more as an interactive tool in future.

Teacher 7: ... It was imposed ... I do not like it ... learners are not behaving in the classroom because of tablets.

Teacher 8: ... I am happy ... it gives you multiple ways of explaining something, for example, you may use video clips or download songs, music that is relevant to the topic at hand.

Teacher 9: ... I am happy ... because now I created my database of my videos and I know which video I can upload for my learners ... it does make the difference.

Teacher 10: ... It's amazing ... because everyone has an opportunity to get access to the Internet ... if we are not sure about something ... we Google.

Teacher 11: ... I don't like my learners to use tablets all the time ... I want them to listen to me as a teacher, take my instructions and guidance / notes rather than relying on tablets ... they spent time downloading but they do not study.

Teacher 12: ... I am adapting to it ...

Teacher 13: ... I am excited ... learners like it and feel excited too, to use it in the classroom.

Teacher 14: ... I am happy ... as a nation we need to catch up with technology ...

Teacher 15: ... I am happy ...

Teacher 16: ... I am happy ... although it is not reliable ... battery can run out anytime ...

Teacher 17: ... It is exciting ...

Teacher 18: ... I am not happy about it; however, I am using it because it is a mandate from the government.

Teacher 19: ... I do not like it ... because some essential skills like writing skills, drawing skills, notes taking skills tend to be ignored when using tablets in the classroom ... we want them to download ... and expect them to write a test / exam on the paper ... they can't spell, they can't write properly, they can't finish their formal tasks / test because they are not used in writing ... they are used in scrolling or navigating in the tablet ...

Teacher 20: ... It is exciting to teach and show learners video clips at the same time, I think they are benefiting ...

Teacher 21: ... I am happy ... I know that the world is changing ... we must be flexible.

Teacher 22: ... I am happy ...

Teacher 23: ... It doesn't make a difference ... teachers still need to teach, and learners still need to learn or to study ... it doesn't bring miracle ... we all have the responsibilities to ensure that teaching and learning is taking place.

Teacher 24: ... It is exciting to be exposed to the new way of teaching and learning ... let's get used to it ...

Teacher 25: ... I like to use technology in my class ... you play one video clip and win learners then you teach.

Teacher 26: ... I am happy ... technology is inevitable, we must force ourselves to it ...

Teacher 27: ... I like the initiative ... but must be more interactive rather than providing resources, only.

Teacher 28: ... I feel that it must be blended with the traditional way of teaching ... for example, learners must get a hard copy of a poem ... and write on it all the explanation ...

Teacher 29: ... Discipline is a problem ... they have a huge impact on discipline ...

Teacher 30: ... I do not like it ... due to technical problems ... sometimes it freezes, no Wi-Fi, etc.

Teacher 31: ... I am happy ... learners have resource available ...

Teacher 32: ... I am skeptical ... because learners play with it ...

Teacher 33: ... It is exciting ... because you can download life lesson for them ... as a teacher you talk less, and they discover knowledge on their own.

Teacher 34: ... I am happy ... we are connected ... internet access brings miracles or immediate answers in the classroom.

7.5 Have you been trained to use tablets for educational purposes? If yes, may you elaborate on the nature of training or give more details about your training.

Teacher 1: ... Yes, the school conducted numerous training sessions for the staff.

Teacher 2: ... Yes, there is a lot of training that takes place in this school. You are taken step by step on all the usage of technology in the school.

Teacher 3: ... Not trained to use tablets, we were trained to use the programmes on the tablets, e.g., TYB Portal / IMS / Moodle.

Teacher 4: ... Yes, in-house training.

Teacher 5: ... No.

Teacher 6: ... Yes. Portal, Moodle and IMS Training have been done. Creating, uploading and downloading of lessons and how to push content.

Teacher 7: ... Yes. Especially on how to use the programme.

Teacher 8: ... Yes ... the school equip us with skills on how to use the programme.

Teacher 9: ... No, they didn't train us on how to use a tablet for teaching and learning.

Teacher 10: ... Yes. They trained us on Portal, Moodle and LMS to download lessons.

Teacher 11: ... Yes. They have induction programme on how to use the system.

Teacher 12: ... Yes. They show you step by step on how to use the programme.

Teacher 13: ... Yes.

Teacher 14: ... The programme is installed in the tablet then training is about how to use the programme.

Teacher 15: ... No.

Teacher 16: ... Yes ... they show us how to download textbooks ...

Teacher 17: ... Yes ... on how to use TYB Portal / IMS / Moodle for educational purposes.

Teacher 18: ... Yes ...

Teacher 19: ... Yes ...

Teacher 20: ... Yes ... on how we download.

Teacher 21: ... No ...

Teacher 22: ... Yes. I know how to use the programme to access study materials.

Teacher 23: ... No ... they assumed we will know how to use tablets because we have our personal devices.

Teacher 24: ... Now I know how to use TYB Portal / IMS / Moodle because the school offered that training to us.

Teacher 25: ... Yes ... they shown us how to download a textbook or lesson.

Teacher 26: ... Yes ... they train us on how to use the programme.

Teacher 27: ... Yes ... they support ...

Teacher 28: ... Yes ... there were training ...

Teacher 29: ... Yes ... there were numerous workshops regarding the programme.

Teacher 30: ... Yes ... I know how to access textbooks, upload, create and so forth ...

Teacher 31: ... Yes ...

Teacher 32: ... Yes ... now I know how to use TYB Portal / IMS / Moodle in my classroom.

Teacher 33: ... They train us on how to use the programme ... to access information in the programme ... not teaching or showing us best practice.

Teacher 34: ... Yes ... the school trains us on how to use TYB Portal / IMS / Moodle.

7.6 What did you expect your learners to do with tablets in the classroom settings to achieve the learning objectives?

Teacher 1: ... Use it as a learning tool to access their work.

Teacher 2: ... Always have e-textbooks, download presentations, tasks and resources for the subject.

Teacher 3: ... Complete short tests (informal), download notes, watch educational videos and make use of their electronic textbooks.

Teacher 4: ... Operate a textbook.

Teacher 5: ... Downloading notes and research on the internet using the tablets.

Teacher 6: ... Highlight important facts, add notes to content and use interactive content.

Teacher 7: ... To download textbooks and study / read.

Teacher 8: ... To watch educational video clips.

Teacher 9: ... To search for information on the internet, download notes and textbooks.

Teacher 10: ... To complete tasks at hand, using textbooks, diagrams and other information in the textbooks.

Teacher 11: ... must make use of their electronic textbook ...

Teacher 12: ... To keep them in their bags until they were asked to take out and follow instructions.

Teacher 13: ... To download the lessons and to study

Teacher 14: ... They must be able to download and use that information to complete their tasks.

Teacher 15: ... I want them to be able to access textbooks, videos and lessons.

Teacher 16: ... They must find the page and start working.

Teacher 17: ... They must follow instructions ...

Teacher 18: ... To download a textbook.

Teacher 19: ... To download ...

Teacher 20: ... They must know how to download lessons, textbooks, etc.

Teacher 21: ... I want them to download school related work.

Teacher 22: ... To work.

Teacher 23: ... To download the lesson and to find the correct page ...

Teacher 24: ... To follow instructions ...

Teacher 25: ... To access textbooks, lessons and activities.

Teacher 26: ... To download the lesson and activities.

Teacher 27: ... I want them to be able to share information ...

Teacher 28: ... To watch video clips and teachers' PowerPoint presentation.

Teacher 29: ... Access internet when they are asked to do so ...

Teacher 30: ... able to find the page we are working on ...

Teacher 31: ... To download and help each other where possible.

Teacher 32: ... To take and follow instructions given by the teacher.

Teacher 33: ... To download and operate at the same time.

Teacher 34: ... Must be able to access their books and work.

7.7 Are they doing exactly what you are expecting from them to do (referring to 7.6)? If not, what needs to be done to ensure that your expectations are addressed?

Teacher 1: ... Not all the time ...

Teacher 2: ... Yes, they are doing what is expected from them.

Teacher 3: ... Most of the time. Sometimes learners use tablets for non-educational purposes, e.g., playing games – learners simply need to be monitored when using tablets in class.

Teacher 4: ... Social media should be excluded from educational-purposed tablets.

Teacher 5: ... Yes.

Teacher 6: ... No. Learners are not mature enough as yet to see device as a learning instrument rather than a playing tool.

Teacher 7: ... Not always ... often I caught them playing unnecessary games, texting ...

Teacher 8: ... Yes ...

Teacher 9: ... Yes ... because many of them do not have data at home to download schoolwork ...

Teacher 10: ... Yes ... some of them they open the reader or textbook and study ...

Teacher 11: ... No ... they got an opportunity to play ... there must be control in place what needs to be done and how ...

Teacher 12: ... No ... they watch other sites ... teachers must be hands-on and check or monitor what they are doing ...

Teacher 13: ... No ... the level of noise just goes up ... rather tell them what to do or give them more work ...

Teacher 14: ... No ... they play games that are irrelevant to education ... I suggest that educational games must be installed in the programme as well ...

Teacher 15: ... Yes ...

Teacher 16: ... No ... few of them will be doing something else ... except learning ... I think we need to change their mindset and understand that tablets are meant for learning ...

Teacher 17: ... No ... sometimes you caught them watching videos that are totally unacceptable ... I wish if system itself can block such activities or find some ways of reporting so that a learner will get demerit.

Teacher 18: ... Yes ...

Teacher 19: ... Yes ...

Teacher 20: ... Yes ... they find the page and work.

Teacher 21: ... Yes ... but you must be very vigilant ... they can take chances ...

Teacher 22: ... Yes ...

Teacher 23: ... Yes ... they work ...

Teacher 24: ... No ... they watch other stuff ... a teacher must be the one who displays videos in the overhead projector, not learners.

Teacher 25: ... Not at all ... learners must be monitored ...

Teacher 26: ... Yes ... they sometimes follow instructions ...

Teacher 27: ... Yes ... they work.

Teacher 28: ... No ... it is difficult to monitor each learner ... the system must be set-up in the way that will assist us as teachers to monitor them.

Teacher 29: ... Yes ...

Teacher 30: ... Yes ...

Teacher 31: ... Yes ...

Teacher 32: ... No ... since they are immature ... they play games ... games must be related to learning ...

Teacher 33: ... Yes ...

Teacher 34: ... Yes ...

7.8 How did you feel when tablets were introduced (Happy / Excited / Imposed)?

Teacher 1: ... Imposed.

Teacher 2: ... Excited.

Teacher 3: ... Excited and anxious as it was new to me.

Teacher 4: ... Happy.

Teacher 5: ... Excited.

Teacher 6: ... Excited.

Teacher 7: ... Happy.

Teacher 8: ... Happy.

Teacher 9: ... Happy.

Teacher 10: ... Excited.

Teacher 11: ... Happy.

Teacher 12: ... Happy.

Teacher 13: ... Excited.

Teacher 14: ... Excited.

Teacher 15: ... Imposed.

Teacher 16: ... Imposed.

Teacher 17: ... Happy.

Teacher 18: ... Happy.

Teacher 19: ... Happy.

Teacher 20: ... Imposed

Teacher 21: ... Excited.

Teacher 22: ... Excited.

Teacher 23: ... Excited.

Teacher 24: ... Happy.

Teacher 25: ... Happy.

Teacher 26: ... Excited.

Teacher 27: ... Imposed.

Teacher 28: ... Happy.

Teacher 29: ... Imposed.

Teacher 30: ... Happy.

Teacher 31: ... Happy.

Teacher 32: ... Excited.

Teacher 33: ... Excited.

Teacher 34: ... Excited.

7.9 How do you view teaching? What counts as teaching in a classroom setting?

Teacher 1: ... Learners must be able to understand and apply the content knowledge to real life ...

Teacher 2: ... Inclusive education, regular classes and support given to learners so that they can learn. Learner involvement, teaching and learning to take place.

Teacher 3: ... Helping learners to understand certain concepts / topics in a fun and interesting way.

Teacher 4: ... Enlightening students.

Teacher 5: ... Learners being able to do activities and show understanding by responding well.

Teacher 6: ... When learners can go home understanding and grasping knowledge.

Teacher 7: ... Teaching is an art of unpacking information until learners understand what you are saying.

Teacher 8: ... Be in class, on time and give direction to the learners ...

Teacher 9: ... Teaching means that you are learning everyday ... never underestimate the opinion of other learners. What counts is that you are growing everyday ...

Teacher 10: ... Teaching means sharing knowledge with learners under your care ...

Teacher 11: ... It means developing learners, holistically ... values need to be taught as well, in the classroom settings ...

Teacher 12: ... Never give up, one day a child will realise his / her mistakes or misconceptions.

Teacher 13: ... Impart knowledge and give them examples so that they will understand ...

Teacher 14: ... Teaching means that a teacher must be able to use any tool to help a child to understand.

Teacher 15: ... Is the process of making an individual child understand what is expected of him / her ...

Teacher 16: ... Means to engage ...

Teacher 17: ... It is the acquisition of knowledge ...

Teacher 18: ... Every learner can learn ... do not exclude ... include all.

Teacher 19: ... Teaching means patience ... if a child didn't understand you today ... use another approach or examples tomorrow until the child understand.

Teacher 20: ... Means that you are a life-long learner ...

Teacher 21: ... It means that knowledge that you are teaching them do not count ... until they realise that you care for them ... therefore what counts is caring ... not teaching ...

Teacher 22: ... Teaching is about exploring new ways / approach to make an individual understand ...

Teacher 23: ... It's when you go an extra mile (extra lessons, showing video clips, educational tour, etc.) to ensure that learners learn something at the end of the day.

Teacher 24: ... It is whereby an individual teacher is unpacking the information ...

Teacher 25: ... Is the process of promoting interaction in the classroom ...

Teacher 26: ... It is about selecting knowledge in the curriculum / CAPS that needs to be taught ...

Teacher 27: ... If one can improvise and innovative ...

Teacher 28: ... Teaching is to give support ... or ongoing support until everyone understands ...

Teacher 29: ... To assess the strengths and weaknesses of the child and support if necessary.

Teacher 30: ... By embarking on the process of unpacking knowledge ...

Teacher 31: ... As a process of organising meaningful tools and information to enhance learning ...

Teacher 32: ... It is all about demonstrating and acting ...

Teacher 33: ... It is about making someone to understand something ...

Teacher 34: ... Teaching is about showing and illustrating at the same time ... show by example ...

7.10 Is there anything I have not asked or am unaware of that I should know about the introduction of these tablets or the "paperless classroom" initiative in general?

Teacher 1: ... No, that's all.

Teacher 2: ... No.

Teacher 3: ... No response ...

Teacher 4: ... Social media is a concern ...

Teacher 5: ... No.

Teacher 6: ... No.

Teacher 7: ... No.

Teacher 8: ... No.

Teacher 9: ... No.

Teacher 10: ... No.

Teacher 11: ... No.

Teacher 12: ... No.

Teacher 13: ... No.

Teacher 14: ... No.

Teacher 15: ... No.

Teacher 16: ... No.

Teacher 17: ... No.

Teacher 18: ... No.

Teacher 19: ... No.

Teacher 20: ... No.

Teacher 21: ... No.

Teacher 22: ... No.

Teacher 23: ... No.

Teacher 24: ... No.

Teacher 25: ... No.

Teacher 26: ... No.

Teacher 27: ... No.

Teacher 28: ... No.

Teacher 29: ... No.

Teacher 30: ... No.

Teacher 31: ... No.

Teacher 32: ... No.

Teacher 33: ... No.

Teacher 34: ... No.

Protocol 8: Questionnaires for all Learners in Grade 8

8.1 How long you have been using / integrating technology in your lessons?

Learner 1: *No response.*

Learner 2: *I've been using my school tablets for almost two months.*

Learner 3: *I've been using my personal tablets for more than 3 years.*

Learner 4: *... Never.*

Learner 5: *... I've been using it for a month and eight days.*

Learner 6: *... Since the year began (2018).*

Learner 7: *... 2 months.*

Learner 8: *... I've been using technology (tablets) about 27 days.*

Learner 9: *... It has been 2 months.*

Learner 10: *... I have been using technology (tablets) in my lessons for 2 months now.*

Learner 11: *... This is my first year using technology at school ...*

Learner 12: *... I started using technology last year in Grade 7 for my studies.*

Learner 13: *... Two months.*

Learner 14: *... Ever since we have started with school. I think it's about 5–6 weeks now.*

Learner 15: *... I've been using technology for school purposes from the start of this term.*

Learner 16: *... It's been two months.*

Learner 17: *... It is now two years using technology and is very easy to learn how to use it.*

Learner 18: *... I have been using technology in my lessons for about 2 months.*

Learner 19: *... One month.*

Learner 20: *... Since we have started working when school opened on the first week of school.*

Learner 21: *... Two months.*

Learner 22: *... It's my first year using a tablet at school for textbooks or homework or activities.*

Learner 23: *... For 4 years.*

Learner 24: *... We have been using it for many months.*

Learner 25: *... I've been using technology in lessons from Grade 5, and it's been nice.*

Learner 26: *... I have been using technology since Grade 8 and 8 weeks.*

Learner 27: *... I used it last year in Grade 7.*

Learner 28: *... Ever since I came to Sunward Park High. We have been using them apparently for 6 weeks.*

Learner 29: *... Its two years now, I'm using technology in lesson.*

Learner 30: *... I've been using integrated technology for about 2 years.*

Learner 31: ... I have been using technology for 2 years.

Learner 32: ... I have been using it for about 1 year two months.

Learner 33: ... I've been using technology in my lessons since I started Grade 8.

Learner 34: ... 2 years and 2 months.

Learner 35: ... For about 2–3 years.

Learner 36: ... 4 weeks back.

Learner 37: ... Two months back.

Learner 38: ... 5 weeks back.

Learner 39: ... I've been using it for about 4–5 weeks.

Learner 40: ... 2 years and 2 months.

Learner 41: ... 6 lessons.

Learner 42: ... It is 5 years now.

Learner 43: ... I have been using a tablet since the beginning of 2018.

Learner 44: ... I have been using technology in my lessons for 2 years.

Learner 45: ... I have been using integrating technology in my lessons only this year.

Learner 46: ... Irrelevant answer ...

Learner 47: ... We use tablets throughout the whole day.

Learner 48: ... It has been two years from primary to high school and it is my first time to use it for learning purposes.

Learner 49: ... Since from the first day of Grade 8.

Learner 50: ... From the beginning of the year.

Learner 51: ... I've been using it for months.

Learner 52: ... It is my first year using / integrating technology in my lessons.

Learner 53: ... For a long time because we must download some lessons on TYB.

Learner 54: ... It's my first time using technology in school.

Learner 55: ... We download lessons.

Learner 56: ... I have been using technology in my lessons for about 2 months this year.

Learner 57: ... I have been using the technology for the past months and few weeks.

Learner 58: ... I will use it eventually for 6 hours per day in all 9 subjects. I use it for Wi-Fi, password for lessons.

Learner 59: ... I have been using technology for a few months for my lessons.

Learner 60: ... Since 2015, I started using tablets when I was at primary school.

Learner 61: ... It has been 6 weeks.

Learner 62: ... For about 2 months.

Learner 63: ... Have only been using it in Grade 8 so far for all my lessons.

Learner 64: ... I have been using tablets since Grade 7 in Dawn Park Primary School.

Learner 65: ... I started in Grade 5.

Learner 66: ... Since from Grade 4, about 4 years.

Learner 67: ... 2 months.

Learner 68: ... I have been using it for two months now, in all the subjects.

Learner 69: ... I've been using it since I've started Grade 8 on the 17th of January 2018.

Learner 70: ... For now, its 5 weeks.

Learner 71: ... I've been using technology in my lessons for 2 years.

Learner 72: ... I've been using integrated technology for approximately 5 weeks.

Learner 73: ... Since we started this year.

