



**UNIVERSITY OF
KWAZULU-NATAL**

**INYUVESI
YAKWAZULU-NATALI**

**Natural Science Teachers' Experiences of Using WhatsApp in Teaching in Primary
School**

by

Name: Presanthi Coopasamy

Student Number: 209514198

Supervisor: Dr Cedric Bheki Mpungose

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and Curriculum Studies**


2023

University of KwaZulu-Natal

DECLARATION

I, **Presanthy Coopasamy** declare that:

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Dr. Cedric Bheki Mpungose

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DEDICATION

I would like to dedicate this project to my parents, who have been my pillar of strength during this time. This was certainly not easy; I have had many obstacles along the way. Thank you for pushing me onward and always reminding me to stay strong.

Abstract

Teachers' have been raged to move from traditional to online instruction to link with the pressures of the fourth (4th) industrial revolution. Therefore, schools make requirements of educational technological resources which may include but not limited to smart board, computers, application software. Nevertheless, the lack of skills to incorporate technology into curriculum hinders effective online pedagogy, and this results in the poor curriculum implementation. Therefore, this qualitative case study thus aims to explore experiences of teachers on the integration of WhatsApp to teach Natural Sciences in Primary Schools. Also, this qualitative case study looks at six teachers experiences on the incorporation of WhatsApp to teach Natural Sciences. Likewise, these teachers were purposively and appropriately selected because they were teaching Natural Sciences, and they were easily accessible. One-on-one semi-structured WhatsApp interviews, and online reflective activities were used to generate data which was thematically analysed using inductive and deductive reasoning. Findings uttered that the training of teachers to integrate WhatsApp into the teaching of the Natural Sciences curriculum improve them to draw from different experiences (formal, informal and conformal). This study therefore sought to balance experiences to ensure a successful integration of educational technological resources into curriculum.

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Transcripts

Chapter 1

1.1.Introduction

In South Africa, there have been many changes in the reforms of the curriculum in public schools, especially after 1994 (Khoza, 2015). Lepik (2015) has said that the noun curriculum is broadly defined as the entirety of learner experience that occur during the educational process. Thus, curriculum refers specifically to a planned sequence of instruction. It is a repetition of activities that must be taught in the classroom. Covid-19 had brought about many other changes and many of the teachers had struggled to impart information to learners. The use of technology had become more relevant and useful. Technology harnessing became the new way of teaching and learning. Carl (2014) asserts that curriculum disparity was reflected in curriculum changes at different levels (Macro and Micro) for natural Sciences implementation in KwaZulu-Natal Schools. Hence this study explores The Use of WhatsApp in KwaZulu-Natal Primary schools, covering: Natural Sciences Teachers' Experiences.

1.2. Background of the Study.

Mpungose & Khoza (2020) have argued that Learning Management Systems (LMS) are used for both formal and informal learning. Many teachers used technology for purely administrative work, not seeing the must to integrate the technology into teaching and learning.

The teaching and learning methods have been changing with the advancements in technology. Demir, Kotey and Alenezi (2021) state that teachers want to communicate and have more flexibility with students. For this to happen, technology must be integrated into the classroom. However, we saw the booming increase in the use of technology when the covid – 19 pandemic affected us. My primary concern is that teachers' experience of teaching Natural Sciences in Primary Schools using WhatsApp. According to Kingston and Siraj (2017) learners need a deep foundation of information before they can be exposed to Natural Science concepts and how to use them. Furthermore, due to the lack of teaching time for learners and educators during COVID-19, the teaching of Natural Sciences was not effective and subject gaps were developed. In the setting of COVID-19, the content gap in Primary Schools therefore decreased the efficiency of curriculum distribution. In light of the pandemic, the use of WhatsApp and in this case WhatsApp, was the best form of communication to help share and teach the learners effectively considering that the learners have less contact time.

Learning and teaching have moved from the traditional ways, such as the teacher-centred method of teaching in classroom, and textbook lessons around the globe McDonald (2017). Teachers should therefore teach learners how to think and not what to think; so that they are able to engage in learning and improve their learning skills. Instructional methods should be adjusted so that learners acquire learning skills in the place of memorisation and giving back verbatim the knowledge that they have learnt Snyder and Snyder (2008). The learners gain more value from learning when the lessons are made practical and hands-on. Having theory is one thing, but applying the knowledge is more beneficial to the learners.

Technological content knowledge defines the mastery of technological resources Koehler & Mishra (2009). This suggests that teachers must have knowledge and experiences of modern technological resources such as WhatsApp to successfully be integrate them into Natural Sciences subject by using a laptop, projector, and sharing the content taught via WhatsApp to engage with the learners. Moreover, Russell (2009) suggests that teaching and assessing using technological resources such as WhatsApp requires that teachers have knowledge and experiences of both internet (software) and computer applications (hardware) for holistic use of technological resources (WhatsApp).

In addition, content knowledge in this sense, according to Koehler and Mishra (2006), involves having a deep knowledge of Natural Sciences subject matter, including knowledge of concepts, theories, evidence, and organisational frameworks. This is based on the experiences that the teachers have teaching the content of Natural Science with the use of technology during the Covid-19 Pandemic.

Furthermore, Pedagogical Knowledge encompasses teachers' knowledge of the practices, processes, and teaching and learning methods Koehler & Mishra (2009). Moreover, according to Ile and Nwosu (2019), effective and appropriate teaching of Natural Sciences in the 21st century should adopt the learner-centred approach. In the wake of Covid-19 the teachers' pedagogical practices should be open to learners' contributions as the process of technological resource integration takes place. As Ile and Nwosu (2019) further indicate, the Natural Sciences subject could not embrace technological resources integration had teachers used the traditional teacher-centred methods. Thus, the teachers must have enough experiences of specific methods of delivery and theories which inform their teaching of Natural Sciences, enhancing the subject using technological resources such as WhatsApp. The teachers need to explain how the use of technology such as WhatsApp has helped them to teach and overcome some of the challenges they may have faced when attempting to use technology in their lessons.

According to Mpungose & Khoza (2020) technology has made major advancements in many of the institutions. “The advancement of technology has led to universities and other institutions of higher education (IHE) to adapt and use learning management systems (LMS) for student learning (Mpungose & Khoza, 2020, p. 1). Many schools have also followed in this manner and have opted to use technology such as WhatsApp for teaching and learning. They did find many difficulties while trying to use the system; however, they were able to work through it all and they found that WhatsApp was the best way going forward to engage with the parents and teachers.

1.3.Focus and Purpose of the Study.

The purpose and focus of this study are to explore the use of WhatsApp in KwaZulu-Natal Primary schools giving Natural Sciences teachers’ experiences. The study explored teachers’ experiences using WhatsApp to teach Natural Sciences in the KwaZulu - Natal District in the COVID-19 era. The reason I chose this study is that I was concerned about the cessation of teaching and learning in KZN primary schools. In my observation and in informal conversation with my colleagues, I noticed that teaching conditions had been normal before COVID-19; policy documents were followed accordingly in the teaching of mathematics in foundation phase.

1.4.Location of the Study

The study will be conducted in South Africa, KwaZulu-Natal, Queensburgh, Durban. The school that I have chosen is a special needs school. The learners who attend this school are demographically mixed meaning that the learners come from rural and urban areas. The school consists of African, Indian, White and Coloured teachers and learners.

1.5.Problem Statement:

I have chosen this study because of my personal experience, interest in and teaching of Natural Sciences in Grade six. I had taught Natural Sciences for the last eight years in two different schools. The first school was a middle-income school and the second a rural school. I currently teach in a Special Needs school, at which we also teach Natural Sciences as part of our curriculum. I had noticed that teachers had technology at their disposal; however, they had not used the technology for teaching and learning. The technology was only used for administration and office work. Lessons that could be taught using WhatsApp to explain concepts such as photosynthesis using animated videos could have made the lesson more interesting and

enjoyable. I observed this and tried my best to motivate for a change to take place. This change of WhatsApp usage came quickly and abruptly when the covid-19 pandemic struck. We all had to adjust and rethink the way in which we do things. WhatsApp had a major effect on the way in which we taught our learners and how our learners were learning. The use of WhatsApp was the quickest and easy fix to solving all our issues in terms of getting information to our learners and parents as quickly as possible.