Learner 74: ... I have started using technology in my lesson from Grade 6 at Laer School Van Dyk Primary.

Learner 75: ... I have been using technology for the past two months.

Learner 76: ... 2 years.

Learner 77: ... This year only. I haven't used tablets before Grade 8 although my primary school had electronic boards (interactive boards).

Learner 78: ... I have been using it since Grade 7.

Learner 79: ... It has been a while now, let me say since I've started at Sunward Park High.

Learner 80: ... Since I started being at Sunward Park High.

Learner 81: ... I was using technology in my lessons for 1 year.

Learner 82: ... 1 year. I started when I was in Grade 7.

Learner 83: ... One year and one month.

Learner 84: ... I have been using integrated technology for over three years now.

Learner 85: ... It has been 5 weeks.

Learner 86: ... I have been using / integrated technology in my lessons for 2 years now, since from Grade 7.

Learner 87: ... I have been using it for 2 months now.

Learner 88: ... Since I was in Grade 6.

Learner 89: ... It's about two months.

Learner 90: ... For one year.

Learner 91: ... 2 months.

Learner 92: ... I've been using it this year because in my previous primary school we hadn't got the chance to use tablets.

Learner 93: ... I think it's been 4 weeks or 5 weeks.

Learner 94: ... One year and two months.

Learner 95: ... I have been using technology this year. It is my first time using tablets.

Learner 96: ... 2 years.

Learner 97: ... We sometimes use it for 3 to 4 times a day.

Learner 98: ... I have been using the tablets for 2 years.

Learner 99: ... I've been using technology for about 2 months.

Learner 100: ... For the first two months of 2018 and not in 2017.

Learner 101: ... I have been using technology for 2 months for my lessons.

Learner 102: ... It's been three years.

Learner 103: ... It's been three to four weeks now that we are using technology ...

Learner 104: ... Since Grade 6 in primary school.

Learner 105: ... 2 years.

Learner 106: ... 2 years.

Learner 107: ... I've been using it twice a lesson.

Learner 108: ... Almost for 6 weeks now.

Learner 109: ... I've been using it for a month.

Learner 110: ... 2 months only.

Learner 111: ... 4 weeks.

Learner 112: ... I've been using it for probably 7 weeks. I'm not sure but since from January.

Learner 113: ... A month and some few weeks.

Learner 114: ... Nothing said.

Learner 115: ... I've been using integrated technology in Grade 7 and this year.

Learner 116: ... 2 years, from primary Grade 7 and Grade 8.

Learner 117: ... Since from the day 1 (re-opening of school).

Learner 118: ... Never.

Learner 119: ... It's my first year this year using a tablet.

Learner 120: ... Not a lot of time.

Learner 121: ... It's my first time.

Learner 122: ... I think that the technology we have been using is fine because we do homework in the tablet.

Learner 123: ... Since the beginning of the year.

Learner 124: ... 3 lessons.

Learner 125: ... It's been about mostly all our lesson we've been using technology.

Learner 126: ... It's a year and one month.

Learner 127: ... One year.

Learner 128: ... 3 to 4 times a day.

Learner 129: ... 4 weeks.

Learner 130: ... From Grade 7.

Learner 131: ... Since the school started.

Learner 132: ... Since January 2018.

Learner 133: ... I use this technology every day and in every lesson.

Learner 134: ... It has been 25 days since I have arrived at Sunward High.

Learner 135: ... 1 year and 1 month.

Learner 136: ... This is my first year using technology in my lessons.

Learner 137: ... 1 year and 1 month.

Learner 138: ... 1 year.

Learner 139: ... 1-week couple of days.

Learner 140: ... 1 year and 1 month.

Learner 141: ... This is my first year using technology in my classroom.

Learner 142: ... I have been using technology in each lesson.

Learner 143: ... No response ...

Learner 144: ... I've been using technology in my lesson from the 25th of January 2018.

Learner 145: ... It is my first year, using technology in the classroom.

Learner 146: ... It is my first time.

8.2 How do you feel about using tablets as a learning tool in your classroom?

Learner 1: ... I feel happy because it helps me to learn fast, and it makes my school bag less heavy.

Learner 2: ... I feel good because if I don't understand a word, for example, I go to the online dictionary and get the meaning of the word.

Learner 3: ... I, as a learner, I feel good.

Learner 4: ... I feel it is good to use tablets in the classroom and it is much easier for learners to use it in order to access their notes.

Learner 5: ... I think it is a great idea to use tablets in the classroom.

Learner 6: ... It is a privilege to use them.

Learner 7: ... It's helpful to use tablet as a learning tool.

Learner 8: ... I feel happy.

Learner 9: ... It is easy to use, more advanced, paperless and portable.

Learner 10: ... To me it is a privilege to use tablet as my learning tool.

Learner 11: ... I feel like it is easier to understand my schoolwork and make life easier. Now I am not carrying heavy textbooks to school and back home.

Learner 12: ... I am very happy because tablets are much easier to use, and we don't have to carry a lot of textbooks because the textbooks we need are in the tablet.

Learner 13: ... I feel like I am in my own office, sitting, writing the work. I feel happy.

Learner 14: ... I feel very good and is fun. We learn more and have no heavy bags to carry. It is a great privilege for me.

Learner 15: ... I feel good about using tablets for school purposes because we can catch up with work and work faster.

Learner 16: ... Good because we don't carry heavy textbook.

Learner 17: ... Ever since they introduced tablets to school, I felt excited, and this feeling was mutual and know that we won't have to carry heavy textbook.

Learner 18: ... I feel quite great about it because it makes it easy for me.

Learner 19: ... I feel happy because it's faster and convenient.

Learner 20: ... It is an easy to work around with. Tablets help us download lessons and I enjoy working with it.

Learner 21: ... I feel great using tablets.

Learner 22: ... It feels great because you don't have to carry heavy textbooks to school every day.

Learner 23: ... Happy.

Learner 24: ... I feel happy because we use tablets in our school and some schools don't get the opportunity to use them.

Learner 25: ... I feel happy to use it than textbook and it's easier to use and it's also faster when finding pages.

Learner 26: ... I feel good because it also helps me understand more and I feel excited to learn with tablets.

Learner 27: ... It makes it easier because we don't have to carry textbooks.

Learner 28: ... I take it as an advantage because using tablets is easier. When you use a tablet, it is like having everything you need on one tablet / device. So, I feel good using tablets as a learning tool.

Learner 29: ... It feels good using a tablet in classroom. I like it, it is nice using a tablet. I'm enjoying using it.

Learner 30: ... Nice to use a tablet as learning tool because it's better than using a textbook that can get torn.

Learner 31: ... It feels great using tablets.

Learner 32: ... I think it is a good idea, at the same time bad because some people play games in teaching time.

Learner 33: ... I don't really feel great about this because my laptop has connection problems, but I am always able to get all my work done.

Learner 34: ... It's very clever because we can still use Google to ask a question we don't understand, and it makes our bags much lighter.

Learner 35: ... I feel great, because textbooks can make your spinal cord bend, so tablets are good.

Learner 36: ... I feel very happy, it's better than carrying textbooks in school bags.

Learner 37: ... It feels great because you get to be a couple of activities ahead.

Learner 38: ... I feel very happy because it's a very interesting learning tool, compared to the previous grades.

Learner 39: ... I feel happy because a tablet can help focus and keep you awake because it has light ...

Learner 40: ... I don't feel well because lot of children in the class lose concentration easily because they play games.

Learner 41: ... Nice, because it is my first time using technology at school.

Learner 42: ... It feels nice, but the problem is that some learners use it for games not for studying.

Learner 43: ... It feels great to use a tablet in Grade 8.

Learner 44: ... It feels good and useful because we are getting advanced with technology.

Learner 45: ... I felt interested about using tablets as a learning tool in my classroom this year.

Learner 46: ... I feel happy because it helps to do my work faster.

Learner 47: ... I feel good and enjoy using the tablet and I learn more by using it and understand lessons easy and it saves more time.

Learner 48: ... Good, so when you fall behind, you have textbook in your tablets.

Learner 49: ... It's better than carrying textbooks around.

Learner 50: ... It is great because we don't need to carry textbook.

Learner 51: ... I feel good because I could get to know everything in every year.

Learner 52: ... I feel amazed because I am not going to carry both textbooks and books.

Learner 53: ... I feel that it is much easier with the tablets because I don't have to carry heavy textbooks. It's also great because I now have tablet of my own even though my mom is strict about it.

Learner 54: ... I feel great about using them (tablets) because I want to learn / research more.

Learner 55: ... I feel so educated and happy.

Learner 56: ... I feel it is a good opportunity but makes children to not concentrate in class.

Learner 57: ... I feel more comfortable because we don't use big textbooks that will take up all the space on the table and it is easy to look for the page that is wanted.

Learner 58: ... It makes life easier and even how the teachers explain to us at class. For example, normally in some subjects we look at videos about learning skills, it's normally developed our knowledge and mind sets.

Learner 59: ... It's great because you don't have to look at the board or textbooks all the lessons are uploaded in the tablet.

Learner 60: ... I feel happy because we don't have to carry textbooks everyday instead, we do have tablets.

Learner 61: ... It makes me happy because it is easier to read with a tablet than a normal heavy textbook.

Learner 62: ... I feel very proud because we learn more things every day.

Learner 63: ... I feel nice and special because we can't carry textbooks anymore.

Learner 64: ... I feel very happy, but tablets can distract learners at home and during school hours.

Learner 65: ... I feel very happy because we are using what we all like.

Learner 66: ... I feel that we can stop using them ...

Learner 67: ... Good because I learnt many things about it ...

Learner 68: ... I feel good, special and privileged to have an opportunity like this of using tablets in class. When I take out my tablet, I feel so confident and proud of myself.

Learner 69: ... I feel happy because it makes our bags a lot lighter than using textbooks.

Learner 70: ... I felt good because it is good to use tablets more than carrying heavy textbooks.

Learner 71: ... I feel using a tablet in my classroom is great because I can use my tablet to download lessons and my work won't get lost, but tablets can also be distracting and tempt you to play games.

Learner 72: ... I feel good and privileged that we can use tablets with textbooks than carry heavy bags full of textbooks.

Learner 73: ... Happy because of our parents were going to waste money buying textbooks every year. But the problem is that learners go to YouTube and access wrong information.

Learner 74: ... I feel like it is a really great opportunity and some of my fellow classmates use it very wisely and some of my fellow classmates use it reckless.

Learner 75: ... It is light, and we don't have to carry heavy bags all day.

Learner 76: ... It feels good because I can catch up with my work. I would download the lesson and write the work.

Learner 77: ... I really enjoy it. Tablets make things easier, so we don't lose or damage books. We can work easier and faster.

Learner 78: ... I feel really happy because they are helpful.

Learner 79: ... It makes me happy because we don't have to use textbook, we use them (textbooks) in our tablets.

Learner 80: ... I fell it is very helpful because it is much easier to get the information. If you need to make research, you can just do it while working, so you didn't have to wait until you get home.

Learner 81: ... I feel better than using textbooks. Tablets is a good technology device that you can use to download lessons to catch up with your work.

Learner 82: ... I feel great because it is easier to get the information that we need.

Learner 83: ... Good because we are learning in a form that we didn't know. The teachers are teaching us new things and we are learning more.

Learner 84: ... It is nice because you get to know your tablet, work and you also discover new things.

Learner 85: ... I feel excited because it is my first time to use it.

Learner 86: ... I think it is a good idea because our books have been reduced and our bags are lighter which we have a better chance not having back pain.

Learner 87: ... I feel very good about using a tablet as a learning tool instead of using a real book. It helps because our bags are not very heavy.

Learner 88: ... I like it because it's helpful.

Learner 89: ... Happy because it is helping me when I want to Google things that I don't know on the internet.

Learner 90: ... Happy because there are less books in my bag.

Learner 91: ... I feel happy because it's a new thing to me using a tablet in the classroom.

Learner 92: ... I feel very happy and great as it helps us experience the new way of learning using technology in the classroom.

Learner 93: ... I feel it's better than carrying textbooks every day, walking around with them, with a heavy bag.

Learner 94: ... I think it's more effective and efficient.

Learner 95: ... I have no problem because it does not waste time and save money because when using the textbook, it gets lost, and pages get lost even books are heavy to carry them.

Learner 96: ... It feels good to use tablets.

Learner 97: ... I think it makes it easier for us because we don't have to carry heavy textbooks. I think it's great to use tablets as a learning tool.

Learner 98: ... I feel good because I will never carry many books anymore.

Learner 99: ... I feel it is good because it helps learners carry fewer heavy bags and backs getting sore.

Learner 100: ... I think it is better because when we at primary school the textbook was heavy, and bags are not heavy anymore.

Learner 101: ... it's much easier and faster than using a hard copy textbook.

Learner 102: ... It is useful and easier to handle it than textbooks.

Learner 103: ... It feels great because now we don't need to carry too much textbooks to school.

Learner 104: ... I don't like these things. They are just too much work and very disruptive.

Learner 105: ... Happy, because it helps us...

Learner 106: ... I feel good because it's so different from other high schools but sometimes it's a bad idea because children play games in class instead of learning.

Learner 107: ... It's okay, but tablets are going to distract the children.

Learner 108: ... I feel very happy and proud.

Learner 109: ... I've been using it for a month.

Learner 110: ... I feel very excited ...

Learner 111: ... Good, happy...

Learner 112: ... I feel it is a good thing because it's easier for us ... we don't carry textbook.

Learner 113: ... I feel good and excited.

Learner 114: ... Not good. Because sometimes some learners just play games and end up not having any concept of what is happening concerning learning ...

Learner 115: ... Good because our bags are not heavy ...

Learner 116: ... I feel happy because if there were no tablets it was going to be hard for us in Sunward Park High School ...

Learner 117: ... I feel very happy because it's very easy to learn...

Learner 118: ... It feels fine, but some teachers don't help us with our tablets.

Learner 119: ... It is better if we don't finish notes, we finish at home.

Learner 120: ... I find it very nice but other kids just use it to chat in class.

Learner 121: ... I don't feel good because some learners play games and WhatsApp in class during the lesson.

Learner 122: ... Fine, because we are using the tablet that has textbooks to learn.

Learner 123: ... It disturbs the children because some text with their friends from other schools while we are learning. Some play music and games while the lesson is in progress. I don't like these things because they disturb and it's a waste of money.

Learner 124: ... I feel awesome using our tablets at classroom a tool for learning ...

Learner 125: ... I find it easy and very helpful because you can search for words and poems if you need to do that.

Learner 126: ... I feel very happy, because it easier and it also helps us because we don't carry more books.

Learner 127: ... I feel fine with it because now learning is much easier ...

Learner 128: ... I feel relieved because it's easier than using textbooks.

Learner 129: ... I love using tablets because we can Google for all the things that we do not understand, and we don't have to carry textbooks.

Learner 130: ... I feel that it's right because it helps not to carry a lot of textbooks to come to school and not coming with big books.

Learner 131: ... I feel it is teaching us more about technology.

Learner 132: ... I feel is enriching my computer skills and gives easy access to information.

Learner 133: ... I feel very excited to use these tablets as a learning tool in my classroom.

Learner 134: ... I feel happy because I don't have to carry heavy books filled with textbooks and textbooks cost too much money.

Learner 135: ... It feels good.

Learner 136: ... I feel as if it is a destructive initiative because children may be playing games on their tablets.

Learner 137: ... It feels very good ...

Learner 138: ... I always look forward for the next day and I feel excited and happy.

Learner 139: ... I felt special because it was my first time using tablet as a learning tool.

Learner 140: ... It feels good ...

Learner 141: ... I feel happy because we don't carry too much books and textbooks

Learner 142: ... I feel very happy because it's a huge advantage to not carry heavy textbooks and bags.

Learner 143: ... It is very easy because we don't have to carry a lot of books. It is less books.

Learner 144: ... It feels great because at the same time you can search your work during the lesson. I'm able to have my lesson full time.

Learner 145: ... I feel it is more effective than textbooks.

Learner 146: ... It is better than using textbooks ...

8.3 Can you tell me about how you use tablets in your classroom?

Learner 1: ... We use the tool (tablets) to download some school information (teacher's notes, textbooks, class activities, homework and video clips).

Learner 2: ... I go to textbook and write homework.

Learner 3: ... No response ...

Learner 4: ... Still in the process of buying one tablet that I will use in my classroom.

Learner 5: ... We open up our tablets when we told to do so, we download the lesson or open up e-textbook and follow instruction from there ...

Learner 6: ... We use them for textbooks and lessons (access and study) and some learners use them for games.

Learner 7: ... We download lessons.

Learner 8: ... I download lessons and do what teachers told us what to do.

Learner 9: ... We use TYB mostly and sometimes SNAPLYFIG (programmes that help them access e-lessons and e-textbooks).

Learner 10: ... I download lessons and use the textbooks in the tablet.

Learner 11: ... We use tablets to download activities to do in class or for homework and for reading stories.

Learner 12: ... I use my tablet to download lessons and to download videos based on the lessons.

Learner 13: ... We use our tablets when we search for the page of the textbook and download the work.

Learner 14: ... We take them out then we open a network on Chrome or internet browser called the TYB Portal. Then we click on Grade 8. Then we select the subject, then download, then term, then the lesson number, then the notes or worksheet of the day.

Learner 15: ... I only use tablets when our subject teacher tells us to use or take it out.

Learner 16: ... We use them as our textbooks and to download lessons.

Learner 17: ... We download textbooks and download lesson then we refer to the lesson and it also helps us study.

Learner 18: ... We download classroom lessons and take down the notes in our exercise books. It also consists of our textbooks that we also use for activities.

Learner 19: ... We have a SNAPPLIFY APP where our textbooks are.

Learner 20: ... We use them to download our activities, textbooks and notes and to write down notes we get from the TYB Portal into our books.

Learner 21: ... We connect to the school's Wi-Fi and download the lessons on our tablets.

Learner 22: ... It's good because we don't have to take out heavy textbooks for schoolwork.

Learner 23: ... I read on the textbook on my tablet.

Learner 24: ... We use our tablets when our teachers tells us to do so because some learners take out their tablets without the teacher's permission then they play games.

Learner 25: ... We use it for research and for dictionaries, textbooks, and class lessons.

Learner 26: ... We take tablets out when the teacher says so then we download the lesson after she/he explains then we do the activity and copy down the notes.

Learner 27: ... I used my tablet for textbooks and for the lessons we do. It is easier than carrying textbooks.

Learner 28: ... We use them as textbooks, notes activities and worksheets.

Learner 29: ... We use tablets for textbooks and us also "Log in" on TYB for some lessons.

Learner 30: ... We use tablets in the classroom, without a tablet there's no working.

Learner 31: ... It feels great because we write small work.

Learner 32: ... I only use tablet for textbooks and downloading.

Learner 33: ... We use our tablets or laptops regularly; we download and search for meanings of words.

Learner 34: ... We use them for textbooks, reading books, going to the internet, and downloading certain lessons that need to be downloaded.

Learner 35: ... I use my tablet as a school learner.

Learner 36: ... We download textbooks in our tablets. Some subjects are in the TYB Portal, so we download lessons.

Learner 37: ... Yes, you just download lessons and learn on textbooks.

Learner 38: ... Check lessons on TYB and use SNAPPLIFY for textbooks.

Learner 39: ... We use tablets to download textbooks and lessons and also to download reading books.

Learner 40: ... I only use it for textbooks and reading.

Learner 41: ... We use tablets for our textbooks, and we use it for studying and Google.

Learner 42: ... We use our tablets to download textbooks and lessons.

Learner 43: ... We use tablets for textbooks and calculating Math problem with the calculator.

Learner 44: ... We download lessons and textbooks and use it for reading purposes.

Learner 45: ... I use tablets for school purposes only and to keep my parents' contact numbers in case of emergency, I can call them.

Learner 46: ... I use it for lessons, and I don't do what other people are doing, I do what the teachers asked me to do.

Learner 47: ... We download lessons and textbooks from them so that we don't copy / write work from the chalkboard because it takes time.

Learner 48: ... I open my textbooks or lessons that copy from the tablet.

Learner 49: ... To learn about different subjects.

Learner 50: ... We use it to do our lessons by opening textbooks and researching information for the lessons.

Learner 51: ... We use tablets for textbooks, internet and assignment.

Learner 52: ... I wait for the teacher to instruct us to take them out or when doing corrections or classwork.

Learner 53: ... I use my tablet for textbook and to download lesson in every subject. Sometimes I download the school magazine or a school issue book for every term, last year.

Learner 54: ... We use them to access internet most of the time and using SNAPPLIFY for textbooks.

Learner 55: ... We use the tablets to go download textbooks.

Learner 56: ... We use it to download textbooks and to do classwork.

Learner 57: ... We use the tablets by going to TYB, to download slides, videos and worksheets that need to be done.

Learner 58: ... We use tablets if the teacher instructed us to download textbooks, SNAPPLIFY and also download lessons, maybe for homework, classwork or activities.

Learner 59: ... We use tablets in class for lessons.

Learner 60: ... Yes, I can download the textbook for lesson in the TYB.

Learner 61: ... We use the tablets for textbooks and assignments.

Learner 62: ... I take out my tablet when I'm told to do so and use my textbook I'm ahead or behind with my work.

Learner 63: ... We use it to download lessons and open our textbooks.

Learner 64: ... I open my textbooks and keep downloading lessons on TYB.

Learner 65: ... I use it for downloading school things and important work.

Learner 66: ... I use it to log in to TYB and textbooks.

Learner 67: ... I use it to learn and study some questions.

Learner 68: ... As soon as we get to class, we take out our books and greet the teacher, we only take out our tablets when they tell us to do so.

Learner 69: ... I use it to log in my textbooks and download some lessons on TYB of all subjects.

Learner 70: ... I have textbooks in them, we just go into it or download lessons.

Learner 71: ... We use tablets to download lessons with the school Wi-Fi and use tablets to enter our textbooks.

Learner 72: ... We log in and go to the textbooks and presentation the teacher made to read.

Learner 73: ... Use them for textbooks, TYB to download more notes.

Learner 74: ... I use my tablet to download documents (lessons) and to have access to my textbook.

Learner 75: ... We use them to download lesson and for textbooks.

Learner 76: ... In my classroom, we use tablets to download the lesson.

Learner 77: ... We use textbooks and TYB. Our tablets have a SNAPPLIFY APP that has our textbooks.

Learner 78: ... We open the textbook and go to the page we need, or we download the lesson.

Learner 79: ... We use our tablets in TYB and we download lessons and videos to help us in our learning processes.

Learner 80: ... I use my tablet to research words I don't understand and for the textbooks which are helpful, and I download books to read when I have nothing to do.

Learner 81: ... We use tablets by using SNAPPLIFY in the tablets and TYB also.

Learner 82: ... I use my tablet for my textbooks and to get some information.

Learner 83: ... We use tablets to download the notes and investigate our textbooks, the positive part of using the tablet we are learning new things and knowing more about technology.

Learner 84: ... I use my tablet for textbooks and to download things on TYB and they are very helpful.

Learner 85: ... I use it when we do schoolwork. I play school games with it.

Learner 86: ... We use our tablets in our classroom when we open our textbooks and / or download lessons so we can do them at home.

Learner 87: ... I use my tablet as a textbook and some of our lessons are also there.

Learner 88: ... I use it as a textbook.

Learner 89: ... I use it for textbooks, lessons and researching.

Learner 90: ... We read from them.

Learner 91: ... Because we download SNAPPLIFY so that we will find our textbooks there.

Learner 92: ... We use tablets for lessons and when we need textbooks.

Learner 93: ... We download textbooks / lessons and learn from them using our school Wi-Fi.

Learner 94: ... When need to use the textbook we go to the tablet for the textbooks.

Learner 95: ... I download lessons or watch videos. I don't use it that much. I use it also for reading or Google.

Learner 96: ... We use tablets for learning.

Learner 97: ... We click SNAPPLIFY and click the textbook that you are instructed to enter in.

Learner 98: ... For textbook and the lesson.

Learner 99: ... We use tablets to work in classroom – downloading lessons, worksheet and Google. We use them very good ...

Learner 100: ... Teachers would tell us to take out our tablets to use our textbook and write our work.

Learner 101: ... We use them for textbook and for downloading notes.

Learner 102: ... I mostly use my textbooks but if I need an answer, I use Google.

Learner 103: ... We use our tablet for learning and download work from SNAPPLIFY.

Learner 104: ... We just download the lessons, notes and open the textbooks, which have problems.

Learner 105: ... Most children use it to play games in the classroom.

Learner 106: ... We use our tablets only when we must use the textbooks or when we go to TYB.

Learner 107: ... We use our tablets in class because of our textbooks that are loaded onto it.

Learner 108: ... I only use my tablet when the teacher says we should.

Learner 109: ... We download the lessons; we write the work. That's all I can tell you.

Learner 110: ... I use it for my textbooks and to download.

Learner 111: ... By using textbooks and downloading lessons by the TYB.

Learner 112: ... I use SNAPPLIFY to open my textbooks and I also download lessons.

Learner 113: ... We use our tablets for downloading lessons on TYB.

Learner 114: ... There is this application called SNAPPLIFY which stores all the Grade 8 textbooks for learning which requires an email account for using and a password which you create and use.

Learner 115: ... I use them when the teacher says we must take out and for textbooks only.

Learner 116: ... We use our tablet for education and others use it for games.

Learner 117: ... We use our tablets for textbooks and download lessons from TYB – Train Your Brain.

Learner 118: ... We use them for fine or joy.

Learner 119: ... We download new lessons and homework. We can study.

Learner 120: ... We use it for textbooks and reading. We also use it for studying.

Learner 121: ... I use my tablet only when the teacher orders me to use it.

Learner 122: ... Some use them for games not for textbook and some they don't have textbook.

Learner 123: ... We download our lessons on TYB and we use textbooks during class.

Learner 124: ... We use it for textbooks.

Learner 125: ... We use tablets to find lessons and activities.

Learner 126: ... We go to SNAPPLIFY and choose which subject and we get to that textbook and learn.

Learner 127: ... We take out tablets when needed, when a command is given to download a lesson, I do so. I also use the textbooks in my tablet to do activities required to ...

Learner 128: ... We use them as textbooks and download the lessons and PowerPoint to study.

Learner 129: ... We get more textbooks and sometimes we go to TYB and download PowerPoint to write in our books.

Learner 130: ... I use it for my textbooks and the TYB for school when they want us to take it out.

Learner 131: ... We use them for textbooks.

Learner 132: ... To get access to internet and access to our textbooks.

Learner 133: ... I use my tablets by accessing my textbooks in the classroom.

Learner 134: ... I use my tablet by downloading lessons and we have SNAPPLIFY which have our textbooks. We even go on Google to Google some work. Our teachers told us to Google but sometimes our Wi-Fi does not allow us.

Learner 135: ... We use them for textbooks and downloading educational video.

Learner 136: ... We use the tablet by opening into our textbooks because the textbooks are in the tablets.

Learner 137: ... We download the lessons we are going to write about ...

Learner 138: ... I use it for my textbooks and nothing else, the rest I do it on my phone.

Learner 139: ... Disadvantages – your tablet can break, and you want to have textbooks to learn / read. Challenges – network sometimes doesn't work well.

Learner 140: ... We use them for textbooks and downloading educational videos.

Learner 141: ... We open an App called SNAPPLIFY where we will find textbooks.

Learner 142: ... Download lessons, look for textbooks and watch videos of a lesson.

Learner 143: ... We use them for textbooks or to search words we don't know.

Learner 144: ... I have a SNAPPLIFY App on my tablet to let me have textbooks. I have TYB to download my lessons.

Learner 145: ... I have books on my tablet making it easier to read.

Learner 146: ... I download my lessons on TYB or I go to my textbooks in my tablet.

8.4 Can you tell me more about the benefits, or disadvantages and/or challenges of using tablets as a learning tool or resource for teaching and learning?

Learner 1: ... The learner will play games while the teacher is teaching and go to WhatsApp and other social media (Disadvantage).

Learner 2: ... When it rains the textbooks can get wet (because there are so many, and it is difficult to protect them from bad weather), and on the other side it is easy to protect one tablet from the rain of bad weather (advantage).

Learner 3: ... We use e-Learning because we can access textbooks in our tablets.

Learner 4: ... It is much easier to use a tablet as a resource (advantage).

Learner 5: ... It makes our bags lighter, by putting all our textbooks on the tablet. It can be used as an alternative for children who struggle to see on the board, now they can look on their tablets.

Learner 6: ... Sometimes it is hard / very difficult to find some lesson.

Learner 7: ... We can use our devices to download textbooks.

Learner 8: ... The benefit is to not carry textbooks. The disadvantage is that learners play games that are not relevant to schoolwork.

Learner 9: ... Easy to download video clips as a learning channel, it is easy to get access to internet and it's use often to make me, or other learners understand more about lessons we have learnt on that day.

Learner 10: ... The benefits is that we can download lessons. The disadvantage is that it easily be stolen.

Learner 11: ... The benefits are that people understand the work easily and the damage of textbooks are very low.

Learner 12: ... The disadvantage is that sometimes learners don't use tablets for school purposes but use them for games, music, and other purposes.

Learner 13: ... It is difficult to download the work when the battery is low and sometimes, they (learners) steal it.

Learner 14: ... Benefit – it's good and fun to learn with. Disadvantage – stealing. Challenge – some learners do not know how to use a tablet and have a problem of lacking behind with their work.

Learner 15: ... Faster working can be since the work is on the tablet rather than the board, but when I lose focus, I stop using it for school use / purposes and do something else.

Learner 16: ... Some learners use tablets to chat and play games.

Learner 17: ... It benefits us by helping us learn and study but at the same time it can also distract a learner because you may either put games, videos, etc.

Learner 18: ... Yes ... the advantage is that we carry less books to school because our textbooks are loaded in the tablets and the disadvantage is that our tablets sometimes can be broken or need to be charged.

Learner 19: ... Benefit – is that we all learn together, advantages – is that we don't carry a lot of textbooks, and disadvantages – is that they can break easily.

Learner 20: ... I have never had a challenge with working with tablets so far.

Learner 21: ... The tablet could break and will not be present at school which might lead to falling behind with work.

Learner 22: ... The disadvantage is that the tablet might get stolen or broken and need to go to the repair shop.

Learner 23: ... Your tablet can break, and you won't have a tablet anymore.

Learner 24: ... There are challenges because some of tablets get stolen, some of the tablets crack and when they crack, they can't touch / work and some of the learners won't be able to write homework or classwork.

Learner 25: ... Charging is a problem sometimes it starts making errors.

Learner 26: ... The challenges are that some of our tablets have problems, so when we tell the teachers they shout at us as if it was our problem. The disadvantage is that the battery can get low, and you can't do your work in time.

Learner 27: ... Some learners do not know how to download the lessons we do in class.

Learner 28: ... The benefits of having tablets as a learning tool is that when you are studying something you can go to Google and use the dictionary and you can use lot of things to enjoy it because it is easier to use it.

Learner 29: ... Tablets are compressed with a thin layer of polymer which forms a skin-like film over tablets.

Learner 30: ... The good thing about a tablet is that you can “zoom-in”, in case if you don’t see. We can also note things down with our tablets.

Learner 31: ... It cracks.

Learner 32: ... The benefits is that we can reduce the books we are carrying. Disadvantage is that some people don’t do their work because of games. Challenge: sometimes your tablets battery gets low while you are using it.

Learner 33: ... Sometimes your laptop or tablet gives you problems with connecting to the Wi-Fi.

Learner 34: ... When the tablet cracks you won’t be able to access the textbooks and it takes a lot of days for it to be renewed.

Learner 35: ... Some kids could play / download games. Use their tablets as their cellphones.

Learner 36: ... The Wi-Fi is very slow, and some get cracked and / or ink is out.

Learner 37: ... The disadvantages are games on your tablets.

Learner 38: ... The benefits are that I don’t have to carry a load of books in my bag. The disadvantages are that I can use access to the internet for unnecessary reasons.

Learner 39: ... The benefit is that we can get the latest things on the internet. The disadvantages are that not everyone can afford tablets and sometimes there is loadshedding, so some children come to school with low battery in their tablets.

Learner 40: ... People lose concentration in classes. They play games during the lesson. They also don’t do work.

Learner 41: ... Most children don’t concentrate on their schoolwork because they are playing games.

Learner 42: ... Tablets make people because they do learn. They play games in class when it’s time to study and learners do not know what to study.

Learner 43: ... When you use a tablet the battery might go flat, or you forget to charge the tablet before the lessons.

Learner 44: ... The tablets help us not to carry books and helps us with some cycle tests and the challenge is that the tablet might have a problem.

Learner 45: ... Downloading lessons is hard because sometimes we can't download the lessons that we are supposed to learn.

Learner 46: ... My tablet gives me problems when I need to download my lessons.

Learner 47: ... We learn how to research and to download lessons on our own without educators' help.

Learner 48: ... People / learners get destructed easily in class due to the use of tablets.

Learner 49: ... No response ...

Learner 50: ... People / learners can play games in class.

Learner 51: ... You will need to try and ignore it and listen to the teacher.

Learner 52: ... The benefits is that you don't need to carry textbooks, but the disadvantages is that it might fall and break screen or they would steal it.

Learner 53: ... It is a challenge because the tablet might get stolen because most people know that Sunward Park uses the tablet.

Learner 54: ... Benefits help by the way of textbooks, if I was still using the ordinary textbooks, I wouldn't be able to finish my work.

Learner 55: ... We benefit if you download textbooks and get distinctions.

Learner 56: ... It is a challenge because the tablet might get stolen because most people know that Sunward Park High students do have tablets.

Learner 57: ... Sometimes our tablet can't connect to the school Wi-Fi so that's a big challenge to us ... because we are not going to get access to internet, textbooks, videos, etc.

Learner 58: ... Disadvantages are: sometimes the school Wi-Fi – is extremely slow to enable us to connect and sometimes they give us videos that we normally do not understand.

Learner 59: ... Disadvantage: some learners play games.

Learner 60: ... They might steal my tablet, or it can get lost somewhere I do not know.

Learner 61: ... The tablets are expensive and people inside and outside of school intend to steal them.

Learner 62: ... Some people play with their tablets, and they don't work in class. It can also break then I will not be able to use my textbooks.

Learner 63: ... Our bags are lighter. We also understand more ...

Learner 64: ... Learners are playing games and YouTube or Google during class time.

Learner 65: ... Tablets can easily distract your mind.

Learner 66: ... Children play games and download the wrong things.

Learner 67: ... It promotes effective learning because there is no disadvantage or challenges.

Learner 68: ... The advantages are: we make our bags lighter by carrying textbook and helps us love school because everyone loves tablets. The disadvantages of using tablets in class is that some learners are less concentrating because some of us buy / download games on it.

Learner 69: ... We might download games, upload videos and pictures. We might distract learners from learning.

Learner 70: ... the advantage is that sometimes the Wi-Fi takes long time to work so we must wait for it.

Learner 71: ... There are many challenges of using tablets in classrooms because learners use their tablets to play music or watch videos when they are supposed to be downloading lessons or writing work.

Learner 72: ... It's easy and quicker to use but its distracting learning and teaching. It can also be stolen by anyone.

Learner 73: ... By being on YouTube to access unnecessary information, pictures and playing games.

Learner 74: ... One advantage is that I don't have to carry a heavy school bag. But one challenge is having to know that other children are failing because of playing games while a lesson has been given / in progress.

Learner 75: ... Benefits: bag is lighter, not a lot of books to carry. Challenges: tablets may freeze, battery may be low and may not want to download lessons.

Learner 76: ... No challenges ...

Learner 77: ... Advantage: our bags aren't heavy. Disadvantage: learners can play games even during the lesson.

Learner 78: ... Disadvantages: when your battery become low you can't do anything or sometimes it jams.

Learner 79: ... The benefits we have is: we learn more, and the disadvantage is that your tablet can break then you won't have it anymore.

Learner 80: ... Well, the benefits are that we don't have to be carrying textbooks in our bags and the disadvantage is that it might get stolen.

Learner 81: ... There are no challenges ...

Learner 82: ... It can be broken, and you do not have anything for learning in the classroom.

Learner 83: ... As I am at Sunward Park High School it is an E-Learning school, so we are having free Wi-Fi and someone who is helping us with the tablet. Sometimes it's not easy to get into TYB for notes and more. Disadvantage: many learners do not use tablets for schoolwork / needs and more.

Learner 84: ... The disadvantage is that children do not listen to the educators when they are busy with their tablets.

Learner 85: ... Disadvantage: Wi-Fi is a problem, sometimes it is difficult to access internet. Advantage: it can download schoolwork.

Learner 86: ... Using tablets is also a disadvantage because not only in our classroom we open our tablets but play games while the teacher is teaching and struggle during test / exam time because we do not listen to teachers.

Learner 87: ... We know that we don't have to pay money for textbook when they are damaged because we use tablets. The disadvantage is when your tablet is damaged you will fall behind with your work.

Learner 88: ... It allows us to research something if we don't understand it, but it is sometimes distracting.

Learner 89: ... It's easy for me to access learning materials.

Learner 90: ... The advantages: less books to carry. Disadvantages: we do not do our work because we are playing games in class, most of the time.

Learner 91: ... Sometimes your tablet can fall, and it might break.

Learner 92: ... It is actually great because you don't have to carry a lot of textbooks and books in our bags.

Learner 93: ... Technology has been used more in nowadays than in the olden days when they had to carry textbooks with books too.

Learner 94: ... They are easy to use; the school bag is lighter. The disadvantage is that the tablets are at risk of being stolen, broken or lost and if happens it is expensive to replace.

Learner 95: ... The disadvantage is: they steal it. They break it. The battery can be low.

Learner 96: ... Some play game and some use it for learning.

Learner 97: ... People can use it for wrong purposes such as games, social networking which might distract people from their classwork.

Learner 98: ... It's a good thing to use tablets in the classroom as we access internet and view videos, use dictionary, etc.

Learner 99: ... The nice thing about tablets it's that learners are carrying less textbooks and books and the disadvantage is that children play games and download porn (sex) games during class time.

Learner 100: ... It is the best to use but some of the learners put wrong things on their tablets.

Learner 101: ... Benefit: good for research and get textbooks on the tablet.

Learner 102: ... It can make learning easier.

Learner 103: ... The challenge is that people can steal it and they can break it.

Learner 104: ... The challenge: the tablets break or stop working and the stuff / textbook and etc. get deleted. Batteries get low during school.

Learner 105: ... Disadvantage: children play games.

Learner 106: ... The challenge is that when it's time to download or read something the children play games.

Learner 107: ... Challenges is that children use their tablets for other things and not for school purposes / for school.

Learner 108: ... Advantages are that it's very efficient and reduces heavy bags. Disadvantage is that people are stealing, and other learners are playing games.

Learner 109: ... People play games in class and if your tablet gets lost you can be behind with work.

Learner 110: ... Sometimes when I really need to use it, the battery just gets low.

Learner 111: ... No response ...

Learner 112: ... Benefits – we don't carry textbooks, so our bags aren't heavy.

Learner 113: ... It helps us because our bags lost weight.

Learner 114: ... It can run out of battery. There are some apps that drain the battery.

Learner 115: ... When the teacher says we must take out the tablets the children can play games.

Learner 116: ... Disadvantages are that a lot of children at school don't use it for educational stuff, they use it for games.

Learner 117: ... The benefits are that you don't have to carry your heavy textbooks around, you have them all in your tablet.