1.6.Rationale of the Study

Teachers' experiences

The study explored teachers' experiences of teaching Natural sciences in primary schools during the COVID-19. The reason I chose this study is that I was concerned about the teaching and learning taking place in Primary schools. In my examination and in unofficial conversation with my associates, I noticed that teaching conditions had been regular before COVID-19; policy documents were followed accordingly in the teaching of Natural Sciences. The Curriculum Assessment Policy Statement (CAPS) document gives a comprehensive weekly planning for teachers to pursue. Each subject was outlined with exactly which topics needed to be taught on specific days throughout the school year. The Annual Teaching Plan (ATP) was ensuring better curriculum coverage and use of the teaching time. Tracking these, teachers were shown and thus knew what and when to teach because each subject outlined exactly the topics to be taught on specific days throughout the school year. Although, in the context of COVID-19, I had to adapt to changes that came about. My personal understanding led me to change my mind set on how things should be done as the learners only attended on some days. I had to teach one topic over two weeks. This caused breaks in curriculum, as ATPs were reduced. As a result, most teachers seem to be confused as to which content was to be covered.

The COVID-19 pandemic caused many challenges and changes in many schools particularly in those in isolated areas. To minimize the risk of being affected by the pandemic, the Department of Health instructed all citizens to observe social distancing wherever they were. As a result, the DBE carries out procedures in an unusual way based on the protocol, issued by the Department of Health. The Department of Education disseminated Circular No. 48 of 2020, which instructed schools to choose from the timetabling patterns to maintain social distancing in the classrooms. This meant that learners now had to attend school for fewer days, according to the timetabling patterns proposed. This caused me to experience issues on how the curriculum could be covered in this difficult context. When I spoke with my colleagues from my school, they also implied having missed about how the Natural Sciences curriculum could be covered using WhatsApp. Perkins (1996) proclaimed that understanding can be extracted

based on three understandings, namely, semi-structured understanding (personal need), structured understanding (professional need), and unstructured understanding (societal need).

1.6.1. Personal experiences:

I have chosen this study because of my experience and involvement as a Natural Sciences teacher. I taught Natural Sciences and technology at two different schools. I had observed that the Natural Sciences teaching methods relied on traditional methods of teaching such as the use of textbooks and chalkboard; while no importance was placed on utilizing modern technology such as the use of a computer, projector, or access to the internet. The computers were mostly used by teachers for administrative work such as typing school letters and notices, preparation of lessons, creating learner reports and other administrative work. I had noticed that this was a pattern many teachers followed. Many teachers including me followed the same pattern of the conventional teaching methods.

We all lacked the ambition to use the present technology to enhance the learning experience of the learner as well as the teaching experience of the teacher. The study will focus on teachers' experiences for using WhatsApp as a teaching tool during covid-19.

1.7. Literature:

Dewey (1938) defines experiences as rooted in the dualism of mind and the world, as well as the mind and body on deductive reasoning that works from the general to the specific. Moreover, the author suggests that experience is grounded in both interaction and continuity between the teacher and the learner. In addition, Khoza (2016) asserts that experiences can be organised into three categories. Firstly, self-experience is applied to the integration of technological resources. Such forms a setting that helps teachers and learners build their own unique individual identities. Secondly, there are communal experiences, these experiences are constructed where a person is raised and shaped by their society Buthelezi (2016). Lastly, we have expert/content experiences. According to Khoza (2018), most teachers draw from self-experiences and communal experiences while ignoring content experiences when integrating technological resources into their teaching and learning. This unbalanced use of experiences leads to a discrepancy during the integration of technological resource. Therefore, to maintain a balance between teachers' experiences, there is a need for this study to be conducted to explore teachers practices on the integration of WhatsApp. When teachers can use the facilities of WhatsApp, Zoom and many other technological platforms, they should be able to make the

lessons interesting; and the children will also enjoy the lesson as they would be able to relate to the technology.

1.8. Theoretical Framework.

The direction from the literature suggests that Technological Pedagogical and Content Knowledge (TPACK) is the most suitable framework to guide this study as displayed in Figure 1 below. Furthermore, Koehler, Mishra, and Cain (2013), together with Graham (2011), share that the TPACK framework was developed from Shulmans' Model (1986, 1987) (as displayed in Figure 2 below) of Pedagogical Content Knowledge (PCK) to explain how teachers' understanding of educational technologies and PCK interact with each other to produce effective teaching with technology.

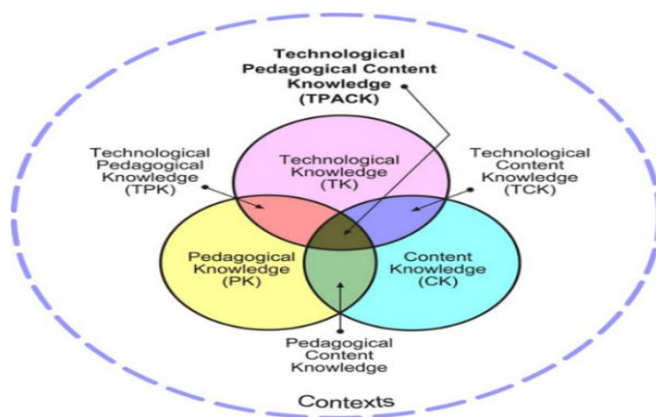


Figure 1: The TPACK framework and its knowledge components (Source: Koehler and Mishra, 2009)

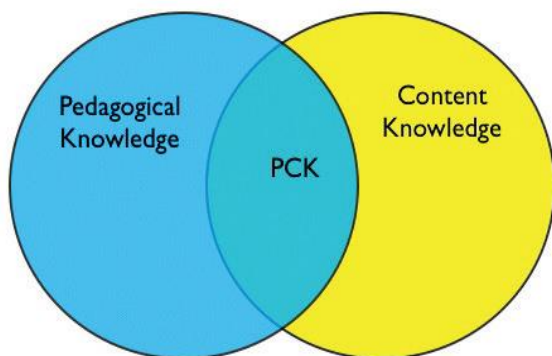


Figure 2: PCK model (Source: Shulman, 1986)

In Koehler and Mishra (2006), the description of the TPACK theory is equated to a framework of teacher knowledge for technology integration. This vouches for the relevance of this

framework in this study as it also aims to explore Natural Sciences teachers' experiences on the integration of technological resources such as WhatsApp. Furthermore, Mercado, Panganiban, and Ramos (2019) maintain that Technological Pedagogical Content Knowledge (TPACK) is the dynamic transactional relationship between, and among, the knowledge and content, pedagogy, and technology.

1.9. Research Questions

1. What are Natural Sciences teachers' experience of using WhatsApp for teaching in KwaZulu-Natal primary schools?
2. How do Natural Sciences teachers' cope with the use of WhatsApp for teaching in Primary Schools?

1.10. Research Objectives

1. To explore Natural Science teachers' experience of using WhatsApp for teaching in KwaZulu-Natal Primary Schools.
2. To explain Natural science teachers' coping methods of using WhatsApp for teaching and learning.

1.11. Research Design and Methodology

While the research paradigm depicts the beliefs of, the researcher on what can be thought about the world, the research design reflects beliefs about what might be the most helpful or noteworthy method of acquiring this information Bertram and Christiansen (2014). According to Creswell and Poth (2016), case studies include the exploration of an issue through at least one case inside a limited framework; for example, a setting or a specific context. This study will adopt a descriptive case of 5 Natural Sciences teachers. Zainal (2007) maintains that descriptive case studies aim to richly describe the natural phenomena that occur within the data in question. In this study, a descriptive case study will be a valuable instrument; the researcher will be able to thoroughly discuss the phenomenon (experiences) of this study in more detail. However, according to Sarantakos (2005), the weakness of case studies, as a style of research, is that the findings could include personal impressions and bias, thus validity cannot be ensured.

1.12. Research Paradigm

In this study, the researcher will adopt an interpretive research paradigm. Bertram and Christiansen (2014), in correlation with Cohen and Manion (2013) state that the interpretive paradigm is the base because it helps the researcher to describe the way in which people understand and give meaning to their world and actions, instead of guessing what people will do. Furthermore, Sarantohos (2005) believes that the interpretive paradigm focuses on cultural

and historical interpretations based on a person's social life and experiences. In addition to this, the greatest aspects given in this paradigm are ontology and epistemology. This study will use the interpretivism paradigm in an ontological manner to look for subjective experiences and ideas of the teachers on the use of WhatsApp as a resource in Natural sciences, considering that teachers have different experiences.