Learner 118: ... The advantage is that: all our textbooks are on your tablet and our bags are light. The disadvantages are keeping the tablets safe all the time is a challenge. If textbooks get deleted, we must go through the downloading processes again.

Learner 119: ... Disadvantages are that we have games and get distracted in the classroom.

Learner 120: ... Disadvantage: they use it for games and WhatsApp.

Learner 121: ... It doesn't want to download my lessons.

Learner 122: ... The teaching is fine, it's just that children having to use their tablet for games. They don't have textbooks in it.

Learner 123: ... Other children don't have tablets, so they don't do homework or classwork.

Learner 124: ... It is downloading the documents.

Learner 125: ... Benefits: very helpful and easy to carry. Disadvantages: it might get stolen, and people start using Google for things that are not for school.

Learner 126: ... Advantages: we are using technology and people love technology. We are not carrying more textbooks. Disadvantages: some people when it's time to learn, they are playing games in their tablets.

Learner 127: ... The disadvantage is that the tablet can be stolen easily outside the school premises.

Learner 128: ... The tablet battery might get lower, or some children play games during a lesson.

Learner 129: ... Some learners are playing games and they get on social media.

Learner 130: ... The tablet could get lost or someone from school can steal it.

Learner 131: ... Children also play games ...

Learner 132: ... Easy access to information. Disadvantages are when it breaks, your schoolwork falls behind.

Learner 133: ... The benefits are that it is easy to use tablets in the class. The disadvantages are that someone can steal your tablet, or your tablet might break.

Learner 134: ... When we are on the Senior Phase side, the Wi-Fi is poor and on the Junior Phase side the Wi-Fi is so excellent. So, I understand that the T-Block is new, but we are not even allowed to go to the junior side at break because we don't have a chance on school hours.

Learner 135: ... The battery gets low.

Learner 136: ... The challenges are that: if your tablet gets broken, you may not learn properly.

Learner 137: ... The advantage is: sometimes it doesn't work / want to download or connect to the Wi-Fi.

Learner 138: ... Most of the time I get my teachers saying I need to download lesson 1 and 2, for example, which by the Wi-Fi is not working properly at the block where you at.

Learner 139: ... Disadvantages: your tablet can break, and you want have textbooks to learn / read. Challenges – network sometimes doesn't work well.

Learner 140: ... The battery gets low.

Learner 141: ... No response ...

Learner 142: ... Some people can put things that are not right like pornography.

Learner 143: ... We can use them easy, but we can lose them or break it.

Learner 144: ... The disadvantages of using a tablet as a learning tool are: student don't listen or pay attention when the teacher is teaching.

Learner 145: ... I don't have to carry many books anymore ...

Learner 146: ... The disadvantages are games and non-educational videos that learners are accessing, people get disturbed easily.

8.5 Have you used tablets before for learning purposes? If yes, how?

Learner 1: ... No, I was using textbooks.

Learner 2: ... No!

Learner 3: ... No response ...

Learner 4: ... No!

Learner 5: ... No, I have not.

Learner 6: ... Yes, for studying (using my personal tablet to find information on the internet).

Learner 7: ... Yes. To do research.

Learner 8: ... No.

Learner 9: ... No, I have not ...

Learner 10: ... No.

Learner 11: ... No, we have not used it before in primary school.

Learner 13: ... No. I haven't used a tablet before for learning purposes.

Learner 14: ... No, this is my first time. Unless, yes, in my personal capacity at home when my parents are helping me to do research for my school project or anything for school.

Learner 15: ... No, but I use to Google for school project only.

Learner 16: ... No, I didn't, it's my first time using it.

Learner 17: ... Yes, at primary school in 7th Grade, we had to download the ABODE READER and load in textbooks by the fees of R300.

Learner 18: ... No, this was my first year in high school using a tablet.

Learner 19: ... No.

Learner 20: ... No.

Learner 21: ... Yes. By downloading textbooks on our tablets.

Learner 22: ... No. In my old school we used textbooks instead of tablets.

Learner 23: ... No.

Learner 24: ... Yes, in my previous school all the Grade 7s used tablets instead of textbooks.

Learner 25: ... No. it was not for me to use tablet for other purposes but for learning.

Learner 26: ... Yes, but not for learning, it was used to interact with friends and family.

Learner 27: ... Yes, I used it last year in Grade 7. I used it for textbooks.

Learner 28: ... No.

Learner 29: ... No, I started using a tablet in high school. In my primary school, we were using normal textbooks.

Learner 30: ... Yes, I have, I usually use the tablet just to view the textbook.

Learner 31: ... Yes, last year in Grade 7.

Learner 32: ... No.

Learner 33: ... No.

Learner 34: ... Yes, for textbooks and reading books.

Learner 35: ... Yes, when we heard to write essays in Afrikaans so we could translate.

Learner 36: ... No.

Learner 37: ... Yes, we download lesson on TYB.

Learner 38: ... No.

Learner 39: ... No.

Learner 40: ... Yes, because the primary school I was in used of tablets.

Learner 41: ... No.

Learner 42: ... Yes, I used it for study.

Learner 43: ... No, we were using textbooks in primary school.

Learner 44: ... Yes, we download textbooks on our tablets.

Learner 45: ... No, I haven't used a tablet before for learning purposes.

Learner 46: ... No.

Learner 47: ... No.

Learner 48: ... No.

Learner 49: ... Yes, for studying and reading and for working.

Learner 50: ... Yes, for games and other purposes.

Learner 51: ... No.

Learner 52: ... No.

Learner 53: ... No, I have never used a tablet before for a learning purpose.

Learner 54: ... No, I did not used tablets as learning purpose before.

Learner 55: ... Yes, in Grade 7, we used tablets which had all textbooks in it, no pictures and music.

Learner 56: ... No, I have never used a tablet before.

Learner 57: ... Yes, for reading books online and researching.

Learner 58: ... Yes, for lessons and textbooks whereby they gather information and activities that we need to understand so all of our schoolwork is based on the lessons.

Learner 59: ... No.

Learner 60: ... Yes, for something else but not for TYB.

Learner 61: ... No, it's my first time.

Learner 62: ... No.

Learner 63: ... No! I haven't.

Learner 64: ... Yes.

Learner 65: ... Yes, I was using textbooks ...

Learner 66: ... Yes, I have all the textbooks and TYB.

Learner 67: ... No.

Learner 68: ... No, it was my first time when I went to Sunward Park High School.

Learner 69: ... Yes.

Learner 70: ... Yes, at home I have a tablet ...

Learner 71: ... Yes, in Grade 7, we used our tablets to download our textbooks, but we were not allowed to have games, videos or music and not even a SIM card.

Learner 72: ... Yes, by using it for learning games which trained us to type fast.

Learner 73: ... No.

Learner 74: ... Yes, because I use to have apps such as dictionary and Math games.

Learner 75: ... No, this the first time.

Learner 76: ... Yes, we were downloading the textbook for the whole year not by downloading lesson each day. Because we download the lesson each day, what about the space, it will be full.

Learner 77: ... No, my old school didn't use tablets.

Learner 78: ... Yes.

Learner 79: ... No.

Learner 80: ... Yes, to get information or research done.

Learner 81: ... Yes, I did used a tablet last year by doing the same thing like downloading the textbooks.

Learner 82: ... Yes, for getting information and for research purposes.

Learner 83: ... No. I started to use it last year, I failed, and I used it this year January, to date.

Learner 84: ... No, I have never.

Learner 85: ... No.

Learner 86: ... Yes, I have, when my father bought one for me to call me if they need me, WhatsApp and games.

Learner 87: ... No. I started using it this year.

Learner 88: ... Yes, in my old primary school, I use it as a textbook.

Learner 89: ... No.

Learner 90: ... Yes, we had textbooks inside our tablets.

Learner 91: ... No, at my previous school we used textbooks.

Learner 92: ... No, because in my previous primary school we didn't use tablets, and this is the first year using them.

Learner 93: ... No, I started this year in high school.

Learner 94: ... Yes, for creating emails and playing games.

Learner 95: ... No, it is my first time using a tablet this year.

Learner 96: ... To learn.

Learner 97: ... No, but we used projectors.

Learner 98: ... yes, by putting textbook in the tablet.

Learner 99: ... Yes. In primary school and here in high school it is less stressing to use tablet because I am used to it.

Learner 100: ... No.

Learner 101: ... Yes, I have my notes and textbooks on my tablets.

Learner 102: ... Before, I need a computer ...

Learner 103: ... No, because primary school do not use tablets.

Learner 104: ... Yes, at primary school – they used to download the things for us and help us if we had a problem ...

Learner 105: ... Yes, in Grade 7 at Down Park Primary School, we used our tablets for textbooks.

Learner 106: ... No, I haven't.

Learner 107: ... Yes, I used it to study, to write my study notes on my textbooks ...

Learner 108: ... No.

Learner 109: ... Yes, for homework and writing in class.

Learner 110: ... Yes, for my textbooks.

Learner 111: ... No.

Learner 112: ... No, it's my first time.

Learner 113: ... No.

Learner 114: ... Yes, to use my school textbooks for that Grade.

Learner 115: ... Yes, for textbooks and homework.

Learner 116: ... Yes, I've used the tablet in Grade 7 for textbooks and educational purposes.

Learner 117: ... No.

Learner 118: ... No.

Learner 119: ... No.

Learner 120: ... No.

Learner 121: ... Yes, as my telephone.

Learner 122: ... Yes, in primary school.

Learner 123: ... Yes. We used to download the textbooks and if you didn't have a tablet, they give you a hard copy of a textbooks.

Learner 124: ... Yes, by learning.

Learner 125: ... No.

Learner 126: ... Yes, I've used a tablet in primary for the textbooks, we didn't have the hard copy of the textbooks and we used tablets.

Learner 127: ... No.

Learner 128: ... we used them at primary for downloading textbooks. So, our school bags wouldn't be as heavy as possible.

Learner 129: ... Yes. By the documents ... by using TYB to get access to our textbooks.

Learner 130: ... No, because they brought the tablet after the learning purposes.

Learner 131: ... No, I haven't.

Learner 132: ... No

Learner 133: ... I have used tablet for learning, for example at an Afrikaans class, if you do not understand you can translate the work.

Learner 134: ... No, I have not, it is my first time.

Learner 135: ... Yes, to research.

Learner 136: ... Yes, I Grade 2 when a TV show was doing a documentary on kids using tablets for learning matters.

Learner 137: ... Yes, to research something.

Learner 138: ... No, I used textbooks ...

Learner 139: ... No.

Learner 140: ... Yes, to research.

Learner 141: ... No.

Learner 142: ... No.

Learner 143: ... No! It is the first time using tablets.

Learner 144: ... Sometimes when researching for a school project, assignment, or something that needs to be researched.

Learner 145: ... No

Learner 146: ... No

8.6 Have you received any training on how to use tablets for educational purposes? If yes, may you elaborate on the nature of training or give more details about your training.

Learner 1: ... No, not at all ...

Learner 2: ... No!

Learner 3: ... No response ...

Learner 4: ... Not yet ...

Learner 5: ... Yes, we were told how to download the lessons and textbooks.

Learner 6: ... No!

Learner 7: ... Yes, we learnt how to download textbooks and lessons.

Learner 8: ... Yes! Teachers told us how to download the lessons and made us download the School Code of Conduct.

Learner 9: ... No training was offered (except being told how to download and I do not regard that as training ...).

Learner 10: ... Yes, it wasn't an actual training, but they show us how to use our textbooks.

Learner 11: ... Yes, we have a lady helped us download the TYP and SNAPPLIFY APP and how to download the activities.

Learner 12: ... No, I have not received any training on how to use tablet for educational purposes.

Learner 13: ... No, I haven't train anymore.

Learner 14: ... no, I helped myself and got it right ...

Learner 15: ... yes. How to enter the website to download the worksheet and notes.

Learner 16: ... yes, they train us how to download lessons and lessons on TYB.

Learner 17: ... No, I have not received any training on how to use tablets for educational purposes because I already knew how to use it, I self-taught myself to download what is needed.

Learner 18: ... No, not really ...

Learner 19: ... No.

Learner 20: ... No.

Learner 21: ... Yes. They taught us how to sign up and download and logging on to Wi-Fi.

Learner 22: ... No, but I had a tablet when I was in Grade 6, so I already knew how to use a tablet.

Learner 23: ... No.

Learner 24: ... No, because I had a phone and a phone works like a tablet.

Learner 25: ... Yes, we were thought how to download and how to load tasks and how to play videos on a website.

Learner 26: ... No, I had to learn by myself, and it was not hard because it was like a phone, so it was easy.

Learner 27: ... No.

Learner 28: ... Yes, we use a website called TYB Portal to download our notes, activities and homework.

Learner 29: ... Not sure, but I can say that first day in Sunward, they taught us how to use tablets in Sunward like how to log in on TYB and download the textbooks.

Learner 30: ... No.

Learner 31: ... No, I learnt myself or on my own.

Learner 32: ... No.

Learner 33: ... No, I only learnt how to use it the first time, with my dad assisting me.

Learner 34: ... No, I have not.

Learner 35: ... Yes, by telling me the details of how a tablet can be used.

Learner 36: ... No.

Learner 37: ... No.

Learner 38: ... Not precisely, I just eventually learnt myself.

Learner 39: ... No.

Learner 40: ... No.

Learner 41: ... No.

Learner 42: ... No, they didn't train me.

Learner 43: ... No, I don't need training on how to use a tablet.

Learner 44: ... No, I have not.

Learner 45: ... No, I haven't received training on how to use tablet for educational purposes.

Learner 46: ... They haven't given me training ...

Learner 47: ... No, because I learnt using a tablet on my own without any training.

Learner 48: ... No response ...

Learner 49: ... No.

Learner 50: ... No, I haven't.

Learner 51: ... No.

Learner 52: ... No.

Learner 53: ... Yes, my sister used to be a learner in Sunward Park High, so she knows a lot about tablet, she thought me how to use my tablet.

Learner 54: ... No, I did not train to use tablets, I just learnt it by myself.

Learner 55: ... Yes.

Learner 56: ... No, no one came to this school to offer training, my family taught me how to use a tablet.

Learner 57: ... No, I have never received a training on how to use tablets before.

Learner 58: ... No, we didn't have training or more details about tablets. Normally they don't give us technical skills.

Learner 59: ... Yes, by the IT educators in school.

Learner 60: ... Yes, my brother works with this thing, so I learned if from him.

Learner 61: ... No, they just showed us how to download TYB Portal.

Learner 62: ... No.

Learner 63: ... No! I have never.

Learner 64: ... No!

Learner 65: ... No, I wasn't taught.

Learner 66: ... Yes, I know how to log in TYB.

Learner 67: ... No.

Learner 68: ... No, I have not received training on how to use tablets for educational purposes.

Learner 69: ... No.

Learner 70: ... No.

Learner 71: ... Yes, we have been taught on how to go to TYB Portal and download lessons.

Learner 72: ... Yes, how to go onto the textbooks and downloading presentations to read.

Learner 73: ... No.

Learner 74: ... No, I haven't.

Learner 75: ... No, we first go to TYB to download our lessons and SNAPPLIFY to get our textbooks.

Learner 76: ... No.

Learner 77: ... Yes, the teacher taught us how to use it. She also showed us how to get books.

Learner 78: ... No.

Learner 79: ... No, they didn't give us training.

Learner 80: ... No.

Learner 81: ... No, I did not receive any training, but I want to learn more about the use of this devices. I want to understand how to use it and how to study with the tablet.

Learner 82: ... No.

Learner 83: ... Yes, I have received a training, I was trained to go to TYB and how to download notes and download our textbooks to read the classwork and homework.

Learner 84: ... No, I have never been trained.

Learner 85: ... No.

Learner 86: ... No, I have not.

Learner 87: ... No, we were only showed how to download lessons and textbooks.

Learner 88: ... No, I haven't.

Learner 89: ... No.

Learner 90: ... No.

Learner 91: ... No response ...

Learner 92: ... No, not really, because it's simple, you just sign up in TYB and download all the lessons you need to work.

Learner 93: ... Yes, we have been told how to download textbooks, given the password and after that you can get anything from the textbook.

Learner 94: ... No.

Learner 95: ... No, I had my own tablet, but I was not using it for school.

Learner 96: ... No, I learnt myself.

Learner 97: ... No, I have never received any training on how to use tablets for educational purposes.

Learner 98: ... No, I haven't ...

Learner 99: ... Not really. I trained myself now to use a tablet.

Learner 100: ... No, because I learned by myself how to use a tablet when I got my first one.

Learner 101: ... No response ...

Learner 102: ... Yes, when we came to this school ...

Learner 103: ... No, I haven't because they just shown us how to download.

Learner 104: ... Not really.

Learner 105: ... Yes, they shown us how to use it.

Learner 106: ... No, I haven't.

Learner 107: ... No, I have not.

Learner 108: ... No.

Learner 109: ... No. I never had training before but when I came here, the other ladies gave us the idea and help us.

Learner 110: ... No. I haven't been trained.

Learner 111: ... Yes, I knew how to download.

Learner 112: ... No.

Learner 113: ... No.

Learner 114: ... No. I haven't.

Learner 115: ... No.

Learner 116: ... Yes. They showed me how to use it and how to download textbooks.

Learner 117: ... No.

Learner 118: ... I think so because they show us how to download.

Learner 119: ... No, I haven't received training at all.

Learner 120: ... Yes ...

Learner 121: ... No.

Learner 122: ... No.

Learner 123: ... No.

Learner 124: ... Yes, taught us ...

Learner 125: ... No.

Learner 126: ... No. I wasn't trained. They loaded the textbooks for us so I wasn't trained to use the tablet, but I can use it.

Learner 127: ... No.

Learner 128: ... We haven't gotten training.

Learner 129: ... No. Self-bought and training.

Learner 130: ... No.

Learner 131: ... No, I just know how to use it without being trained by someone.

Learner 132: ... No

Learner 133: ... No.

Learner 134: ... Yes, on the 16th of January 2018 we were showed how to use our tablets. Now we can go to TYB Portal and download our lessons and whatever we need.

Learner 135: ... No.

Learner 136: ... No, I have never.

Learner 137: ... No, I haven't received ...

Learner 138: ... No.

Learner 139: ... Yes, they told us our password or usernames and how to use the App. To download our textbooks and lessons.

Learner 140: ... No.

Learner 141: ... Yes.

Learner 142: ... No.

Learner 143: ... No! But my parent did when I was young.

Learner 144: ... No, because this year 2018 it's been my first time to use tablet as my learning tool.

Learner 145: ... No.

Learner 146: ... No.

8.7 What did you use tablets for?

Learner 1: ... I use my tablets for learning and playing a crossword game.

Learner 2: ... To access schoolwork and homework.

Learner 3: ... No response ...

Learner 4: ... For studying.

Learner 5: ... I used tablets to look at lessons and to copy it down into our books and to do activities.

Learner 6: ... Download textbooks and lessons. I use the tablets to also study.

Learner 7: ... For lessons, textbooks and for writing notes.

Learner 8: ... Downloading lessons and textbooks.

Learner 9: ... Textbooks and Internet access (download videos or extra lessons on the day's work).

Learner 10: ... I used it for my textbooks and downloading my lessons.

Learner 11: ... We use tablets for downloading, doing our work and activities / studies.

Learner 12: ... It is used for my textbooks and lessons.

Learner 13: ... We use tablets for learning.

Learner 14: ... To do research, to look for information, and other searches for school purposes.

Learner 15: ... I use it to make calls ...

Learner 16: ... To download ...

Learner 17: ... We used tablets to learn and received the heavy load textbooks.

Learner 18: ... For learning in class.

Learner 19: ... Worksheets, notes and revision.

Learner 20: ... I use my tablet for worksheets, textbooks and notes. I download books to help with my reading.

Learner 21: ... For downloading textbooks and research.

Learner 22: ... We use tablets for notes, activities, homework and classwork in general.