In this study, the researcher will use a descriptive case study of six Grade six natural sciences teachers. Each teacher will give their description and feedback on their experiences of teaching Natural Sciences using technology; and in this case WhatsApp to share information and as a form of communication. Yin (2003) states that descriptive case studies are good for giving rich insight when the researcher investigates a particular problem in an educational or social setting. The motivation of the study is to use WhatsApp as a tool to socially connect with the learners and teaching them. In this study, the recruitment of the participants (teachers) will be conducted via online pamphlets, through emails and Google forms to prospective participants of this study.

1.13. Research Approach/Style

Qualitative research approach as understood by Creswell (2014), is the approach of understanding and exploring the meaning of groups or individuals on a social problem. Denzin and Lincoln (2017) maintain that the qualitative approach to research includes the study and the use of diverse empirical materials which could include experiences, case studies, life stories and interviews.

According to Anderson (2010), the strength of a qualitative approach is that the problem explored can be examined in detail so that the researcher can gain full insight into teachers so that the researcher can understand why the teacher may be having trouble using technology or how the technology has helped the teacher. This study will use this strength to complete an intense examination of the Natural Sciences teachers experiences when using WhatsApp as a resource in natural sciences teaching and learning.

1.14. Sampling

The study will be looking into the experiences of teachers using WhatsApp to teach Natural Sciences. A group of 5 teachers will be selected that have had differing experiences using WhatsApp to teach. I worked on a sample of teachers ranging in age who have taught the subject over the last few years to gain a better understanding. The sampling method used to attract teachers to the study was an advert explaining the study being conducted. I had then addressed the Grade Six natural sciences teachers collectively and made them aware of the study that I would be conducting. All participants were given sufficient information about the

study; and they agreed to work and collaborate. The teachers were excited to join in and participate in the study once they had all the information. Sitting as a team with the teachers also made the process easier as they had shared experiences working with technology through the Covid-19 pandemic not only with Knowledge of subjects such as Natural Sciences. Some of the teachers also teach other subjects such as Mathematics. These teachers had explained the difficulties as well as the positive side of using WhatsApp to teach and share information.

1.15. Data-Generation Method

According to Thorne (2016), the data-generation methods are semi-structured WhatsApp interviews, a reflective activity and Zoom group discussion interviews will be used to generate information needed for the study.

1.16. Reflective Activity

This study will use an online reflective activity to generate data from participants by using a series of questions that address the main question of this study. According to Cohen, Manion, and Morrison, (2011), reflective activities entail a written series of questions which address the phenomenon explored by the researcher. Reflective activities provide authentic data and reflect the experiences of all participants; the researcher's subjective beliefs do not take precedence over the views of participants Cohen, Manion and Morrison (2011). Likewise, in this study, I shall design an open-ended questionnaire which was steered by my theoretical framework (TPACK).

1.17. One-on-one Semi-structured Observation

This study employed semi-structured interviews. Corbetta (2003) asserts that semi-structured interviews reflect the order in which different topics are discussed through a conversation; the wording is left to the researcher's discretion. Flick (2009) argues that semi-structured interviews are valuable because of their ability to provide researchers with opportunities to explore subjective viewpoints and to generate detailed accounts of participants' experiences. Therefore, semi-structured interviews, in this study, will benefit the researcher by generating detailed accounts of Natural Sciences teachers' experiences: the researcher will be available to probe for more clarity from participants. Jamshed (2014) suggests that to keep to the allocated time, interview guides work to maintain the interview focused on the desired course of action.

1.18. Zoom Group Discussion Interviews

Cohen, Manion and Morrison (2011), and Newcomer, Hatry, and Wholey (2015b) agree that group-discussion interviews are planned discussions in which a researcher uses a set sequence of questions to gain participants' insight into a particular topic. In this study, 45 minutes to 1-hour group -discussion interview will be held on Zoom, with 5 participants in the study.

1.19. Data Analysis

According to Bertram and Christiansen (2014), data analysis refers to a close inspection or study through system or partition of whole into its part for the purpose of the study. In addition, Cohen, Manion, and Morrison (2018) posit that the process in data analysis entails noting patterns, themes, describing, and understanding the generated data. This study will employ thematic analysis as a data analysis method. Braun, Clarke, and Hayfield (2019) defines thematic analysis as the process of systematic organising, identifying, and making meaning of the data patterns involved across data. In addition, Cohen, Manion, and Morrison (2018) maintain that thematic analysis helps the researcher to display multiple perspectives and experiences of participants supported by diverse citation that provides evidence to the reader. In this study, both inductive and deductive qualitative thematic analysis will be used by the researcher to identify patterns (teacher experiences) of data generated from the three methods used in this study, namely: Zoom group-discussion interviews and one-on-one semi-structured interviews. The researcher will use inductive approach. Likewise, Creswell (2012) strengthens this argument by maintaining that qualitative data is inductive; it shifts from detailed data (from Zoom group discussion interviews, and one-on-one semi-structured WhatsApp interviews) to general codes and themes (transcriptions).

1.20. Ethical Issues

According to Creswell and Poth (2018), researchers must to consider the ethical issues that might arise during the planning and designing of qualitative research and how they may overcome them. These ethics refer to behaviours that are considered either “right” or “wrong” in the research (Bertram & Christiansen, 2014). In addition, Hatch (2002) asserts that to ensure ethics that are maintained, the researcher must be sensitive to vulnerable populations and must prevent placing participants at risk. Thus, Bertram and Christiansen (2014) and Cohen, Manion, and Morrison (2018) suggest ethical principles which can be employed to address research ethics. These include non-maleficence, beneficence, anonymity, and autonomy.

Non-maleficence indicates that the study should bring no harm to the research participants Cohen, Manion & Morrison (2018).

I will first apply for a gate-keeper’s letter from the University of KwaZulu-Natal research office to obtain permission to conduct the study within the university. In addition, I will also send a letter to seek ethical clearance from the office of research at the University of KwaZulu-Natal’s College of Humanities, so that the study is approved prior to involving participants.

In addition, anonymity implies that the identity and information of participants should be protected Fenton, Cardarelli, Molloy & Novick (2019). This study will ensure anonymity of participants by using pseudonyms, and by ensuring that reflective activities provide no information that identifies participants. Moreover, participants will receive consent forms detailing their rights, stating how the study will protect their confidentiality, reminding of their freedom to withdraw; and all other relevant information that the participant must be aware of should they participate in the study.

1.21. Trustworthiness

Korsteins and Moser (2018b) states that trustworthiness defines the degree to which the research of the study can be trusted. According to Lincoln and Guba (1985) for interpretivists to gather the trustworthiness criteria, they should consider the four considerations which are as follows: credibility, transferability, dependability, and confirmability.

Credibility refers to the reality or the representation and interpretation of the participants (teachers) opinions Polit & Beck (2012). Thus, credibility is concerned with research findings reflecting the real experiences of participants without the researcher's subjectivity in the interpretation of findings. This means that credibility shows concern with the findings of the research reflecting real experiences of the participants without the research prejudice and analysis of the findings. I will generate data using various methods as suggested by Lincoln & Guba (1985). I will also take notes and make recordings during the interview process.

Bitsch (2005) states that transferability is accountable for outlining the extent to which the findings can be transferred to another group or context. In this study transferability will be ensured by giving a comprehensive explanation of the research processes, a clear explanation of the methodology, the research approach, a summary of the data generated, and the data analysis processes used.

1.22. Anticipated Problems/ Limitations

Creswell and Poth (2018) state that the researcher must consider the ethical problems that may emerge during the designing and planning of the qualitative research and how the researcher can overcome these problems. According to Bertram & Christiansen (2014) the ethics refers to the behaviours that can be seen as either right or wrong in research.

Cohen, Manion and Morrison (2018) state that non-maleficence entails that the study should bring no harm to the research participants. This rule will followed, by keeping harm from its participants. Such will be achieved through being aware of the harm that the study may cause, therefore protecting the welfare of the participants.