Learner 23: ... For textbook.

Learner 24: ... We use our tablets to learn in class, our tablets have textbooks, and we have readers where we use to read in our textbooks.

Learner 25: ... We use it for textbooks.

Learner 26: ... Interacting with family and friends.

Learner 27: ... I use it for textbooks and lessons.

Learner 28: ... I only use a tablet to download work at Sunward High.

Learner 29: ... We use tablets for textbooks and to log on TYB for lessons.

Learner 30: ... For schoolwork.

Learner 31: ... I use it for learning.

Learner 32: ... I'm using it for school textbook and downloading school stuff.

Learner 33: ... I used it for downloading textbooks and searching for information related to school matters.

Learner 34: ... For learning purposes like textbooks, reading books and a calculator.

Learner 35: ... For translating essays from English to Afrikaans.

Learner 36: ... For textbooks and lessons.

Learner 37: ... Textbooks.

Learner 38: ... As mentioned on the previous page, I go to TYB and SNAPPLIFY.

Learner 39: ... I used tablets to get information for project or assignment.

Learner 40: ... For learning and reading.

Learner 41: ... No

Learner 42: ... I use tablet for studying, phoning and WhatsApp.

Learner 43: ... We use tablets for textbooks and downloading lessons.

Learner 44: ... I use it for e-learning.

Learner 45: ... Educational purposes only.

Learner 46: ... I used tablets for lessons and textbook.

Learner 47: ... For learning purposes.

Learner 48: ... To download textbook and learning.

Learner 49: ... To learn from textbooks and to watch educational videos. They can also be used to research information.

Learner 50: ... Learning.

Learner 51: ... So that we cannot have many books to carry to school.

Learner 52: ... Function – download textbooks.

Learner 53: ... Last year in primary, I didn't really use my tablet because my mom wouldn't let me use it. I started using it this year.

Learner 54: ... I used tablets for a usual phone, to call and do other stuff.

Learner 55: ... School and to learn.

Learner 56: ... I didn't really use it ...

Learner 57: ... For school ...

Learner 58: ... For educational purposes and for our subjects everything that is based on schoolwork.

Learner 59: ... Textbooks and learning.

Learner 60: ... For schoolwork and textbooks.

Learner 61: ... For learning purposes.

Learner 62: ... For education and to use textbooks.

Learner 63: ... For textbooks.

Learner 64: ... Textbooks and downloading lessons.

Learner 65: ... We use it to study, learn and helps us to do homework easily.

Learner 66: ... To download lessons ...

Learner 67: ... To study and learn the schoolwork and to download lessons and textbooks.

Learner 68: ... We used them to learn and download textbook on it.

Learner 69: ... For textbooks and schoolwork.

Learner 70: ... For studying and learning my subjects in that tablet and it had formula, e.g., all marks formula.

Learner 71: ... We use tablets to access our textbooks and use them to note down homework or research.

Learner 72: ... For textbooks and learning apps.

Learner 73: ... I use it for schoolwork.

Learner 74: ... I used tablets in primary as a device that has my textbooks.

Learner 75: ... For learning purposes and for reading books.

Learner 76: ... For learning.

Learner 77: ... We use it for learning. Tablets are easy to use for school purposes.

Learner 78: ... Textbooks and PowerPoint.

Learner 79: ... No response ...

Learner 80: ... For study, do research, record myself at home when I'm doing speeches and practicing.

Learner 81: ... Not relevant answer ...

Learner 82: ... Textbooks and for the research.

Learner 83: ... Learning at school.

Learner 84: ... We used the tablets for learning purposes and for textbooks.

Learner 85: ... Google and TYB.

Learner 86: ... I used a tablet for educational purposes last year and this year.

Learner 87: ... We use it as our textbook.

Learner 88: ... For learning.

Learner 89: ... For learning and making our lives easier when we need to write something.

Learner 90: ... For reading and researching.

Learner 91: ... We use tablets for textbooks and to download lessons on TYB.

Learner 92: ... I use my tablet for school and learning purposes and reasons and studying.

Learner 93: ... We use tablets as our textbooks and get some information from them.

Learner 94: ... To do research on Google, etc.

Learner 95: ... No response ...

Learner 96: ... To learn more things and best than textbook.

Learner 97: ... For e-learning, basically for textbooks.

Learner 98: ... To access textbooks and lessons...

Learner 99: ... We used tablets to learn and take in more information ...

Learner 100: ... We did not use tablets at Windmill Park School last year.

Learner 101: ... To download and use our textbooks because our textbooks are a lot ...

Learner 102: ... For researching, mostly ...

Learner 103: ... We use our tablets to access textbooks only.

Learner 104: ... Textbook only.

Learner 105: ...Textbooks.

Learner 106: ... I use tablets for textbooks or to download school stuff.

Learner 107: ... For studying and work, to do work and our activities and to learn.

Learner 108: ... I did not have one.

Learner 109: ... we use the tablet for learning ...

Learner 110: ... my textbook.

Learner 111: ... Textbooks.

Learner 112: ... For learning.

Learner 113: ... I have never used a tablet in primary.

Learner 114: ... Textbooks and games.

Learner 115: ... For the textbooks.

Learner 116: ... We used tablets for educational purposes.

Learner 117: ... I never used tablets for any purposes it's my first time.

Learner 118: ... We use tablets for loading our textbooks and downloading lesson, etc.

Learner 119: ... This is my first year at school using tablets.

Learner 120: ... Learning ...

Learner 121: ... For my schoolwork.

Learner 122: ... Learning purposes ...

Learner 123: ... For textbooks ...

Learner 124: ... I use it for textbooks.

Learner 125: ... Learning ...

Learner 126: ... We use tablets for textbooks, we learn with the tablets.

Learner 127: ... Learning about life ...

Learner 128: ... We used them for learning materials ...

Learner 129: ... For learning, researching and downloading the PowerPoint lessons.

Learner 130: ... Textbooks.

Learner 131: ... Textbooks.

Learner 132: ... Only for schoolwork.

Learner 133: ... No response ...

Learner 134: ... For learning.

Learner 135: ... For reading and downloading educational videos and schoolwork.

Learner 136: ... For social media etc.

Learner 137: ... For researching and downloading.

Learner 138: ... I used my tablet for music, contacting my family and friends but not anymore on my tablet.

Learner 139: ... For textbooks.

Learner 140: ... For reading and downloading educational videos.

Learner 141: ... Textbooks

Learner 142: ... We use tablets because maybe they don't want to have many books or our bags to torn and our textbooks are in our tablets.

Learner 143: ... Research, homework, talking to family.

Learner 144: ... For learning lesson, games and videos

Learner 145: ... Learning.

Learner 146: ... For research, songs, etc.

8.8 How is the use of the tablets monitored?

Learner 1: ... You use your tablet only at school hours (under a supervision of a teacher).

Learner 2: ... No! We are not monitored.

Learner 3: ... No response ...

Learner 4: ... Not answered ...

Learner 5: ... It is monitored by the teacher during class.

Learner 6: ... Teachers tell us when to take out tablets when we need them.

Learner 7: ... It is used by teachers and learners, and no one is checking who is doing what in it.

Learner 8: ... The teachers and parents check our tablets to ensure that we focus on school-related matters.

Learner 9: ... It is monitored by "SPHS Students Wi-Fi".

Learner 10: ... Teachers have access to all information needed.

Learner 11: ... It is monitored by you as a learner by not listening to music and ensure that there are no games on internet App that are irrelevant to schoolwork like WhatsApp, Facebook, Snapchat, and other social media.

Learner 12: ... The tablets are being monitored by the teacher and the parents of the learner.

Learner 13: ... Teachers are monitoring the use of tablets in the classroom.

Learner 14: ... I do not know ...

Learner 15: ... My parents monitor the tablet every week.

Learner 16: ... There must be no games and any social network like WhatsApp.

Learner 17: ... Tablets should be checked every day in order to know what's going on or perhaps the child is not focused on his / her studies and busy with other stuff.

Learner 18: ... The school has got hold of all our information that we keep in our tablets.

Learner 19: ... Websites are blocked.

Learner 20: ... Whether you get into a website that is not the TYB Portal it is locked, and we cannot get into access in that website that is not educational.

Learner 21: ... The teacher would sometimes check if we were working or not.

Learner 22: ... The school said we should download the information and no games or anything that's not related to schoolwork.

Learner 23: ... By putting textbooks in the tablet.

Learner 24: ... They made sure that we do not have games.

Learner 25: ... They check if we have anything else that textbooks or schoolwork.

Learner 26: ... Our parents check everything is still in order and we still keep our schoolwork on the tablet.

Learner 27: ... They check our tablets if we have games or any videos and if you do have, you get suspended.

Learner 28: ... Sometimes they check what is in your tablet for example pornography, games and music.

Learner 29: ... No response ...

Learner 30: ... Parents will monitor their child's tablet / device.

Learner 31: ... By checking the database.

Learner 32: ... They always check that you are not using your tablet for other thing besides schoolwork.

Learner 33: ... They are monitored by us students and it is fun to use them.

Learner 34: ... By the teachers checking them.

Learner 35: ... By parents: always checking out tablets.

Learner 36: ... Very good ...

Learner 37: ... They check our tablets every day.

Learner 38: ... Teachers look if you're using your tablet for necessary reasons or not.

Learner 39: ... The use of tablets is monitored by only using them to download lessons and also use our textbook.

Learner 40: ... It always in the bag and I always keep my bag safe.

Learner 41: ... By school Wi-Fi ...

Learner 42: ... It's not good because this using of tablets makes learners fail because they do not know what the tablet is used for, so they play games.

Learner 43: ... Teachers check our tablets.

Learner 44: ... The parents check the tablets, and the school Wi-Fi blocked some things.

Learner 45: ... For games, movies or pornography videos.

Learner 46: ... I do ...

Learner 47: ... It's monitored by keeping it safer.

Learner 48: ... It is very useful because our bags are not that heavier.

Learner 49: ... Our parents check our tablets on a regular basis.

Learner 50: ... By learning

Learner 51: ... It depends on how you use them.

Learner 52: ... They check it on a regular basis whether it has games or some silly stuff.

Learner 53: ... The tablets can be located either or tracked down if it is lost.

Learner 54: ... It is monitored for education ...

Learner 55: ... To learn at school ...

Learner 56: ... No response ...

Learner 57: ... It is fun to use them.

Learner 58: ... They check our tablets if we have unnecessary games, music, videos, pictures of celebrities, etc.

Learner 59: ... It is not monitored in good way because some learners take advantage of having games in it.

Learner 60: ... No response ...

Learner 61: ... My parents always check the tablets.

Learner 62: ... My mother checks tablet every day.

Learner 63: ... They check if you are on the textbooks and not games.

Learner 64: ... The teachers check whatever you are doing in class instead of learning and concentrating.

Learner 65: ... It is to download schoolwork and textbooks.

Learner 66: ... They check it every day at home and at school.

Learner 67: ... It is only used for schoolwork, not for social media.

Learner 68: ... By School Code of Conduct.

Learner 69: ... Children might lose the tablets because they are not carefully on how they put their tablets in their bags.

Learner 70: ... You are not allowed to play games in class, and you are not allowed to take out your tablet if your teacher didn't tell you to do so.

Learner 71: ... The use of tablets is not really monitored, but our teachers confiscate them when they know we are using them to play games or watch videos when we are not supposed to play with them.

Learner 72: ... If the teacher feels that you are playing on your tablet, they check it.

Learner 73: ... No response ...

Learner 74: ... My tablet is monitored as I take care of it and make sure that it is in my bag when I get into the next class.

Learner 75: ... It is monitored by anyone.

Learner 76: ... Good because we can Google things that we don't know.

Learner 77: ... Irrelevant answer ...

Learner 78: ... I do not know ...

Learner 79: ... No response ...

Learner 80: ... Well, teachers don't allow us to have things which are not school related.

Learner 81: ... Not relevant answer ...

Learner 82: ... No relevant answer ...

Learner 83: ... Our parents, checking if we have games, music or pictures.

Learner 84: ... Teachers look at tablets.

Learner 85: ... They check everything that is in your tablet.

Learner 86: ... Our teachers come unexpected and check what is in our tablets. When they find that our tablets have things that are not related to education, they confiscate them. Then, they had to pay a fee in order to get the tablet back.

Learner 87: ... Teachers don't really check / monitor us when we are using tablets.

Learner 88: ... Its no.

Learner 89: ... My parent's checks.

Learner 90: ... No answer ...

Learner 91: ... We charge the tablet, and we don't live our bags. We go with our bags so that our tablets are not stolen.

Learner 92: ... They give you your own personal username to go on the website to download textbooks.

Learner 93: ... The school Wi-Fi does not allow you to download any other things besides schoolwork.

Learner 94: ... No response ...

Learner 95: ... No response ...

Learner 96: ... Some are not learning or using it in a good way. They just play games.

Learner 97: ... To make sure that students don't download games or log in social media.

Learner 98: ... No response ...

Learner 99: ... There is no use to monitor the use of tablets.

Learner 100: ... It is monitored by the teacher in the classroom if the learners don't have wrong information on their tablets.

Learner 101: ... By not having internet access.

Learner 102: ... My mom makes sure that I don't do anything wrong with it.

Learner 103: ... They check that do you have naughty things or not.

Learner 104: ... They used to check if they are no funny stuff on the tablets regularly.

Learner 105: ... No response ...

Learner 106: ... It's monitored by the school researchers.

Learner 107: ... By parents and teachers check tablets.

Learner 108: ... By parents checking my tablet every day.

Learner 109: ... They don't allow us to do wrong things when we are learning and when we write from the tablet, they walk around the classroom and check.

Learner 110: ... That we shouldn't play games during the lesson.

Learner 111: ... Good ...

Learner 112: ... No response ...

Learner 113: ... Teachers ...

Learner 114: ... No response ...

Learner 115: ... Good ...

Learner 116: ... It is monitored for textbooks.

Learner 117: ... It is well monitored ...

Learner 118: ... Sometimes our register teacher checks our tablets.

Learner 119: ... By checking if we have pictures, music and games on our tablet.

Learner 120: ... No response ...

Learner 121: ... It is good ...

Learner 122: ... To see what they are doing in their tablet.

Learner 123: ... My parents make sure it's only schoolwork in the tablet.

Learner 124: ... By being checked ...

Learner 125: ... The use of tablets is monitored, as when we need our tablets for lessons, we can use them but when we don't need them, we put it in our bags.

Learner 126: ... By checking the tablets if we are not playing games.

Learner 127: ... Teachers walk around checking what learners are doing on their tablets and parents also check at home.

Learner 128: ... If we don't have the things we not supposed to have on our devices.

Learner 129: ... If we don't understand we can research.

Learner 130: ... By not allowing children to go to any App within the school's premises.

Learner 131: ... No response ...

Learner 132: ... It is regularly checked at home.

Learner 133: ... No response ...

Learner 134: ... By downloading the notes and textbooks.

Learner 135: ... It is not monitored.

Learner 136: ... We only have books.

Learner 137: ... It's not monitored.

Learner 138: ... It is monitored by educators to check if we have our tablets or not.

Learner 139: ... They check our tablets every day (our parents) if there are no things that are not supposed to be in our tablets.

Learner 140: ... It is not monitored

Learner 141: ... No response ...

Learner 142: ... It is monitored by RCL and teachers to check what is in the tablet.

Learner 143: ... No response ...

Learner 144: ... We are helped by ICT specialist and educators.

Learner 145: ... It is monitored by my parents in the mornings.

Learner 146: ... No response ...

8.9 How did you feel about using digital devices like tablets in your classroom and why?

Learner 1: ... Happy, because I will be teaching myself more about technology. I will search more information that teachers included in the tablet.

Learner 2: ... It feels good because it helps me to study and do homework.

Learner 3: ... No response ...

Learner 4: ... I feel good because it is much easier to study the notes using tablets.

Learner 5: ... I feel that it is a great idea to use tablets in the classroom but at the same time it is distracting the smooth progress of the lesson.

Learner 6: ... I feel good and proud to use this tablet in the classroom. In fact, it is a privilege to have them in the classroom.

Learner 7: ... I felt good because we could use our tablets for research and other stuff ...

Learner 8: ... Happy because my bag won't be heavy like last year.

Learner 9: ... Happy because there are less textbooks and heavy load to carry to school and from school.

Learner 10: ... I felt good and it was a privilege to have tablets in our school because many schools don't get this opportunity to use digital devices.

Learner 11: ... Very happy because it is a break from textbooks and heavy bags because of heavy textbooks.

Learner 12: ... I felt relieved, because we were not going to carry heavy textbooks but carry a tablet for textbooks.

Learner 13: ... I feel happy and excited because I did not use a tablet before.

Learner 14: ... Good and fun because it has been fun to use tablet.

Learner 15: ... I feel good because we are able to do work faster. There is no need to write notes. Tablets save time.

Learner 16: ... Good because we don't use textbook anymore because some learners tear off pages in textbooks and write on them.

Learner 17: ... I feel dated [sic] because using technology is much easier and faster and updates us very quickly.

Learner 18: ... I feel quite glad about it because it makes it easier, and we don't carry a lot of books.

Learner 19: ... I enjoy using it because it's faster.

Learner 20: ... I enjoy using digital devices like tablets in class because it is faster and enable us to get access to information using internet to search for it.

Learner 21: ... It was exciting. It was easier because tablets are lighter than actual textbooks.

Learner 22: ... I felt very proud and good of the school because you can do everything that's relate to schoolwork.

Learner 23: ... Happy because textbooks are very heavy.

Learner 24: ... I felt happy because we won't be carrying heavy books, because we wouldn't carry textbooks.

Learner 25: ... Happy, it was easier and quicker to use and more fun than textbook.

Learner 26: ... I feel good because it keeps the vibe going, like we watch educational videos and if you don't understand, you can watch it again in your free time so you can understand.

Learner 27: ... I was happy because it was easier than carrying textbooks because they sometimes hurt my back.

Learner 28: ... I felt evolved because everything I need for my studies are in the digital device like a tablet.

Learner 29: ... I can say it feels good using a tablet in my classroom. Some schools are using normal textbook and Sunward is using tablets which is nice.

Learner 30: ... I felt good about it because it was nice to use it.

Learner 31: ... It was nice.

Learner 32: ... I feel good because it reduces my books.

Learner 33: ... I felt excited at first but now I'm not happy about using these devices because they are struggling with connection and get heavy.

Learner 34: ... I felt very happy because we can use Google and the calculator.

Learner 35: ... I felt happy because my / our spines won't hurt because of heavy textbooks.

Learner 36: ... I felt good because we are not carrying heavy books and textbooks.

Learner 37: ... It feels great because you get to explore new things on the internet.

Learner 38: ... It's fascinating because I don't have to carry textbooks and everything I want is in the tablet.

Learner 39: ... I feel fine with it because it makes our bags lighter, and we don't have to stress about how we are going to download things.

Learner 40: ... I felt happy because it was my first time.

Learner 41: ... I feel good because I can learn more...

Learner 42: ... I did not get happy, because using tablets makes us fail because we do not listen to teachers, we play and chat in the classroom.

Learner 43: ... I was so happy to use a tablet because it upgrades our learning.

Learner 44: ... I felt good because I like technology than normal textbooks.

Learner 45: ... I felt great because it's my first year using tablets.

Learner 46: ... I feel good because you don't need to take out your textbook from your bag.

Learner 47: ... I am proud and confident when using the device for learning purposes such as downloading and researching.

Learner 48: ... I feel bad but a little good because of textbooks. The reason why I feel bad is because people get easily distracted in class due to the use of tablets for teaching and learning purposes.

Learner 49: ... I feel as if we are allowed access to a higher education because we can access all the educational information.

Learner 50: ... It was interesting ...

Learner 51: ... I feel happy because you don't need to look for your textbook, you find everything in the tablet.

Learner 52: ... I feel amazed because I have never had my own device that belong to me.

Learner 53: ... I felt very excited and really thought is it was very cool because I felt important.

Learner 54: ... I feel like it's the only best way of education because billions of teens would want to use them for school purposes.

Learner 55: ... Happy and do not have to use textbook.

Learner 56: ... No response ...

Learner 57: ... I feel okay to use them and it is interesting as well to use tablets in the classroom.

Learner 58: ... I felt good about it because it's a new way of learning unlike using textbooks everyday but makes life easier.

Learner 59: ... It feels great because it is easy to use.

Learner 60: ... I felt happy but others played games and WhatsApp during school time.

Learner 61: ... I was excited because it's easier to use a tablet as a textbook.

Learner 62: ... Very happy because in nowadays reading from textbooks can be boring but on a digital device it's much more fun.

Learner 63: ... I was so happy.

Learner 64: ... I felt like I was special with no heavy textbooks.

Learner 65: ... well because it is easy and simple than textbooks and it won't get lost or deleted very fast.

Learner 66: ... I felt happy because I am not carrying heavy textbooks.

Learner 67: ... It feels good, it promotes effective learning and studying.

Learner 68: ... I felt happy and excited because it was my first time using it for "learning".

Learner 69: ... I feel happy because we don't have to carry heavy books to school or when changing classes.

Learner 70: ... Good because it is easier to use textbooks in your tablet than carrying a heavy textbook.

Learner 71: ... I felt it would be awesome because I wouldn't have to use big textbooks and the textbooks in my tablet would not be destroyed.

Learner 72: ... I feel satisfied that we can have tablets in our classrooms it's much better than using textbooks.

Learner 73: ... Happy because the tablet is lighter than textbooks.

Learner 74: ... I feel like is a great opportunity for some learners, but some use it reckless as they believe it's for games and play games while a lesson is given / in progress.

Learner 75: ... Nice, no textbooks.

Learner 76: ... Happy because we used to carry textbook and the bag.

Learner 77: ... I like it because my bag is lighter. My books are neat.

Learner 78: ... I feel happy because it is useful.

Learner 79: ... I felt great because I don't have to carry textbooks.

Learner 80: ... I feel it is a good thing because we are not only learning with tablets, but we are learning more of how technology works.

Learner 81: ... I feel great with the devices because keeping too much textbook is a challenge on its own.

Learner 82: ... Great because we did not have big textbooks in our bags, and they are too heavy.

Learner 83: ... Happy because I am learning more.

Learner 84: ... Bad, because parent was worried about their children, they might access things that they don't need to access at their age.

Learner 85: ... Excited because it was the first time using high intelligent device in my life.

Learner 86: ... I felt excited because my bag will be lighter, and less pain occurred on my back.

Learner 87: ... I felt happy because it is easier and fun to use technology / tablet because we can also research to get more details about a topic.

Learner 88: ... I like it because it makes our bags lighter, and it allows us to research information.

Learner 89: ... Happy because it makes my life easier as I am not going to carry heavy textbooks.

Learner 90: ... Happy because we do not have heavy books in our bags.

Learner 91: ... Happy because I won't be carrying a heavy bag at school.

Learner 92: ... I felt very great, because there was no carrying heavy bags with extra textbooks in it.

Learner 93: ... I felt so happy when we started using digital devices because we now carry few books and a tablet with many textbooks.

Learner 94: ... I felt happy and excited because we are using technology instead of textbooks.

Learner 95: ... I feel happy because the keyboard of the tablet can help me do the correct spelling.

Learner 96: ... Bad, because your mind run away from the classroom.

Learner 97: ... I felt relieved because we are no longer carry heavy textbooks.

Learner 98: ... Nice, because I was not going to carry more books to school and back home.

Learner 99: ... I feel good and bad because it has advantages and disadvantages ...

Learner 100: ... I was happy because no longer have textbooks in the bag to make it heavy.

Learner 101: ... I felt happy because the textbooks were heavy and a lot.

Learner 102: ... I am not so convinced about the idea of e-learning, because sometimes people don't always use them for education purposes.

Learner 103: ... I felt great because now we don't need to carry textbooks because they are heavy.

Learner 104: ... It was exciting because it was new until the tablets started breaking.

Learner 105: ... It feels good because the textbooks are on the tablets.

Learner 106: ... I felt amazing because it was my first time to use tablet.

Learner 107: ... It's okay, but people or children will start putting on funny things and playing music, games and watching other things, porno.

Learner 108: ... Proud, because in my previous schools we did not have e-learning.

Learner 109: ... Happy because we do not carry heavy textbooks and bags.

Learner 110: ... No response ...

Learner 111: ... Feels good because when you are done with your classwork, I can play games just to calm my mind.

Learner 112: ... I feel great because it's less work ...

Learner 113: ... I felt happy because it was my first time.

Learner 114: ... Happy and positive about it.

Learner 115: ... Good because it helps us ...

Learner 116: ... Happy because it was going to make things easy for us.

Learner 117: ... I was very proud because it has many advantages ...

Learner 118: ... it feels fine because it is easier to learn knowing no one has left any textbook at home, it is on our tablet.

Learner 119: ... It's good, textbooks don't get lost.

Learner 120: ... I find it boring; I missed using our textbooks, but it is fine using technology.

Learner 121: ... Good and unhappy, I feel good because it's easier but sometimes unhappy because when the teacher is teaching some are playing games.

Learner 122: ... Fine, it's helping us to understand.

Learner 123: ... I don't like it. Everything we do, we do on tablets, even assignment and tasks.

Learner 124: ... Because it is helping us ...

Learner 125: ... I felt very happy because it is very helpful and easy to carry.

Learner 126: ... I feel better because we don't carry textbooks and our bags are not heavy, so that's why I am happy.

Learner 127: ... I felt good because now learners won't have to carry to many books in their bags.

Learner 128: ... I felt happy ...

Learner 129: ... Excited, we will not carry our textbooks anymore.

Learner 130: ... Wrong, because children can play games without working with the tablet.

Learner 131: ... I was very happy because my bag will no longer be heavy.

Learner 132: ... I was happy, it is easy to use and reduces the schoolbooks and bags to carry, it gives you information that you want to know.

Learner 133: ... No response ...

Learner 134: ... I feel happy because I've never used a tablet or learning with it.

Learner 135: ... It felt good because it makes life easier than carrying heavy textbooks.

Learner 136: ... It was nice, because we are learning new things.

Learner 137: ... good Good because you learn about how to use technology in the classroom.

Learner 138: ... I felt happy because we used to carry lots of books in our bags but now the tablets are carrying our textbooks for us.

Learner 139: ... Happy, because it was my first time.

Learner 140: ... It felt good because it makes life easier than carrying heavy textbooks.

Learner 141: ... Exciting.

Learner 142: ... I felt happy because our bags will be not heavy.

Learner 143: ... To do work.

Learner 144: ... At first, I wasn't happy ...

Learner 145: ... It felt very different than using books all the time.

Learner 146: ... It is more advanced and informative.

8.10 What do you think counts as learning?

Learner 1: ... Many things about environment and the world ... I need to know more about my surroundings and global issues and debates.

Learner 2: ... Hard work.

Learner 3: ... No response ...

Learner 4: ... Studying ...

Learner 5: ... Using tablets counts as learning. You learn everyday how to access information.

Learner 6: ... Books.

Learner 7: ... Getting more information for things you do not know.

Learner 8: ... Learning more about tablets and lessons.

Learner 9: ... Writing, learning and understanding the work you do, and to do extra practice in order to totally understand the work given to you.

Learner 10: ... I think what counts as learning is to get good marks from what we have been learnt.

Learner 11: ... I think is when a teacher teaches in class and if learners listen in the classroom and not for the teacher to stop and talk to the disruptive learners in classroom.

Learner 12: ... If everybody gets education and learn in order to succeed.

Learner 13: ... Textbook.

Learner 14: ... The information we find in the tablet and using tablets as a faster way of learning.

Learner 15: ... Going over the work / notes after the teacher has explained.

Learner 16: ... That you should be educated don't get influenced by some learners.

Learner 17: ... What counts is that as long as the kid has a tablet to learn the more, he/she does better in learning.

Learner 18: ... No response ...

Learner 19: ... The learning environment and the educator.

Learner 20: ... The way we are comfortable in our working place and the accessible to technology.

Learner 21: ... I think that writing and reading counts as learning.

Learner 22: ... We use tablet and now they are electronics and electronics are related to technology and Math and helps our brains to think.

Learner 23: ... Knowing what you are reading or writing.

Learner 24: ... To be clever and have a bright future.

Learner 25: ... No response...

Learner 26: ... Getting high marks.

Learner 27: ... I think learning is preparing you for your future. Learning is the key to make you successful in life.

Learner 28: ... To gain more knowledge and to have a future.

Learner 29: ... No response ...

Learner 30: ... Being successful.

Learner 31: ... Working together.

Learner 32: ... Having proper education counts.

Learner 33: ... I think what counts as learning is to understand what you are learning and be able to explain and remember.

Learner 34: ... Understanding and listening to the work and getting knowledge.

Learner 35: ... Books and practice.

Learner 36: ... My marks.

Learner 37: ... Listening.

Learner 38: ... Understanding the work.

Learner 39: ... That you follow the rules and respect one another

Learner 40: ... No response ...

Learner 41: ... Being successful in life.

Learner 42: ... We don't listen to teachers because of the tablets.

Learner 43: ... Books.

Learner 44: ... Textbooks.

Learner 45: ... To access internet for extra information.

Learner 46: ... Understanding what the teacher is telling or explaining in class.

Learner 47: ... The quality of education, learning experience and the classroom environment that they live / received from teachers and learning more skills such as thinking, reading, reasoning, and other life skills.

Learner 48: ... Everything, because it makes you who you want to be when you grow up.

Learner 49: ... Understanding things that you don't understand, listening to your teacher, studying and practicing.

Learner 50: ... Books ...

Learner 51: ... So that you can pass your studies.

Learner 52: ... No response ...

Learner 53: ... I think that everything else that is pointless must not be in your tablet.

Learner 54: ... It counts as the good way to learn.

Learner 55: ... Technology makes us learn better.

Learner 56: ... No response ...

Learner 57: ... Using the tablets ...

Learner 58: ... Downloading lessons, making sure we have TYB PORTAL, textbooks apps and documents of videos.

Learner 59: ... A lot like education.

Learner 60: ... No response ...

Learner 61: ... Getting all the information that you need.

Learner 62: ... That we gain something new at the end of the day.

Learner 63: ... Using the tablets ...

Learner 64: ... Concentration.

Learner 65: ... It's technology ...

Learner 66: ... I think all the sums and quiz are on the textbook (tablets).

Learner 67: ... It is when you understand what you have been taught about.

Learner 68: ... The knowledge that you get into your mind / head.

Learner 69: ... To gain more knowledge and to be someone in life.

Learner 70: ... Study hard and work hard.

Learner 71: ... When you listen in the classroom and when you learn from your past mistakes to never make it again.

Learner 72: ... TV channels because it can teach you things you never know.

Learner 73: ... Studying and listening.

Learner 74: ... No response ...

Learner 75: ... Remembering what you've been thought.

Learner 76: ... It is easily because we can catch up with our work.

Learner 77: ... Reading and teachers explaining work. Acknowledging information and using that information to find out more.

Learner 78: ... Understanding what you learn.

Learner 79: ... Being forced ...

Learner 80: ... Well, we learn things and at the end we gain a lot.

Learner 81: ... I think learning with tablets is good for me.

Learner 82: ... Not relevant answer ...

Learner 83: ... Gaining more knowledge about electronics.

Learner 84: ... No response ...

Learner 85: ... TYB.

Learner 86: ... Learners and teachers share information and have a better chance of interacting.

Learner 87: ... Gaining more information and knowing as much as possible.

Learner 88: ... No response ...

Learner 89: ... Textbook.

Learner 90: ... Reading.

Learner 91: ... No response ...

Learner 92: ... Always reading for the best mark you can get.

Learner 93: ... I think learning can get you far and most can have bright future.

Learner 94: ... I have learned that you can use tablets for many reasons such as for textbooks.

Learner 95: ... No response ...

Learner 96: ... Just nothing about it.

Learner 97: ... The Wi-Fi because we would have to buy our own data.

Learner 98: ... Irrelevant response ...

Learner 99: ... more.

Learner 100: ... It counts, but they must only allow the Wi-Fi to be on when learners need something for learning ...

Learner 101: ... By having textbooks on your tablet.

Learner 102: ... The knowledge you gain as well as wisdom.

Learner 103: ... Tablet.

Learner 104: ... Textbooks and notes.

Learner 105: ... No response ...

Learner 106: ... I think is a good thing ...

Learner 107: ... I think that you read from your book and make notes from your learning book – is counted as studying / learning.

Learner 108: ... Being focus on what you do.

Learner 109: ... We will have a bright future and education is the key to success.

Learner 110: ... No response ...

Learner 111: ... Participating in class.

Learner 112: ... No response ...

Learner 113: ... Knowledge...

Learner 114: ... No response ...

Learner 115: ... To give us more information.

Learner 116: ... For textbook and educational stuff.

Learner 117: ... Concentration, participation and well housing.

Learner 118: ... Reading and revising.

Learner 119: ... Reading.

Learner 120: ... Education.

Learner 121: ... Be good in class and respectful.

Learner 122: ... It's the textbooks

Learner 123: ... Textbooks.

Learner 124: ... Like learning.

Learner 125: ... Everything.

Learner 126: ... Education.

Learner 127: ... Also learning.

Learner 128: ... Getting a boost of knowledge.

Learner 129: ... Studying, research and tablet.

Learner 130: ... Education.

Learner 131: ... Education.

Learner 132: ... Knowledge and skills.

Learner 133: ... No response ...

Learner 134: ... To be successful and achieve my dreams, being a doctor and have a higher education.

Learner 135: ... It felt good because it makes life easier. Reading and understanding that's what count.

Learner 136: ... It was nice because we are learning new things.

Learner 137: ... Completing your homework and other things that your teacher asked you to do.

Learner 138: ... Research.

Learner 139: ... Reading and learning.

Learner 140: ... Reading and understanding that count.

Learner 141: ... Tasks and notes.

Learner 142: ... No response ...

Learner 143: ... The textbooks and research.

Learner 144: ... No response ...

Learner 145: ... The E-learning books count as learning.

Learner 146: ... Finding research on your work.

8.11 Is there anything I have not asked or am unaware of that I should know about concerning the introduction of tablets or the paperless classroom initiative in general?

Learner 1: ... No!

Learner 2: ... No!

Learner 3: ... No response ...

Learner 4: ... No!

Learner 5: ... No.

Learner 6: ... People (learners) are playing games that involve pornography / sexual activities.

Learner 7: ... No.

Learner 8: ... No.

Learner 9: ... No.

Learner 10: ... No.

Learner 11: ... No!

Learner 12: ... You have not asked what the responsibility of the learner to the tablet is and what the importance of tablets is.

Learner 13: ... No response ...

Learner 14: ... Not really, I think you have answered all my questions.

Learner 15: ... No.

Learner 16: ... No. There is no other thing that I want to tell you.

Learner 17: ... Yes, if you do not have enough money to buy a tablet you should be consulted, and the Department of Education must organise textbooks for you.

Learner 18: ... No, not that I know of ...

Learner 19: ... Yes, the viruses, it's also a huge concern.

Learner 20: ... No.

Learner 21: ... No. there is nothing ...

Learner 22: ... No. You have asked everything I wanted to ask you.

Learner 23: ... No.

Learner 24: ... No, there is nothing.

Learner 25: ... No, there's nothing else that you are unaware of.

Learner 26: ... Yes, some learners I know that they do not use it for schoolwork. They use it for Instagram, WhatsApp and they take pictures during class.

Learner 27: ... No.

Learner 28: ... No, I have said all I know.

Learner 29: ... No response ...

Learner 30: ... No, there's nothing ...

Learner 31: ... Why do children play games on their tablets?

Learner 32: ... No.

Learner 33: ... No, you have asked everything that should know.

Learner 34: ... No, I have nothing to ask, I know how to operate the tablet.

Learner 35: ... No.

Learner 36: ... No.

Learner 37: ... No. there's nothing.

Learner 38: ... No.

Learner 39: ... Yes, what we can do if there was no electricity and our tablets have not been charged.

Learner 40: ... No.

Learner 41: ... No.

Learner 42: ... What makes us pass or fail?

Learner 43: ... No, there isn't.

Learner 44: ... No.

Learner 45: ... No.

Learner 46: ... No.

Learner 47: ... Tablets make it easier in learning areas for educators to teach their learners.

Learner 48: ... No response.

Learner 49: ... No.

Learner 50: ... No response ...

Learner 51: ... No.

Learner 52: ... No.

Learner 53: ... No, there is nothing, all I have is textbooks and some important contacts and my family pictures.

Learner 54: ... Yes, the question is, is there anything else you use your tablet for, except learning by the tablet and what could be it?

Learner 55: ... No response ...

Learner 56: ... No response ...

Learner 57: ... Where do we buy the tablets?

Learner 58: ... No, thank you, all your questions have been answered.

Learner 59: ... No.

Learner 60: ... No.

Learner 61: ... No, there isn't anymore.

Learner 62: ... No.

Learner 63: ... Is it safe and do we have games in our tablets? I don't have games.

Learner 64: ... Yes, the question is to say: what will the teachers do if they find you doing something outside of schoolwork?

Learner 65: ... No, I am sure about everything.

Learner 66: ... Yes, learners have Instagram, Facebook, WhatsApp, etc.

Learner 67: ... None.

Learner 68: ... No, there is nothing you've left out.

Learner 69: ... I think you did ask everything according to me.

Learner 70: ... No.

Learner 71: ... Whether learners use their tablets to learn or just bring them to school for the sake of having a tablet.

Learner 72: ... No, I feel everything has been asked.

Learner 73: ... Nothing that I am aware of.

Learner 74: ... No.

Learner 75: ... No.

Learner 76: ... No response ...

Learner 77: ... tablets also be used for test? Tablets should also be used for writing.

Learner 78: ... No.

Learner 79: ... There is nothing to worry about, everything is fine.

Learner 80: ... No.

Learner 81: ... No, everything you introduce it's okay.

Learner 82: ... No.

Learner 83: ... No.

Learner 84: ... It is bad for children, so there are more children that fail because of the tablet. They keep on playing during contact time instead of learning and listening to teachers.

Learner 85: ... No.

Learner 86: ... No, you have asked everything, I think.

Learner 87: ... No, everything is asked.

Learner 88: ... No.

Learner 89: ... No.

Learner 90: ... No.

Learner 91: ... No response ...

Learner 92: ... No.

Learner 93: ... No, I think you've asked everything as yet concerning the tablets.

Learner 94: ... No.

Learner 95: ... No response ...

Learner 96: ... Why do people play games?

Learner 97: ... Why do we have to buy some of the textbooks while we have our own tablets and can download them?

Learner 98: ... No!

Learner 99: ... No!

Learner 100: ... Learners' tablets must be checked every day.

Learner 101: ... No.

Learner 102: ... No, your questions are good ...

Learner 103: ... No, you haven't ...

Learner 104: ... How do we work if tablets are broken or in for repairs?

Learner 105: ... No.

Learner 106: ... No, there is nothing.

Learner 107: ... No, there's nothing, but children are only required to be on their tablets when they have a task to do.

Learner 108: ... No.

Learner 109: ... I'm aware of everything and if I am not sure I can ask my teacher (educator).

Learner 110: ... No response ...

Learner 111: ... We should also download the lessons at home using data.

Learner 112: ... No response ...

Learner 113: ... No.

Learner 114: ... No response ...

Learner 115: ... Yes ...

Learner 116: ... No response ...

Learner 117: ... No response ...

Learner 118: ... No response ...

Learner 119: ... Who came with this clever idea and why?