1.23. Application for Ethical Clearance

I shall first apply for the gate-keeper's letter the university of KwaZulu-Natal's research office, thus obtaining permission to conduct the study within the university. I shall also send a letter to seek ethical clearance from the office of research at the University of KwaZulu - Natal's College of Humanities. The study will thus be approved before involving the Department of Education, the school principal, and the participants. Bertram & Christiansen (2014) suggest that the study be beneficial directly to the participants, the educational community, and other researchers. Cohen, Manion and Morrison (2018) state that it is seen as being unethical and egotistical if the study is only used for the researcher's benefit. On the ethical rule, this study will give back to the educational community by offering its findings to literature and making recommendations about upcoming research based on experiences of the teachers. Teachers can thus confidently integrate WhatsApp into their teaching.

Trustworthiness

Trustworthiness relates to the methods by which I as the researcher is able to ensure that the quality of the research is of a very high standard, and the findings are worthy of recognition (Cian, 2021). These cover credibility, transferability, dependability, and confirmability.

Credibility

Credibility agreements with the focus of the research and refers to certainty in how well data and processes of analysis address the intended focus (Cope, 2014). In fulfilling this principle, the researcher used specific sources (teachers teaching in the FP) to ensure that data generated addressed the focus of the study.

Transferability

Transferability refers to the extent to which the findings can be transferred to other settings (Daniel, 2019). This was enriched through a clear category of the context and a thorough presentation of the characteristics of the participants. In this study, I as the researcher did not vigorously seek for transferability; however, her position was that through execution of the task, the findings can be transferred to similar contexts.

Dependability

Dependability refers to a circumstances in which I as the researcher can account for adaptations in the study (Kabir, 2017). The researcher ensured that the research design, methodology and data generation methods displayed sufficient information, and that there was fitness for purpose. This means that the method of data generation (one-on-one semi-structured interviews, zoom interviews observation) ensured that the researcher could generate the necessary data. Furthermore, I used techniques used by other researchers in conducting research in a related environment.

Confirmability

Confirmability is the in-depth methodological explanation which allows consistency of the research results to be examined Amankwaa (2016). To improve confirmability, I did not allow personal issues to interfere with the study. The teachers' experience were recorded literally, without any tampering by me. All the teachers will receive the same set of questions to generate data.

Chapter 2

The Review of the Literature.

2.1. Introduction

The previous chapter focused on introducing the study which is about exploring teachers' experiences with using WhatsApp to teach Natural sciences. Chapter 1 gave a synopsis on research questions and objectives, the research design, literature, and the chapter overview. The literature review clarifies the key concepts, terms, and meanings for the research; and establishes the context for the research Cohen, Manion & Morrison (2007). As such, this chapter gives a review of literature based on the phenomenon (teachers' experiences) and the focus (use of WhatsApp). This chapter aims to explore teachers' experiences using WhatsApp to teach Natural sciences in KwaZulu - Natal Primary Schools. This chapter attempts to understand teachers' experiences, to explain what informs teachers' experiences, and the lessons that can be learnt from the teachers' experiences.

2.2. Phenomenon (Teachers Experiences)

“An experience should have appropriate interaction between objective and internal conditions. When the individual components and environmental components of an experience are working together, they form a situation—a complete and whole experience which changes both the user and the context of use.” (Aedo.C., p.1.2002)

Experiences play a vital role in the teaching and learning process. Furthermore Van Manen (1991) confirms that experiences have the potential to engage teachers in a critique of their beliefs and practices during the teaching and learning process. Schon (1983), concurs with Van Manen (1991) that those experiences are a purposeful, systematic enquiry into practice, such suggests that teachers may be engaged in various activities for them to reflect on issues of their curriculum. In other words, the experiences of the teachers are very important this experiencing process, can allow the teachers to adjust their teaching methods and use technology that is easily accessible to students. In this case WhatsApp is the method used to pass down and share learning material that would be needed.

Boehm and Hansen (2006) have defined experiences as a framework for learning. These researchers further state that having an experience is the knowledge of the lesson being taught via WhatsApp; and the interaction involved through the teaching of Natural Sciences with the use of WhatsApp. Similarly, Vyas and Van der Veer (2005) suggested that the experiences of teachers teaching Natural Sciences, must be looked at holistically within the setting of the learning environment. In this case the use of WhatsApp is the learning space and teaching tool. Every interaction that we have creates an experience that teachers can remember as they go

along the teaching and learning path. The most important part is to learn and take back a lesson that will help us grow. In other words, once teachers have the experience and have prepared themselves physically and mentally, the experience becomes a habit. Once the habit is formed, it becomes embedded. Teachers tend to run with habits known to them.

Forlizzi and Battarbee (2004) suggested that experience can be regarded as an ongoing reflection of an event. In this way, experiences are categorised into three different aspects user-centred, interaction-centred, as well as written-centred experience Dewey (1958) O'Brien (2002) and Garrett (2010). The idea is that everything that the teacher says, does, and uses in the classroom influences the way in which the learner reacts and responds to the situation. For example, when the Covid -19 pandemic had affected the world, many people had to change their way of living and working. Universities and schools had to move to technology to continue with their teaching and learning. It was very difficult, especially for schools that did not have all the facilities to go to a completely digital way of teaching and learning. The use of WhatsApp was the quickest way to get in touch with learners and pass information to them. Richards and Rodgers (2014) emphasised that teachers who are involved in having experiences, put significant attempts into examining the effectiveness of their teaching and into better meeting the learning needs of their learners. Furthermore, teachers may not disregard their experiences, especially in Natural Sciences, if their perception is to produce better learners. Likewise, if teachers make experiences their habit, this will help in creation of specialized knowledge (Greenwood, 1998; Iqbal & Jumani, 2015). Such allows teachers also to imagine what they are doing and how the lesson can be improved Alsulami & Taylor, (2012). Iqbal and Jumani (2015) declare that if teachers have experience in their teaching this will lead to better management of their teaching practices.

Sanders (2003), Law (2009), Karapanos (2009) as well as Dell'Era and Landoni (2014) describe user-centred experience as a beneficial activity which is composed of two parts - the programme and the user. Firstly, there is what the programme (WhatsApp) provides; and, secondly, there is what the users (learners and teachers) bring to the interaction of the learning process. The study furthermore outlines that those experiences are applied to gain a better understanding of comparatively complicated or unstructured practices. This is largely based on the reprocessing of knowledge, understanding, and possibly emotions that we already possess. Likewise, Forlizzi and Ford (2000) as well as Clark et al. (2012) declare that user-centred experiences help one to understand the types of people (learners and teachers) who will use the platform -WhatsApp to teach and learn. Moreover, interaction-centred experience is defined as

the most important tool in understanding how users (teachers and learners) experience a designed or adopted learning system (WhatsApp) (Battarbee, 2004; Bourrier et al., 2016). Studies by Liston and Zeichner (2013); Ghaye (2010); Brantlinger (2007) as well as Osterman and Kottkamp (2004) declare that experiences empower teachers to become successful decision-makers who take responsibility for their actions. The continuous reflection of teachers on their experiences helps them to construct professional knowledge. Clarà (2015), on looking for clarity in ambiguity, declares that experiences are a form of mental processing that we use to fill the purpose of justifying practices or attaining some expected outcome.

When using online platforms, these systems are created such that they allow learners to interact with the learning content, gain access to reading material and activities and examples of assessments. Learners can communicate with their classmates as well as their teachers and have a discussion on concepts on which learners need clarity. Sahin & Yardugül (2020). Experiences help teachers to understand and make meaning about how to use WhatsApp as a teaching tool - how best it can be used. According to (Zeichner and Liston 1987), when teachers understand how the system works, they can take the lead in terms of knowledge that must be shared and shared, thereafter sharing this knowledge through their work. Teachers talking and writing about their experiences using WhatsApp to teach Natural Sciences is very important. Discussion should be encouraged amongst teachers who should think deeply about their own ways of teaching.

When teachers encounter new information or knowledge to teach and pass onto the learners, they are bound to come across challenges and positive sides to everything. Kelly (2016) defined experiences as any thinking processes that change an uncertain situation into a certain one. Additionally, Schon (1983) reasoned that reflection addresses the teacher, suggesting new ways to give consistency to the uncertain situation. In addition to this, Schön (1987) suggested that experiences are seen as a discussion with the situation. Using WhatsApp as a teaching tool has both positive and negative sides to it. Teachers must take note of the experiences they have had while teaching using WhatsApp. Once teachers have gone through a few lessons using WhatsApp, they will have a better understanding of how the lessons are going and what needs to be changed or added while using WhatsApp to teach. Teachers can liaise with teachers from other schools to find out how they feel about using WhatsApp to teach Natural Sciences. In this way, they will be able to discuss a few solutions to problems or to the challenges they are facing; and they can also outline the positive side to using WhatsApp in teaching Natural Sciences.