Learner 120: ... Why don't we get tablets without games, only have textbooks? Why don't you check every day to see if they have games?

Learner 121: ... That are the learners doing their schoolwork or just playing games.

Learner 122: ... No!

Learner 123: ... No.

Learner 124: ... No.

Learner 125: ... No.

Learner 126: ... No.

Learner 127: ... No.

Learner 128: ... E-learning can cause laziness because childrens' marks might drop.

Learner 129: ... No.

Learner 130: ... No.

Learner 131: ... None.

Learner 132: ... No.

Learner 133: ... No response ...

Learner 134: ... No, I think you have asked me enough, thank you.

Learner 135: ... None.

Learner 136: ... No response ...

Learner 137: ... None.

Learner 138: ... No.

Learner 139: ... No.

Learner 140: ... None.

Learner 141: ... None.

Learner 142: ... No.

Learner 143: ... No.

Learner 144: ... No response ...

Learner 145: ... No.

Learner 146: ... No, you have covered everything and please don't get rid of the tablets.

Protocol 9: Letter to the Principal of Sunward Park High School

3483 Ikhala Street

Extension 3

Palm Ridge

Johannesburg

1458

Date

The Principal

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Mrs Ansie Peens

Re: Permission to conduct research for PhD research studies at Sunward Park High School

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD in Education thesis required by the University of the Witwatersrand, I would like to conduct a research study on the topic mentioned above at Sunward Park High School (Grade 8).

No mention will be made of the school's name or the names of the participants in this study in the thesis, in possible future presentations or in any other forum. Information gathered in this study will be used solely for my research. The information acquired during research will remain anonymous and confidential; the data will be securely locked away and destroyed after five years.

For the purposes of my research, I request permission to:

- Interview 40 Grade 8 learners in the school. I will need to use a class list to select them randomly (20 girls and 20 boys). Interviews will last for approximately 15 minutes for each participant. A tape recorder will be used to capture the

conversations between the researcher and each learner. I will make the necessary arrangements to conduct these interviews during break time(s) or after school.

- interview four Grade 4 teachers (teaching Natural Sciences) in your school. These interviews will also be recorded. It is estimated that each interview will last for 15 minutes. I will arrange to conduct these interviews during break time(s) or after school.
- observe 12 lessons (this means that I will observe three lessons per teacher) in Grade 8 when teachers use tablets to teach learners or when learners learn with tablets in the classroom setting.
- administer questionnaires to all teachers teaching Grade 8 and all learners in Grade 8.
- use data gathered in the school for academic research purposes.
- conduct this study during contact time (where necessary or the need arises).

Consent will be obtained from everyone selected prior to the commencement of the study.

Should you have questions about this study, I will be happy to answer them and to address any concerns you may have. Please let me know if you require any further information.

Yours truly

SK Nyembe

Primary school teacher / part-time PhD student University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

CONSENT FROM PRINCIPAL OF SUNWARD PARK HIGH SCHOOL FOR GRADE 8 TEACHERS AND LEARNERS TO PARTICIPATE IN PHD RESEARCH STUDY

Please complete and return to Stanley Nyembe.

I _____ (Principal's full names) hereby give permission for Sunward Park High School Grade 8 teachers and learners to be observed and interviewed about learning and teaching during school hours, breaks and/or immediately after school.

Principal's Signature: _____

Date: _____

School Stamp

Protocol 10: Sunward Park / Grade 8 Learners' Assent Letter

3483 Ikhala Street

Extension 3

Palm Ridge

Johannesburg

1458

Date

The Grade 8 Learner

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Learner

Re – Permission to observe and interview you for my PhD research study

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

This form may have some words that you are not familiar with. Please ask someone to explain any words that you do not understand. You may take a copy of this form home to think about it and discuss it with your parents before you decide whether you want to take part in this study or not.

As part of my PhD studies at the University of the Witwatersrand, I would like to observe your teacher using mobile technology (tablets) to teach you, or you are using tablets to learn in a classroom setting. This information will help me to fulfil the requirements of my studies. I will observe 12 lessons, and this means that I will observe three lessons per of teachers teaching Natural Sciences. For my classroom observation I will use an observation schedule and I will note down information where necessary and record the lessons.

Afterwards, I will interview you about the use of technological resources (such as tablets) to improve learning and how your teachers use them to teach you. I will use class lists to select twelve learners only in a Grade to participate in the interviewing process. These interviews will take place during breaks or immediately after school and should only take between 10 and 15 minutes for each learner. I will ask you open-ended questions during the interview.

I will use a tape recorder to capture the conversation between you and me (the researcher), but I will not tell your teacher, your friends or your parents about what you have said. The conversation between you and me will be strictly confidential. If I need to talk about the study in speeches, presentations and in writing a report at the university, I will never mention or use your name. The data will be used for writing a research report (thesis) to my supervisor at Wits University about what you are using tablets for and how are you using the in your school.

I need your assent to observe you and to interview you.

You have a right to choose whether to participate in this study or to answer a question(s) and you may stop a conversation at any time without being threatened or intimidated by the researcher, parents or teachers. If you decide to take part in this research study, please sign the attached form and return it to me. Make sure that you do not sign the form until you have had all your questions have been answered and that you understand what you will be required to do.

If you have questions about taking part in this study, you can talk to me or you can ask your parent/s or another adult to call me.

Yours sincerely

Stanley Nyembe (Mr)

Primary school teacher / part-time student at the University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

ASSENT FORM FROM GRADE 8 LEARNER TO BE OBSERVED AND INTERVIEWED AS PART OF THE PHD RESEARCH STUDY

Please do not sign this form if you have any questions. Be sure that someone answers your questions.

ASSENT FORM

I have read this form and I understand the information about this study. I am willing to take part in this study.

Learner Name (Printed)

Signature

Date

Witness Name (Printed)

Signature

Date

NOTE: The witness must be an adult aged 18 or older, and present when the learner signs.

Protocol 11: The Natural Science Teacher at Sunward Park / Teachers' Consent Form

3483 Ikhala Street

Extension 3

Palm Ridge

Johannesburg

1458

The Natural Science Teacher

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Teacher

Re – Permission to observe and interview you for PhD research study

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD studies at the University of the Witwatersrand I am doing research on the above-mentioned topic. I would like to observe you teaching three lessons using tablets in a classroom setting. I need to observe how this new mobile technology (tablets) is used to promote/enhance learning and/or used to engage learners in learning and thinking. I selected only teachers teaching Natural Sciences in Grade 8 to participate in both interviews and observations and that also includes a subject that you are teaching. During my classroom observations I will use an observation schedule and note down information where necessary; I will tape-record the tape lessons in order to that accurate information is taken for analysis purposes.

After this observation process, I would like to interview you during breaks or immediately after school; this interview should not last longer than 20 minutes. During the interviews I will ask you questions about the use of tablets, particularly for learning and teaching. The conversation between you (the teacher) and me (the researcher) will be recorded for the purpose of analysis and for the partial fulfilment of my study requirements.

I would like to assure you, however, that your responses to any questions asked during the interviews and any data collected during my observations of your lessons will be strictly confidential. I will not discuss your responses with my colleagues, friends or your school principal. Your name, the name of the classes you teach, or the name of the school will not

be disclosed in my thesis writings, speeches and presentation of the findings, or in any other public forum. The findings will be used for the sole purpose of the research report (thesis) which is required for my PhD degree, and I will destroy the raw data collected after five years. During these five years the data will be kept securely locked away. I believe that your participation will provide a long-term benefit to the school as the study aims to examine the value of using mobile technology (tablets) in schools.

I need your permission to observe you teaching and to interview you.

You have the right to choose not to participate in this study. If you do choose to participate, you may stop at any time without any negative implications. You may also choose not to answer a question (s) that are asked during the interview without being intimidated or persuaded to answer.

If you agree to participate in this study, please sign and return the form below. Should you have any questions about the study, or your participation please contact me.

Sincerely

Stanley K Nyembe

Teacher at Freeway Park Primary School Primary / part-time student at the University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

CONSENT FORM OF NATURAL SCIENCE TEACHER AT SUNWARD PARK HIGH SCHOOL TO PARTICIPATE IN PHD RESEARCH STUDY

I have read this request and I understand the information about this study and what my participation entails. Questions that I wished to ask about the study have been answered. My signature confirms that I am willing to participate in this study.

Teachers' Name (printed)

Signature

Date

Name of the person conducting informed consent discussions/witness (printed)

Signature of the person conducting informed consent

Investigator's signature: _____

Protocol 12: Sunward Park Parent's / Guardian's Consent Letter

3483 Ikhala Street

Extension 3

Palm Ridge
Johannesburg
1458
Date

The Parent / Guardian of Grade 8 learner

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Parent/Guardian

Re – Permission to observe and interview your child / ward in Grade 8 for PhD research study

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD studies at the University of the Witwatersrand, I am required to complete a research report (thesis). I would like to observe your child using a tablet in classroom settings; how they use a tablet, what they use it for and how the learners engage in the learning process through the use of new mobile technology (tablets) in the school settings.

I have selected Natural Sciences in Grade 8 and I will observe twelve (12) lessons (3 lesson per teacher in Grade 8. Throughout the period of my classroom observations, I will use an observation schedule, note down information where necessary and record the lesson for accurate analysis purposes when writing research report (thesis). Once I have completed this observation process, I would like to interview your child/ward during breaks or immediately after school. This interview should not last longer than 15 minutes. During the interview I will ask your child questions about tablets, learning and teaching. I will randomly select 40 learners for interviews (20 girls and 20 boys).

The conversation between me (the researcher) and your child will be recorded for the purpose of analyses and for the partial fulfilment of the study requirements. I would like to assure you that your child's responses to any questions asked during the interview and any data collected during my observations of the lessons will be strictly confidential. I will not discuss any responses with my colleagues, the school principal or friends. Your child's name, the name of the class, or the name of the school will not be disclosed in my report (thesis) writings, speeches and presentation of the findings, or in any other public forum.

The findings will be used for the sole purpose of the research report (thesis) which is required for my PhD degree, and the raw data will be destroyed after five years. During these five years the data will be securely locked up. In short, this means that the name of your child will always remain anonymous and confidential.

You are under no obligation to ask your child to participate in this study. If you choose to allow her/him to participate in this study and later change your mind, you may stop her/him from participating at any time. There will be no repercussions if you ask your child to drop out of the study at any time.

Should you have questions about allowing your child to be part of this study, please contact me?

Yours sincerely

Stanley Nyembe

Freeway Park Primary teacher and part-time student at the University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

Please sign and return this form via your child/ward to Stanley Nyembe or to your child's/ward's class teacher for him to collect.

**CONSENT FROM PARENT OR GUARDIAN OF GRADE 8 LEARNER
OF SUNWARD PARK HIGH SCHOOL FOR THEIR CHILD OR WARD
TO BE OBSERVED AND INTERVIEWED AS PART OF THE PHD RESEARCH STUDY**

I have read this letter of request. I understand the information about this study. I give consent for my child/ward to participate in this study.

Parent / Guardian name (printed)	Signature	Date
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Witness name (printed)	Signature	Date
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NB: The witness must be an adult aged 18 or older, present when consent is signed.

Protocol 13: Letter to the Spokesperson (or Representatives) of the Gauteng MEC of the Department of Basic Education

3483 Ikhala Street

Extension 3
Palm Ridge
Johannesburg
1458
Date

Gauteng MEC Spokesperson
Gauteng Department of Basic Education
111 Commissioner Street
Johannesburg CBD

Dear Oupa Bodibe (Mr)

Re – Permission to interview you for PhD in Education research studies

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD in Education research report (thesis) required by the University of the Witwatersrand in partial fulfilment of the degree requirements, I would like to conduct a research study about the above topic and interview you about the introduction of tablets (mobile technology in Gauteng schools). The aim is to investigate the motive behind this huge programme (paperless classrooms) and your vision to make sure that all schools in Gauteng are equipped with this new mobile technology by 2017 or sooner. It is estimated that the interviews will not last longer than 20 minutes.

I will need to record our conversation for the purpose of analysis and for the partial fulfilment of the requirements of this study. I assure you, however, that responses to any questions asked during the interviews will be strictly confidential. The interview will not be discussed with my colleagues, school principals, or friends. Your name will not be disclosed in my report (thesis) writings, speeches and presentation of the findings, or in any other public forum. The findings will be used for the sole purpose of the research report (thesis) which is required for my PhD degree, and the raw data collected will be destroyed after five years. During these five years the data will be securely locked up. For the purposes of my research, I request permission:

- for a one-on-one interview for about 20 minutes;
- to record the interview or conversation for the purpose of analysing results;
- to use data gathered for academic research purposes;

➤ to conduct this interview during your office time.

I will be happy to answer any question (s) related to the study and to address any concerns you might have.

Yours sincerely

SK Nyembe

Freeway Park Primary School Teacher / Part-time student University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

I have read this letter of request. I understand the information about this study. I give consent to participate in this study.

Name (printed)	Signature	Date
_____	_____	_____
Witness name (printed)	Signature	Date
_____	_____	_____

Protocol 14: Letter to the Ekurhuleni District Director (or Representative) of the Department of Basic Education / Consent Form

3483 Ikhala Street

Extension 3

Palm Ridge
Johannesburg
1458

Jerry Bhangaloo (Mr)
The Ekurhuleni District Director of the Department of Basic Education
No 2 Robin Close
Infinity Office Park
Meyersday

Dear Mr J. Bhangaloo

Re – Permission to interview for PhD in Education research studies.

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD in Education research report (thesis) required by the University of the Witwatersrand in partial fulfilment of the degree requirements, I would like to conduct a research study about the above-mentioned topic and interview you in the process about introduction of tablets (mobile technology in Gauteng schools). The aim is to investigate motive behind this huge programme (“The Classroom of the Future”) programme) and your vision about making shore that all schools in Gauteng need to use this new mobile technology by the year 2017 or sooner. It is estimated that interviews will not last longer than 20 minutes.

Please note that the conversation between me (researcher) and you will be recorded for the purpose of analyses and for the partial fulfilment of this study requirements. However, I would like to assure you that responses to any questions asked during the interviews will be strictly confidential. I will not discuss any responses with my colleagues, principal, or friends. I am not going to disclose your name in my report (thesis) writings, speeches and presentation of the findings, or in any other public forum. The findings will be used for the sole purpose of the research report (thesis) which is required for my PhD degree, and I will destroy the raw data collected after five years. During these five years I will lock up the data in my trunk. In short, this means that your name will remain anonymous and confidential when presenting and writing the report.

For the purposes of my research, I request permission to:

- have one-on-one interviews for an estimated period of 20 minutes

- record our interviews or conversation for the purpose of analysing my results.
- use data gathered for academic research purposes.
- allow me to conduct this study during your office time.

If you have questions about this study, I will be happy to answer any question (s) related to the study and to address any concerns you might have.

Yours sincerely

Mr Nyembe S. K.

Freeway Park Primary School Teacher / Wits University Part – Time Student

Cell: 074 1110 753 / 082 6271 361

E – Mail: stanleynyembe@ymail.com

I have read this letter of request. I understand the information about this study. I give consent to participate in this study.

Name (printed)	Signature	Date
Witness name (printed)	Signature	Date

Protocol 15: Letter to all Grade 8 learners who will be receiving questionnaires and observed in Natural Sciences classroom

3483 Ikhala Street

Extension 3

Palm Ridge

Johannesburg

1458

Date

The Grade 8 Learner

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Learner

Re – Permission to observe you for my PhD research study

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

This form may include some words that you do not know. Please ask someone to explain any words that you do not understand. You may take home a copy of this form home to think about it and talk to your parents about before you decide if you want to take part in this study or not.

As part of my PhD studies at the University of the Witwatersrand, I would like to observe your teacher using mobile technology (tablets) to teach you or you are using tablets to learn in a classroom setting to help me fulfil the requirements of my studies. I will give you questionnaires and observe twelve (12) lessons and this means that I will observe three lessons per teacher teaching you Natural Sciences. During my classroom observation I will use an observation schedule, note down information where necessary and record the lesson for proper analysis to fulfil the purposes of this study. I will not record or videotape these observation sessions.

Your name and the name of the school will never be used or mentioned if I need to talk about the study in speeches, presentations and in writing a report at the university. The data will be used for writing a research report (thesis) to my supervisor / Wits University about what you are using tablets for and how are you using them in your school.

I need your assent to observe you in your classroom.

You have the right to choose whether to participate in this study or not participating without being threatened or intimidated by the researcher, parents or teachers. If you decide to take part in this research study, please sign this form attached and return it to me. Make sure that you do not sign the form until all your questions have been answered and that you understand what you will be required to do.

If you have questions about being in this study, you can talk to me or you can ask your parent/s or another adult to call me.

Yours sincerely

Stanley Nyembe (Mr)

Primary school teacher / Part-time student University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

ASSENT FORM FROM GRADE 8 LEARNER TO BE OBSERVED AND INTERVIEWED AS PART OF THE PHD RESEARCH STUDY

Please do not sign this form if you have any questions. Be sure that someone answers your questions.

ASSENT FORM

I have read this form I understand the information about this study. I am willing to take part in this study.

_____	_____	_____
Learner Name (Printed)	Signature	Date
_____	_____	_____
Witness Name (Printed)	Signature	Date

Protocol 16: Sunward Park parent's / guardian's consent letter (to observe your child/ward in the classroom)

3483 Ikhala Street

Extension 3

Palm Ridge

Johannesburg

1458

Date

The Parent / Guardian of Grade 8 Learner

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Parent / Guardian

Re – Permission to observe your child / ward in Grade 8 for PhD research study

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD studies at the University of the Witwatersrand, I am required to complete a research report (thesis). I would like to observe your child using a tablet in classroom settings; how they use a tablet, what they use it for and how the learners engaged in the learning process through the use of new mobile technology (tablets) in the school settings. I have selected twelve (12) lessons (three per teacher teaching Natural Sciences, in Grade 8 for observation. Throughout the period of my classroom observations, I will use an observation schedule, note down information where necessary and record the lesson for proper analysis to fulfil the requirements of the study.

I would like to assure you that any data collected during my observations of the lessons will be strictly confidential. I will not discuss any responses with my colleagues, principal, or friends; your child's name, the name of the class, or the name of the school will not be disclosed in my report (thesis) writings, speeches and presentation of the findings, or in any other public forum. The findings will be used for the sole purpose of the research report (thesis) which is required for my PhD degree, and I will destroy the raw data collected after five years. During these five years the data will be securely locked up. In

short, the name of your child/ward will remain anonymous and confidential when presenting and writing the report.

You are under no obligation to ask your child/ward to participate in this study. If you choose to allow her/him to participate in this study and later change your mind, you may stop her/him from participating at any time. There will be no repercussions if you ask your child to drop out of the study at any time.

Should you have questions about allowing your child/ward to be part of this study, please contact me.

Yours sincerely

Stanley Nyembe

Freeway Park Primary teacher and part-time student at the University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

CONSENT FROM PARENT OR GUARDIAN OF GRADE 8 LEARNER

OF SUNWARD PARK HIGH SCHOOL FOR THEIR CHILD OR WARD

TO BE OBSERVED AND INTERVIEWED AS PART OF THE PHD RESEARCH STUDY

I have read this letter of request. I understand the information about this study. I give consent for my child/ward to participate in this study.

Parent / Guardian name (printed)	Signature	Date
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Witness name (printed)	Signature	Date
------------------------	-----------	------

Protocol 17: Letter to the School Governing Body of Sunward Park High School

3483 Ikhala Street

Extension 3

Palm Ridge

Johannesburg

1458

Date

The SGB Chairperson

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Chairperson

Re: Permission to conduct research for PhD research studies at Sunward Park High School

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD in Education thesis required by the University of the Witwatersrand, I would like to conduct a research study on the topic mentioned above at Sunward Park High School (Grade 8).