Kileen (2007) has noted that teachers' experiences and their reflections on their experiences should give teachers an idea of the way in which they teach, how they are going to teach, what and why they are teaching, and most importantly, the method they are using to teach. In this case the use such refers to the of WhatsApp to teach Natural Sciences. Van Manen (1991) states that experiences can allow teachers to work together and reflect on their way of thinking and their practices during the teaching and learning process. This can help the teachers improve and give them guidance as they go along. The study concludes that experiences are a process in which you behave according to the way the experience led you to think. Teachers thereafter question the way in which they teach, and what they would like to change/adjust to be better teachers.

Killen (1989), Zeichner and Liston (1987) believe that teachers experiences will help them to form good connections with all their work colleagues. Teachers must also be vocal and speak out to others about their experiences. This would allow them to learn and gain ideas, resulting in teachers developing and becoming stronger using many different teaching strategies. Teachers will also learn from other teachers using WhatsApp as a teaching tool in teaching their respective subjects and this will give teachers a wider thinking space.

Van Manen (1991) has stated that experiences allow teachers to interact and make judgements on what they believe and practices while they are teaching, and learners are learning. This will result in the experience process enabling teachers to make changes to their approach in teaching. Schon (1987) agrees with Van Manen (1991) that teachers work on what is known to them, using it based on their surroundings, and experiences of what teachers think and what they do. Schon (1987) states that your experience will guide your thought processes as a teacher for the future. The actions that must be followed will have an impact on the ways and tools used or needed at the time of teaching.

Van Manen (1977) has stated that there are three levels of experiences, which are technical, practical, and critical experiences. Zeichner and Liston (1987) believe that in the technical experience, teachers must deal with the applications of the knowledge that must be educational. Knowledge based in a good learning space would make it easy to achieve the teaching and learning goals set out. At this level, teachers are encouraged to use ideas that are different, the teachers somehow having to teach by thinking out of the box. Using WhatsApp to teach and pass information easily accessible to learners in small amounts is one of the ways in which they have managed during the Covid-19 pandemic. Van Manen (1977), together with Zeichner and Liston (1987), state that at the practical level of experience, teachers are concerned with the

values that drive their teaching. Teachers are concerned about the aims and objectives to be accomplished.

Zeichner and Liston (1987) state that at the critical level of experience, teachers are involved with exterior factors of classroom teaching methods. Such can enlighten their experiences, which consist of social matters such as fairness and freedom. The researchers take it further in discovering that for any critical level of experiences to be productive, teachers must reflect on two purposes: understanding the power and connection in teaching; and understanding the assumption and teaching methods.

Teachers must be careful of how they pass down information; and be mindful of their beliefs being passed on to the learners, with the learners then confused over their own beliefs. Teachers must also look back at what they have done so far with the learners in using the various teaching techniques. In this case WhatsApp is being used to teach Natural Sciences and keep a record of such. Teachers can go back to check what works and what does not work. According to (McCarty, Maor & McConney, 2019), it is essential that teachers create a safe learning environment. Teachers that create learning experiences through digital technology, with the conventional experience of learning in a classroom digitally, will improve the learners' learning abilities and promote inclusive learning opportunities. This study will focus on the three levels of experience, which are personal experiences, professional experiences, and social experiences.

2.2.1. Personal Experiences.

Hekkert (2007) maintained that personal experience is shaped by numerous qualities of the user (teacher) such as cultural values, background, skill and attributes, personality and motives; together with those of the WhatsApp system (e.g., shape, design, learning resource). This implies that all factors, processes and actions involved may contribute to the prevailing actions during the learning process (Dewey, 1980). In line with this, Pucillo and Cascini (2014) as well as Law, van Schaik, and Roto (2014) established that this level of teachers' experience is often influenced by the personal habits (experiences are created) of using any technological programme such as WhatsApp for interaction during the teaching and learning process. Ellis, Corette, Ansell, and Lievens (2014) have mentioned that personal experiences are an active way of demonstrating how we think and feel. These experiences and the way in which we reflect also stem from our family situation. Our thinking and experiences that we go through daily become more active when we interact socially. Ellis et al. (2014), Stringer, Maree Lee, Sturm & Giacaman (2022) conducted a study on teachers' experiences with the use of technology in support of helping the learners with enhancing their education. "The benefits of

DT education span from an individual level to that of society. At the individual level, students are provided with increased opportunities to develop skills such as personal agency, problem solving, communication and executive functioning European Commission/EACEA/Eurydice, 2019; Webb et al. (2017). They are given opportunities to apply their knowledge to design, create, test and produce digital solutions to issues that are meaningful to them” (Barendsen et al., 2015; European Commission/EACEA/Eurydice, 2019; Reinsfeld & Fox-Turnbull, 2020 Stringer, Maree Lee, Sturm & Giacaman,2022., p12587.

Dewey (2013) agrees with Zeichner and Keneth (1987) that the attitude of the individual brought to bear on the act of reflection could either pave the way for learning or block it. This would suggest that self -reflection is self -introspection of an individual. For example, as a natural sciences teacher using WhatsApp to teach Grade six learners, I personally found many positives and negatives to the whole method. I would certainly want to use my personal experience of the day’s lesson to improve myself, giving of my best to the learners and imparting the knowledge that I have gained using the WhatsApp application. Hence, having a positive attitude, the dissemination of the content and constantly reflecting on my personal experiences will be most valuable should I encounter an unpleasant situation. Skovholt & Trotter – M Adhison (2014)

2.2.2. Professional Experience.

A study conducted by Pedro (2005) believes that a written reflection of a teacher’s experience helps to guide the teacher teaching practices for improvement of the delivery of the curriculum. Khoza (2016) also supports this idea by stating that the practices of teachers are driven by a written reflection of the teachers’ experiences of using WhatsApp to teach natural sciences. Such Practices are always professional being guided by what has been stated in journals and policy documents (CAPS).

This clearly suggests that upholding professional teaching practices using WhatsApp, Natural sciences teachers in Grade six should be guided by written experiences. Their practices should be guided by the CAPS documents, department circulars, and all other relevant documents on teaching N. J Newton and Anderson (2017). “DT education has the ability to develop students’ understanding, competencies and beliefs to ensure they can benefit from and contribute to the complex society and demanding labour market of their future.” (Stringer, Maree Lee, Sturm, Gaicaman, 2022, p.12607). The learners will be given opportunities to understand concepts in a safe learning environment and they can work from any space that they are comfortable in.

2.2.3. Social experiences.

(Pedro, 2005, p.61) states that “verbal reflection requires teachers to share ideas about their teaching practice, and this can be achieved in various ways, such as when teachers attend workshops, cluster meetings, staff developmental meetings.” The studies show that social experiences help to clarify the experiences teachers have in their various schools. This is to say that having a social experience and sharing thoughts and ideas verbally, and on social media via videos, pictures and workshops creates a social platform. Here concerns relating to the teaching of Natural Sciences with the use of WhatsApp can be discussed, addressing the needs of society (all concerned with teaching) Khoza (2016).

This means that the teachers can share their experiences about how they go about using WhatsApp as a tool for teaching Natural sciences, stating their challenges and ways of improving their teaching methods. Such ways should be driven verbally and shared with their mentors (heads of department, principals, senior management team, circuit managers). Pedro (2005). This will enable teachers to become well experienced both professionally and socially in the teaching of Natural Sciences with the use of WhatsApp. Social experiences are sometimes called Interaction-centred experiences defined as the most important tool in understanding how users (teachers) experience a designed or adopted WhatsApp (Battarbee, 2004; Bourrier et al., 2016). Furthermore, Forlizzi and Battarbee (2004) noted that this stage of experience is a significant tool in investigating the role that WhatsApp plays in linking the gap between the curriculum implementers (teachers) and users (learners). Moreover, interaction-centred experience is positioned within a social context, in which teachers and learners can interact with one another to exchange ideas on the curriculum (Natural Sciences content). As Alben (1996), Alben (2011) and Fallman (2003) maintained, interaction-centred experience focuses on interaction between individuals (teachers and learners) and the WhatsApp and experiences that resulted. Moreover, this level of experience also highlights the importance of social interactions, in which students interact and decode particular events, thereby creating meanings (Dourish, 2004). In addition, Hohn (2013, p. 1) stated that “It takes all sides of human existence, it brings in the world, as the methodological point of departure.” User-centred experience is thus a central aspect when using WhatsApp because it seeks an interaction among learners so that they can share and communicate ideas about any given activity. In other words, this stage of experience relates to all possible affective experiences involved in teachers’ interaction with WhatsApp Desmet & Hekkert, (2007). Little, Gollidge, Agarwalla, Griffiths & McCamlie (2019) believe that teachers who are knowledgeable about technology and are mobile equipped, find it easier to engage with learners and to break across all barriers. “This review highlighted that DT learning increases primary school students’

creativity, confidence, attitudes, and interest in DT (Bower & Falkner, 2015; Funke et al., 2016; Geldreich & Hubwieser, 2020)” (Stringer, Maree Lee, Sturm & Giacaman, 2022, p. 12607). McCarthy, Maor & McConney (2019) have also stated “A challenge facing education systems, therefore, is understanding how teachers change from “nonusers of technologies to becoming transformative teachers with technology.” (Tarling & Ng’ambi, 2016, p. 554). For hospital teachers, knowledge development can be impacted by contextual factors (Phillips, 2017) as well as common barriers to sustaining PD identified by Tondeur et al. (2016), including inadequate infrastructure and lack of use of proven teacher knowledge frameworks like technology, pedagogy, and content knowledge (TPACK) for technology integration (Mishra & Koehler, 2006; McCarthy, Maor & McConney, 2019, p500)

2.3. Curriculum presentation (intended curriculum, implemented curriculum and achieved curriculum)

According to Hoadley and J. Jansen (2013), Pinar (2012), Pinar (2013) as well as Thijs and van den Akker (2009a) the term curriculum stems from Latin verb “currere” which means to run a course. The studies further stated that curriculum also refers to sequence and a vehicle for learning. However, when it comes to the education setting, curriculum is referred to as planned learning experiences that the educational institution such as school or university aims to provide for its learners (Salter & Tapper 1998; Kelly, 2009). Further to this, from the intended view curriculum is explained as a plan for learning (curriculum developers’ and designers’ view) (Van den Akker & Brugman, 2014). An implemented curriculum is defined as plan of learning (students’ experiences) (Pinar 2004; Khoza, 2016). Hoadley and Jansen (2012), Pinar (2013) as well as Van den Akker et al. (2009) state that curriculum can be represented by three main categories; intended, implemented and achieved.

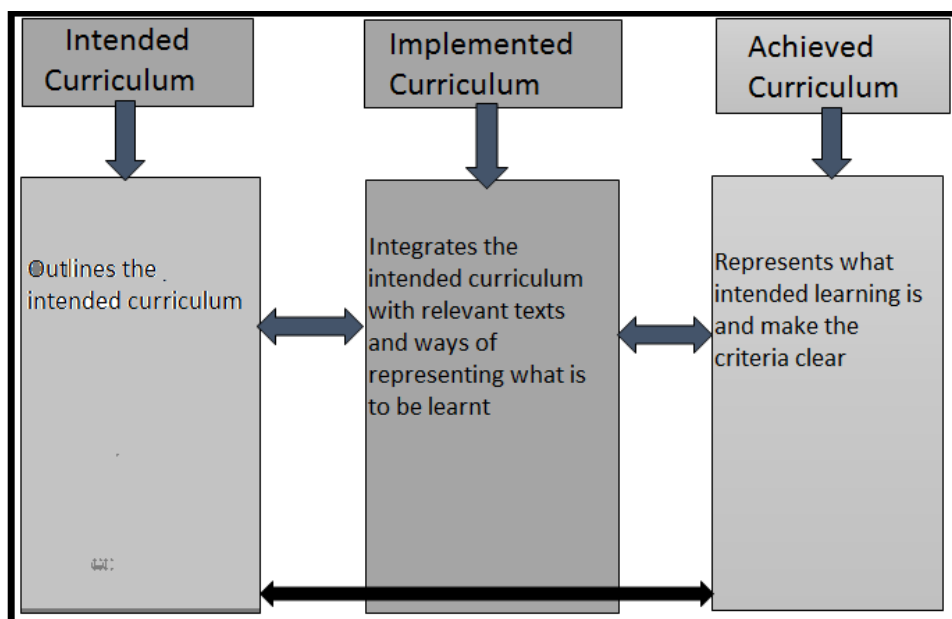


Figure3

This diagram in Figure 3. shows how each category of the curriculum is related to the other.

Makumane & Khoza (2020) also believe that the curriculum is set to achieve certain goals and it must be broken down to the level of the learners in order for it to be achieved.

2.3.1. Intended curriculum.

Curriculum refers to what is planned or agreed for learners to learn in the practice of learning (intended, formal, planned, or prescribed curriculum) (Braslavsky, 2003; Hoadley & J. Jansen, 2013). These studies further declare that intended curriculum stands for the basic values underlying a curriculum; and the intentions as set by curriculum policies. In other words, it sets out what its creator aims should be learnt (Thijs & van den Akker, 2009a). Further to this, this curriculum draws from written policies of thoughts which are guided by essential educational vision and theories specifying the plans of the curriculum (Khoza, 2015a; Van den Akker & Thijs, 2009). The intended curriculum is inspired by written-centred experience because this category of curriculum is driven by organised written ideas, principles, procedures and knowledge of the policy documents intended to be learned by students

The achieved curriculum is defined as the learners' learning experiences measured through the attainment of learning outcomes by the learners (V. d. Akker & A. Thijs, 2009; Hoadley & Jansen, 2013). This category of curriculum helps to determine whether what is intended and implemented has been achieved.

2.3.2. Implemented curriculum.

This curriculum type discusses and guides us on what is planned or expected that learners can learn per the method of learning (intended, formal, planned, or prescribed curriculum) (Braslavsky, 2003; Hoadley & J. Jansen, 2013). Furthermore, this category of curriculum draws from written policies of thoughts which are guided by fundamental educational vision and theories stipulating the intentions of the curriculum (Khoza, 2015a; Van den Akker & Thijs, 2009). The intended curriculum is guided by written-centred experience because this category of curriculum is driven by organised written ideas, principles, procedures, and knowledge of the policy documents intended to be learned by learners. For example, when the learners are learning Natural Sciences, they are guided by a written outline of content showing the subject aims, objectives and assessment tasks that learners are expected to achieve. Furthermore, an intended curriculum cannot be successful without being implemented by curriculum experts such as teachers and other curriculum experts.

2.3.3. Achieved curriculum.

An attained curriculum is defined as the learners' learning experiences measured through the attainment of learning outcomes by the learners (V. d. Akker & A. Thijs, 2009; Hoadley & Jansen, 2013). This part of the curriculum helps to determine whether what is intended and implemented has been achieved. Hoadley and Jansen (2013) have claimed that the attained curriculum provides responses to and input for both intended as well as implemented curriculum. The attained curriculum therefore acts as a connection between the intended and the implemented curriculum. What is in the intended curriculum, is that which must be achieved or assessed. Assessment can be made formatively as well as summative.

Pinar (2012) defines curriculum from both the implemented and achieved viewpoints. The researcher refers to a curriculum as the teacher's role in interpreting the intended curriculum; and as learners' experiences which are measured through the fulfilment of learning outcomes. This relates to user-centred (teacher/learner) personal and communication experience of using WhatsApp in attaining learning outcomes when learning the Natural Science subject matter.

2.4. Curriculum Approaches:

Visscher-Voerman and Gustafson (2004), have stated that there are three curriculum development approaches, which are the instrumental, the communicative and the artistic approach. An instrumental approach refers to the methodical design process, based on precise

analysis. Explicit, measurable, and achievable objectives for the development process are devised also called planning by objectives (Ralph, 1949; Tyler, 2013b).

The communicative approach includes all the participants in curriculum design. Van den Akker & Thijs (2009) have stated that this approach highlights the importance of coherent strategies in which developing relationships with other participants and the input of other participants involved is important.