No mention will be made of the school's name or the names of the participants in this study in the thesis, in possible future presentations or in any other forum. Information gathered in this study will be used solely for my research. The information acquired during research will remain anonymous and confidential; the data will be securely locked away and destroyed after five years.

For the purposes of my research, I request permission to:

- interview 40 Grade 8 learners in the school. I will need to use a class list to select them randomly (20 girls and 20 boys). Interviews will last for approximately 15 minutes for each participant. A tape recorder will be used to capture the

conversations between the researcher and each learner. I will make the necessary arrangements to conduct these interviews during break time(s) or after school.

- interview four Grade 8 teachers teaching Natural Sciences in your school. These interviews will be recorded. It is estimated that each interview will last for 15 minutes. I will arrange to conduct these interviews during break time(s) or after school.
- observe twelve lessons (three per teacher teaching Natural Sciences in Grade 8 when teachers use tablets to teach learners or when learners learn with tablets in the classroom setting.
- administer questionnaires to all teachers teaching Grade 8 and all learners in Grade 8.
- use data gathered in the school for academic research purposes.
- conduct this study during contact time (where necessary or the need arises).

Consent will be obtained from everyone selected prior to the commencement of the study.

Should you have questions about this study, I will be happy to answer them and to address any concerns you may have.

Yours truly

SK Nyembe

Primary school teacher / part-time PhD student at the University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

CONSENT FROM SGB CHAIRPERSON OF SUNWARD PARK HIGH SCHOOL FOR GRADE 8 TEACHERS AND LEARNERS TO PARTICIPATE IN PHD RESEARCH STUDY

Please complete and return to Stanley Nyembe.

I _____ (SGB Chairperson's full names) hereby give permission for Sunward Park High School Grade 8 teachers and learners to be observed and interviewed about learning and teaching during school hours, breaks and/or immediately after school.

SGB Chairperson's Signature: _____

Date: _____

School Stamp

Protocol 18: Grade 8 Teachers' Consent Form

3483 Ikhala Street

Extension 3

Palm Ridge

Johannesburg

1458

Grade 8 Teachers

Sunward Park High School

44 Cresta Street

Sunward Park

1459

Dear Teacher

Re – Permission to observe and interview you for PhD research study

Study Title: How are technological resources (tablets) used in the promotion of effective teaching and learning in high schools?

As part of my PhD studies at the University of the Witwatersrand I am doing research on the above-mentioned topic. I would like to observe you teaching three lessons using tablets in a classroom setting. I need to administer questionnaires to all teachers teaching Grade 8 to obtain data on variations around the use of tablets in the classroom and observe how this new mobile technology (tablets) is used to promote/enhance learning and/or used to engage learners in learning and thinking. I selected only teachers teaching Natural Sciences, Mathematics, English and Social Sciences in Grade 8 to participate in both interviews and observations and that also includes a subject that you are teaching. During my classroom observations I will use an observation schedule and note down information where necessary; I will tape-record the tape lessons in order to that accurate information is taken for analysis purposes.

After this observation process, I would like to interview you during breaks or immediately after school; this interview should not last longer than 20 minutes. During the interviews I will ask you questions about the use of tablets, particularly for learning and teaching. The conversation between you (the teacher) and me (the researcher) will be recorded for the purpose of analysis and for the partial fulfilment of my study requirements.

I would like to assure you, however, that your responses to any questions asked during the interviews and any data collected during my observations of your lessons will be strictly confidential. I will not discuss your responses with my colleagues, friends or your school principal. Your name, the name of the classes you teach, or the name of the school will not be disclosed in my thesis writings, speeches and presentation of the findings, or in any other public forum. The findings will be used for the sole purpose of the research report (thesis) which is required for my PhD degree, and I will destroy the raw data collected after five years. During these five years the data will be kept securely locked away. I believe that your participation will provide a long-term benefit to the school as the study aims to examine the value of using mobile technology (tablets) in schools.

I need your permission to observe you teaching and to interview you.

You have the right to choose not to participate in this study. If you do choose to participate, you may stop at any time without any negative implications. You may also choose not to answer a question (s) that are asked during the interview without being intimidated or persuaded to answer.

If you agree to participate in this study, please sign and return the form below. Should you have any questions about the study, or your participation please contact me.

Sincerely

Stanley K Nyembe

Teacher at Freeway Park Primary School Primary / part-time student at the University of the Witwatersrand

Cell: 074 1110 753

Email: stanleynyembe@ymail.com

CONSENT FORM OF GRADE TEACHERS AT SUNWARD PARK HIGH SCHOOL TO PARTICIPATE IN PHD RESEARCH STUDY

I have read this request and I understand the information about this study and what my participation entails. Questions that I wished to ask about the study have been answered. My signature confirms that I am willing to participate in this study.

Teachers' Name (printed)

Signature

Date

Name of the person conducting informed consent discussions/witness (printed)

Signature of the person conducting informed consent

Investigator's signature: _____

Protocol 19: Table 5.4: Summary of categories

Strongly agree	Most enabling environment	
Agree	Enabling environment	
Disagree	Not an enabling environment	
Strongly disagree	Least enabling environment	

Protocol 20: Table 5.5: Analysis of teaching techniques observed in four Grade 8 classes

Criteria	Example (s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Teaching	To guarantee the effectiveness of a teaching and learning process.	1	9	1	1	12
	Provide little time or opportunity for learner interaction and expect learners to have mastered the information by the time of assessment.	2	7	3	-	12
	Introduce concepts and their definitions.	4	6	2	-	12
	Find him/herself dealing with learners who pay less attention, play games or send messages on their tablets or even sleep in class.	1	8	3	-	12
	Total: 4 Justified Criteria	8	30	9	1	48 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Strongly Agree	Agree	Disagree	Strongly Disagree	Sub-Total per 12 lessons observed
Demonstrations						
	Demonstrate how a phenomenon 'works' (how to manipulate the device or how to make meaning of information found, etc.).	-	-	11	1	12
	Do not allow all learners to experience the phenomenon (e.g., only a teacher who shows and tells, etc.).	-	5	7	-	12
	Most learners are uninvolved and still passively receive information.	1	7	4	-	12
	Learners are able to get involved and see first-hand how the phenomenon presents itself in the real world.	1	4	7	-	12
	Allow all learners to experience the phenomenon.	3	5	4	-	12
	Total: 5 Justified Criteria	5	21	33	1	60 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Strongly Agree	Agree	Disagree	Strongly Disagree	Sub-Total per 12 lessons observed
Discussions	A hybrid form of teaching takes place, as learners both give and receive information.	1	5	6	-	12
	Learners are able to explore issues of interest, opinions and ideas.	1	8	3	-	12
	Learners are able to listen first and understand the contributions of other learners in order to respond or add to them.	-	8	3	1	12

	During discussion, learners are attentive, active, more engaged, and motivated.	-	9	3	-	12
	Total: 4 Justified Criteria	2	30	15	1	48 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Agree	Strongly Agree	Disagree	Strongly Disagree	Sub-Total per 12 lessons observed
In-class activity	All learners are involved in learning in the class, either working in groups or alone, to solve a problem or puzzle.	-	9	3	-	12
	Learners are able to see a phenomenon unfold and are able to personally manipulate and practice using the phenomenon first-hand.	2	9	1	-	12
	Learners' learning is assessed by administering all six levels of Bloom's taxonomy.	-	8	4	-	12
	Total: 3 Justified Criteria	2	26	8	-	36 Points of Likert Scale
Total						

Sources: Abdull et al. (2013), Craig et al. (1994), Davis et al. (2000), Eisenburg (1986), Jacobs (1996), Ausubel et al. (1972) and Klein (1991)

Protocol 21: Table 5.6 - Analysis of meaning observed in four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Meaning	Using new technology (tablets) meets learners' expectations (they understand the concept better, they know how to apply knowledge and put it into practice, it makes sense, they obtain knowledge that is sufficient for the task, etc.).	8	3	1	-	12
	Using new technology (tablets) is definitely not meeting learners' expectations because knowledge has been shown to be deficient and it distresses learners.	-	1	6	5	12
	They access knowledge that is highly relevant and loaded to their tablet that simplifies/enhances their understanding.	11	-	1	-	12
	Learners show an ability to discriminate one thing from another, to contrast a and b and differentiate.	1	10	1	-	12
	Total: 4 Justified Criteria	20	14	9	5	48 Lessons
						48 Points of Likert Scale

Sources: Abdull et al. (2013), Czerniewiez (2007) and Ausubel et al. (1972).

Protocol 22: Table 5.7 - Analysis of promoting effective learning observed in four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly Disagree	
The learners' perspectives	Does the teacher begin a new topic or lesson with the learners' own view of things? For example, to establish what they know, or think they know, about the topic? What differentiation do they make, and what values do they place on this differentiation?	1	10	1	-	12
	How do learners use tablets as a tool to understand the world? How do learners use tablets to go beyond understanding of the topic to an understanding of world phenomena?	1	8	3	-	12
A deep approach to learning	The learners' intention is to understand ideas.	1	9	2	-	12
	They have an intrinsic interest in the task and an expectation of enjoyment in carrying it out.	1	10	1	-	12
	Making the task coherent with their own experience, relating and distinguishing evidence and argument, looking for patterns and underlying principles, integrating the task with existing awareness, and so forth.	1	7	4	-	12
A surface approach to learning	Learners see tasks as external impositions and they have the intention to cope with these requirements.	-	10	2	-	12
	They are instrumentally or pragmatically motivated and seek to meet the demands of the task with minimum effort.	-	7	5	-	12
	They focus on unrelated parts of the task, separate treatment of related parts, focus on what are seen as essentials, reproduce the essentials as accurately as possible, and memorise information for assessment purposes rather than for understanding.	-	8	4	-	12
Ability to teach themselves	Learners demonstrate a potential to monitor, control and regulate certain aspects of their own cognition, motivation and behaviour as well as some features of their environment.	-	4	5	3	12
	Learners were taught to be more effective self-regulators.	-	1	6	5	12
Promoting learner engagement	Learning is seen as the responsibility of everybody in the society, that is, learners, parents, teachers, the Department of Education and the community at large – i.e., a holistic approach to learning (Nystrand et al., 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	5	5	2	-	12

Procedural engagement	Learners and teachers go through the motions of schooling: they ask and answer questions, assign and carry out homework, and maintain reasonable standards of comportment (Nystrand et al., 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	5	7	-	-	12
	They do not grapple extensively with difficult or controversial academic work/topics (Nystrand et al., 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	2	8	1	1	12
	Although most learners regularly attend school to learn, they are less often engaged in their studies (Nystrand et al., 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	-	6	6	-	12
Substantive engagement / Intellectual engagement	There is ongoing engagement with challenging academic problems and issues (Nystrand et al., 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	1	10	1	-	12
	There is a sustained commitment to and involvement with academic work (Nystrand et al., 1991; Abbott, 2014; Strommer et al., 1992; Gebre et al., 2014; Taylor et al., 2011; Fredrick, 2013; Appleton, 2008).	-	-	1	-	12
	There is a contract between willing participants.	-	4	5	3	12
	Total: 4 Justified Criteria	18	125	49	12	204 Points of Likert Scale
						204 Lessons

Sources: Trigwell (2010), Biggs (1986), Eizenberg (1986) and Marton and Saljo (1984)

Protocol 23: Table 5.8 - Analysis of seven practices for effective learning observed in four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Use summative assessments to frame meaningful performance goal	Clarify the targeted standards and benchmarks for teachers and learners.	-	5	5	2	12
	Learners are able to apply what they know to the new situation.	1	8	3	-	12
	Teachers are able to set up realistic, authentic contexts for assessment that enable learners to apply their learning thoughtfully and flexibly, thereby demonstrating their understanding of the content standard.	2	9	1	-	12
	Teachers can provide a worthy goal and help learners see a reason for their learning.	-	9	3	-	12
Show criteria and models in advance	Teachers can present evaluative criteria and models of work that illustrate different levels of quality.	5	7	-	-	12
	Learners know the criteria before they begin their work; they have clear goals for their work (they do not need to guess what is most important or how teachers will judge their work).	1	9	2	-	12
	Were learners able to see several examples showing how different learners achieved high-level performance in unique ways?	4	5	2	1	12
Assess before teaching	A variety of practical pre-assessment strategies has been used (including pre-test of content knowledge, skills checks, concept maps, drawings and K-W-L (<i>Know-Want to Learn</i>) charts. Teachers can uncover existing misconceptions by using formative, diagnostic assessment to determine the strength and weaknesses of the learners. Does the use of portable tablets enable teachers to obtain this information instantaneously?	7	2	3	-	12
Offer appropriate choices	Were learners given appropriate options to demonstrate knowledge, skills and understanding?	4	6	2	-	12
	Teachers should allow choices – but always with the intent of collecting needed and appropriate evidence based on goals.	1	11	-	-	12
	Teachers can accommodate different learning or thinking styles.	5	7	-	-	12
	Total: 4 Justified Criteria	30	78	21	3	132 Lessons
						132 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Provide feedback early and often	Teachers are able to provide feedback based on formative assessments.	2	10	-	-	12

	To serve learning, feedback is timely, specific, understandable to the receiver, and formed to allow for self-adjustment on the learners' part.	1	11	-	-	12
	This helps learners understand both their strengths and the areas in which they can improve.	-	12	-	-	12
	Were learners given opportunities to act on feedback – to refine, revise, practice and retry?	2	9	1	-	12
Encourage self-assessment and setting goals to achieve learning objectives	Learners were given an opportunity to review their work against a list of explicit criteria such as a rubric.	-	5	7	-	12
	Learners were able to set personal goals, employ proven strategies, and conduct productive self-improvement.	-	-	10	2	12
Allow new evidence to replace old evidence	Learners were given multiple opportunities to demonstrate their learning.	1	7	4	-	12
	Teachers need to require their learners to provide some evidence of corrective action they will take – such as engaging in peer coaching, revising their report, or practicing the needed skill in a given way – before embarking on their 'second chance'.	-	1	9	2	12
	Total: 4 Justified Criteria	6	55	31	4	96 Points of Likert Scale

Sources: O' Connor and McTighe (2005)

Protocol 24: Table 5.9 - Analysis of promoting effective thinking observed in four Grade 8 classes

Criteria	Example(s) of observation made to justify criterion	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Critical thinkers	Can use logic to solve problems at hand.	-	9	3	-	12
	They are open-minded, and normally evaluate incoming information by determining the basis and validity for the views being expressed in order to make effective or informed decisions (Erickson, 2007; Hudging, 1977; Moseley et al., 2005; Gust, 1995; Van Deventer et al., 2013).	-	11	1	-	12
	They are also able to consider the validity of alternative solutions to the problem, by laying out a timeline and set of steps to achieve resolution (Erickson, 2007; Hudging, 1977; Moseley et al., 2005; Gust, 1995; Van Deventer et al., 2013).	-	10	2	-	12
	They are concerned about "getting it right" (Erickson, 2007; Hudging, 1977; Moseley et al., 2005; Gust, 1995; Van Deventer et al., 2013).	1	11	-	-	12
	They are eager to solve problems (Erickson, 2007; Hudging, 1977; Moseley et al., 2005; Gust, 1995; Van Deventer et al., 2013).	-	12	-	-	12
						60 Lessons
	Total: 4 Justified Criteria	1	58	6	-	60 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Strongly Agree	Agree	Disagree	Strongly Disagree	Sub-Total per 12 lessons observed
Deductive reasoning						
	Evidence of logical process in which a conclusion is drawn from a set of premises containing more information than the premises taken collectively (Gust, 1995).	-	7	4	1	12
	Learners can articulate their thinking processes with their peers and with a global audience beyond the confines of their physical environment (Elder, 2012; Taylor et al., 2011).	2	7	3	-	12
						24 Lessons
	Total: 5 Justified Criteria	2	14	7	1	24 Points of Likert Scale
Criteria	Example(s) of observation made to justify criterion	Agree	Strongly Agree	Disagree	Strongly Disagree	Sub-Total per 12 lessons observed
Inductive reasoning						
	Evidence of logical process in which a conclusion is drawn containing more information than the observations of experience on which it is based (Gust, 1995).	-	10	2	-	12
	Learners are able to make informed decisions to select and analyse appropriate information and use tools that will enhance their learning (Elder, 2012).	-	9	3	-	12

						24 Lessons
						24 Points of Likert Scale
	Total: 5 Justified Criteria	0	19	5	0	Sub-Total per 12 lessons observed
Criteria	Example(s) of observation made to justify criterion	Agree	Strongly Agree	Disagree	Strongly Disagree	
Critical reasoning						
	Look at all the options and various explanations for something and do not merely accept one point of view or the explanation that suits you (Van Deventer et al., 2013).	3	8	1	-	12
	Learners have the confidence to craft and safeguard a positive digital information space (Elder, 2012).	-	7	5	-	12
	Technology is perceived as the designs and environments that engage learners (Gilakjani et al., 2013).	1	11	-	-	12
						36 Lessons
	Total: 5 Justified Criteria	4	26	6	-	36 Points of Likert Scale

Protocol 25: Table 5.10 - Analysis of seven components in the TPACK framework

Criteria	Example(s) of observation made to justify criterion	Example(s) from transcripts to support agreement	Rating of the criteria on four-point Likert Scale				Sub-Total per 12 lessons observed
			Agree	Strongly Agree	Disagree	Strongly Disagree	
Technological Knowledge (TK)	Teachers have knowledge about various technologies, ranging from low-tech technologies such as pencil and paper to digital technologies such as the internet, digital video, interactive whiteboards and software programs (Koehler, 2006; Schmidt, 2009).	Teachers enabling learners to download lessons, textbooks, teachers' notes, educational videos including games, diagrams and other learning materials.	4	8	-	-	12
Content Knowledge (CK)	Teachers have sound subject matter that needs to be learned or taught. Teachers know the content they are going to teach and how the nature of knowledge is different for various content areas (Koehler, 2006; Schmidt, 2009).	Able to prepare PowerPoint lessons, to identify and guide learners on what where to find information in the internet and also to correct learners' misconceptions.	3	9	-	-	12
Pedagogical Knowledge (PK)	Teachers know the methods and processes of teaching, which include knowledge in classroom management, assessment, lesson plan development, and student learning (Koehler, 2006; Schmidt, 2009).	Able to use technological resources to promote collaborative learning, discovery learning, or any form of theories of learning.	2	9	1	-	12
Pedagogical Content Knowledge (PCK)	Teachers have the content knowledge that deals with the teaching process (Shulman, 1986) and are able to blend both content and pedagogy with the goal being to develop better teaching practices in the area (Koehler, 2006; Schmidt, 2009).	Able to use technological resources to give learners access to different types of information and learning materials.	-	8	3	-	12
Technological Content Knowledge (TCK)	Teachers have the knowledge of how technology can create new representations for specific content. TCK suggests that teachers understand that, by using a specific technology, they can change the way learners' practice and understand concepts in a specific context area	By ensuring that pure "classroom of the future" is implemented in the classroom settings.	-	3	9	-	12

	(Koehler, 2006; Schmidt, 2009).						
Technological Pedagogical Content Knowledge (TPK)	Teachers have knowledge of how various technologies can be used in teaching, and understand that using technology may change the way teachers teach (Koehler, 2006; Schmidt, 2009).	By using tablets as a platform to access learners in the classroom and beyond via online learning, creating group chats and other technological platform for learning.	-	2	10	1	12
Technological Pedagogical Content Knowledge (TPACK)	Teachers have knowledge to integrate technology into their teaching in any content area. Teachers have an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK) by teaching content using appropriate pedagogical methods and technologies (Koehler, 2006; Schmidt, 2009).	By ensuring that all learners are on tasks, doing school work when technological resources are used in the classroom settings.	-	1	9	2	12
	Total: 5 Justified Criteria		9	40	32	3	84 Points of Likert Scale

Sources: Koehler (2006) and Schmidt (2009)