The communicative approach includes the purposeful model which covers phases of curriculum development, such as the platform of ideas. During this stage, curriculum designers and other relevant participants involved present their ideas and views on the problem, while striving for agreement. Secondly, there is consideration. In this phase, curriculum designers and other participants develop possible solutions to the identified problem, discussing the most suitable solution. Thirdly, there is design. During this phase, the outcomes of the discussion phase are changed and revised as the draft of the final product (curriculum). This curriculum approach relates to interaction-centred experience. It allows learners to interact with their friends and teachers to construct Natural Sciences knowledge on the WhatsApp group using a platform such as WhatsApp discussion chats. The greatest advantage of this approach is that all participants and teachers are given opportunities to contribute. However, it can be very time-consuming.

The artistic approach is related to the practical use of a curriculum (Van den Akker & Thijs, 2009). In this approach, a sketchy summary of a possible final product hastily is developed. The specifications of curriculum design are demonstrated. After numerous numbers of rounds of design version and evaluation, the curriculum is designed. There is a close interaction with practice in the WhatsApp system. As a end result, this approach relates to user-centered experience because of its focus on the practical aspect of a WhatsApp system.

According to these studies (Bernstein, 1999; Khoza, 2016c; Oliva & Gordon, 1988; Thijs & van den Akker, 2009b), as well as those of (Van den Akker et al., 2012), any learning curriculum contains ten curriculum concepts. The curriculum will comprise a rationale, goals, resources, assessment, content, accessibility, the teaching role, the environment, activities, and give times. These above studies affirmed that teachers' experience of using WhatsApp revolve around the understanding of these curriculum concepts.

2.5. Theoretical Framework (TPACK)

This chapter also reviews the literature related to both the key research questions and objectives covering the experiences of teachers' using WhatsApp in teaching Natural Sciences. This chapter also intends to unpack key theoretical principles guiding the study. Therefore, this study is framed around the TPACK theory also known as a framework for teacher knowledge of technology integration. The theory offers the following principles: technological aspects, content, and pedagogical knowledge (Herring et al., 2016; Mishra & Koehler, 2006) as displayed in Figure 4.

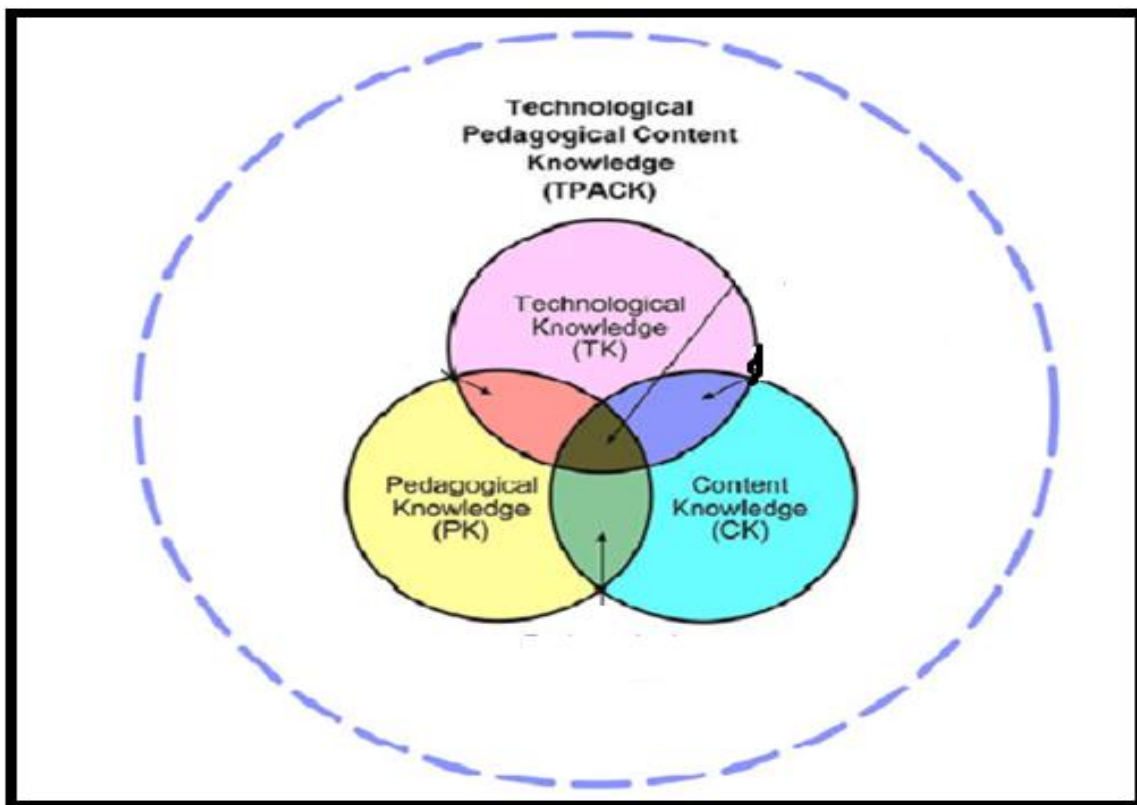


Figure 4. Technological Pedagogical and Content Knowledge (TPACK) by (Mishra and Koehler, 2006, p. 3).

McCarthy, Maor, McConney (2019) believe that “TPACK is a reliable framework for identifying the areas of teachers’ practice requiring support through PD (Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2012). Furthermore, TPACK has “emerged as a representation of the knowledge required to use technology in an educational setting in ways that are

contextually authentic and pedagogically appropriate” (Abbitt, 2011, p. 281).” (McCarthy, Maor, McConney, 2019., p.501)

2.6. Technological Knowledge

One of the well-known social media applications used by most institutions such as schools for teaching and learning and to manage their learning activity is WhatsApp. The name WhatsApp was designed to sound like a greeting “What’s up?” and this was combined with the shortened version “APP” for application to create an easy way to communicate and socialise with people. This was also then used in schools of late to communicate with parents and children for giving them information about their schoolwork. This learning management system (LMS-WhatsApp) was introduced to promote a “social constructivist learning environment, where teachers use their experiences to construct knowledge” (Amory, 2012, p. 2). Brandl (2005) defines WhatsApp as an ‘open source’ platform which allows teachers to custom design the system to individual learners’ needs. WhatsApp is also very compatible with other web-based resources such as Facebook, Emails, Wikipedia, etc., allowing learners’ creativeness and flexibility (Shulamit & Yossi, 2011). Interaction-centred experience seeks teachers and learners to have skills for use of LMSs. As Brandl (2005) noted, LMSs such as WhatsApp encourages teachers and learners to learn skills for intelligent sharing of information and technological communications.

The main purpose was to prepare learners for productive future in a learning management environment (WhatsApp), featuring increasing on-line access to digital and electronic information. Further to this, LMSs such as WhatsApp are designed for a diverse community of users such as universities, librarians, information technologists and researchers. These specialists enable learners successfully to learn Natural Sciences in the technological and digital global learning environment. Additionally, it has been outlined that the use of WhatsApp is good because it focuses on allowing teachers to teach. WhatsApp gives learners the best material to manage and promote learning; and also allows them to organise, manage and receive Natural Sciences course materials (Goodwin-Jones, 2003; Henderson et al., 2017; Kop & Carroll, 2011). Teachers and learners draw much from written experiences when using Moodle in learning Natural Sciences. Studies from Australia such as Liu (2012), Carrington and Robinson (2009), Tunks (2010), Dougiamas and Taylor (2003) and Weil et al. (2011) stated that teachers are enjoying WhatsApp especially when teaching Natural Sciences content because they use WhatsApp to share activities such as chats and discussion forums, thus sharing information about the content. This suggests that teachers and learners actions are also

informed by interaction-centred experience allowing teachers and learners interaction and collaboration in the teaching and learning process. See a qualitative action research study conducted by Mpungose (2018) on lecturers' reflections on the use of Moodle to teach physical science education module in a South African context.

WhatsApp is described as technological knowledge because it is a resource for teaching and learning (Govender & Khoza, 2017). Moreover, a resource refers to any learning equipment or material that can be used to enhance teaching and learning. Criticos et al. (2002, p. 296), defines "a resource as anything which helps students to learn." In other words, resources can be used in supporting teaching and learners' learning. Moreover, Khoza (2015a) defined a resource as anything that aids the learning process. According to these studies Criticos et al. (2005) and Khoza (2012), resources are divided into hard-ware, soft-ware resources and ideological-ware resources. Furthermore, hard-ware resources refer to any mechanism or equipment used in learning, for example, computers, overhead projectors, SMART Boards, Smart-phones etc. (Criticos et al., 2002). Hard-ware resources relate to written-centred experience because hard-ware resources require students to follow written step-by-step procedures, Such as a written user-manual. Teachers and learners must be able to activate any hard-ware resources. On the other hand, soft-ware resources refer to any tools used to display information, such as (computer application soft-ware, e-books, scholarly articles and OHP transparencies, inter alia etc.) (Khoza, 2011; Percival & Elington, 1988). Furthermore, teachers and learners must be able to interact with one another using soft-ware resources to share information. This relates to interaction-centred experiences; the sharing of ideas must be dominant during the learning process using WhatsApp. Ideological ware can be defined as any learning tools that a person cannot see and touch, drives the learning process (Khoza, 2012). Learning aids such as learning approaches, theories, research findings, subject knowledge and experiences are amongst these. (Amory, 2010; Davids, 2013; Govender & Khoza, 2017). These above-mentioned studies further argue that teachers are more interested in Hard-ware and soft-ware resources (Technology in Education) than in ideological-ware (Technology of Education). In other words, they are lacking user-centred experience because they are more interested in technology in education. However, education is not only about technology in education (Hard-ware and Soft-ware). There is the aspect technology of education which involves ideologies (Ideological ware), which drives the learning process (Amory, 2012; Khoza, 2013a). The investigation of teachers' experiences may assist teachers to know and understand their identity by being guided by theories when using WhatsApp.

In other words, learners can interact with one another using soft-ware resources to share information. Furthermore, this relates to interaction-centred experiences in that the sharing of ideas must be dominant during the learning process using WhatsApp. “In preparing teachers for the 21st-century classroom, examples of typical skills and competencies required are critical thinking and problem solving, collaboration and communication, digital literacy, citizenship, student leadership, creativity, and imagination (Fontanilla, 2016; van Laar, van Deursen, van Dijk, & de Haan, 2017; Voogt & Pareja Roblin, 2012). These 21st-century skills are also needed by students to participate in a knowledge-based workforce (Australian Institute for Teaching and School Leadership, 2019; International Society for Technology in Education, 2019; Organisation for Economic Co-operation and Development, 2018; Peccarelli, 2019).” (McCarthy, Maor & McConney, 2019, p501)

2.7. Content Knowledge

Content discusses the subject matter that learners are expected to learn after they have been taught. In the same way, Mishra and Koehler (2006), together with Ward, Kim, Ko, and Li (2015) observed that content can be defined as the concrete subject matter that is to be learned. In education, content knowledge refers to the understanding of the learning experience of a subject matter such as Natural Sciences content. Studies by Graham (2011) as well as Koehler, Mishra, Kereluik, Shin, and Graham (2014) describes content knowledge as the wonder that involves an understanding of the content which encompasses of knowledge of how one's subject matter can be improved by the application of technology (WhatsApp). Loewenberg Ball et al.(2008), Neuendorf (2016) as well as Herring et al. (2016) further pointed out that teachers should also understand the organising principles and structures of the subject matter knowledge. In other words, teachers must not only understand why certain content in sciences is learned but they must further understand why it must be learned and on what grounds, and its warrant can be asserted.

The Natural Sciences curriculum aims to provide learners with opportunities to put together ideas they have about nature, so that they can make sense of what is happening around them. This also encourages learners to ask questions that could lead to further research and investigations. In this way they teacher can use WhatsApp to share information from other social media sites with the learners to make teaching and learning enjoyable. There are three main aims regarding the Natural Sciences content (Curriculum and Assessment Policy, p.10-11):

“Specific Aim 1: ‘Doing Science and Technology’ Learners should be able to complete investigations, analyse problems and use practical processes and skills in designing and evaluating solutions. This means that learners plan and do simple investigations and solve problems that need some practical ability. There are attitudes and values that underpin this ability. Respect for living things is an example of this – learners should not strip leaves off bushes just to compare them; if they examine small animals, they should care for them and release them unharmed in the place they found them.

Specific Aim 2: ‘Understanding and connecting ideas’ Learners should have a grasp of scientific, technological and environmental knowledge and be able to apply it in new contexts. The main task of teaching is to build a framework of knowledge for learners and to help them make connections between the ideas and concepts in their minds – this is different to learners just knowing a lot of facts. When learners do an activity, just answering the set questions is not enough. Discussion must relate to previously acquired knowledge and experience and connections must be made.

Specific Aim 3: ‘Science, Technology and Society’ Learners should understand the practical uses of Natural Sciences and Technology in society and the environment and have values that make them caring and creative citizens. Science and Technology learnt at school should produce learners who understand that school science can be relevant to their lives outside of school. Issues such as improving water quality, growing food without damaging the land, and building energy-efficient houses are examples of everyday applications. Similarly, Science and Technology can lead learners to a range of career and job possibilities. An appreciation of the history of scientific discoveries and technological solutions, and their relationship to indigenous knowledge and different world views, enriches our understanding of the connections between Science, Technology and Society.” (Curriculum And Assessment Policy, p.10-11)

The above aims clearly state what the learners must achieve at each stage; and the information and the way in which it is shared with the learners is crucial to success. It is also important for teachers to encourage learners to go beyond what they have learnt from the textbook and research how the topic being learnt can be beneficial to them.

2.8. Time in Natural Sciences

Time is important because it provides direction for both learners and teachers on when the content is supposed to be shared with the learners. In the academic literature, researchers

generally agree that time focuses on when learners have to learn the content taught by teachers (Van den Akker & Thijs, 2009; Berkvens et al., 2014). Content and time are indivisibly linked to each other because when the content is selected, time frames are also stipulated, such as determines when the selected content is supposed to be taught. According to these studies (Akker & Thijs, 2009; Berkvens et al., 2014; DoE, 2008a, 2011a), learning time is divided into weeks, days, and hours. It is stipulated in the Curriculum and Assessment Policy Statement (CAPS) that the teaching time for Natural Sciences is 3½ hours per week, per grade, that is, for Grades 4, 5 and 6” (DoE, 2011a, p. 9). This means that these content topics are assessed each term.

2.9. Pedagogical Knowledge

Pedagogical knowledge refers to the in-depth knowledge of methods and practices of learning. Pedagogical knowledge can be defined as knowledge of using various technologies (e.g., WhatsApp), and their abilities to unpack the learning content (Chai et al., 2011; König & Kramer, 2016; Ward et al., 2015). Likewise, Mishra and Koehler (2006) and Hutchison and Woodward (2014) also believed that pedagogical knowledge can be referred to as having adequate knowledge about methods, processes, and practices of teaching and learning. Pedagogical knowledge also comprises, among other things, general educational goals, values, and purposes. Thus, this kind of knowledge includes knowledge about learning approaches that teachers can engage to teach Natural Sciences content to Learners. Mishra and Koehler (2006) reinforced that this type of knowledge also involves knowledge about learning methods, strategies, and approaches that can be used in the classroom context and assessment tools for evaluating learners' understanding. Furthermore, Ward et al. (2015) is in accord with the above studies, and making it clear that pedagogical knowledge is concerned with process and practices of learning.

Furthermore, Hutchison and Woodward (2014), and Herring et al. (2016) believe that pedagogical knowledge is a general kind of knowledge which involves all matters of learning such as lesson planning development and execution, classroom management and learners' assessment. Pedagogical knowledge enables teachers to know which learning approach can be used to teach any specific Natural Sciences content and to understand how learners learn. For instance, teachers with adequate subject knowledge understand how learners construct knowledge and acquire essential knowledge and skills (Mishra & Koehler, 2006). Pedagogical

knowledge requires teachers to have a deep knowledge of different theories of learning such as constructivism, behaviourism among others, which can be used in the teaching methods using WhatsApp. Mishra and Koehler (2006) J. Berkvens et al. (2014a) assert that this kind of knowledge needs an understanding of cognitive, social, and developmental theories of learning and how they apply to learners learning by means of the WhatsApp context such consists of the following principles, goals, assessment, learning activities, student's role, location, accessibility, and time.

2.10. Goals

Goals are referred to as what learners can experience and attain at the end of the term and what lecturers aim to accomplish through teaching a particular content (Latham & Locke, 2007; Locke & Latham, 2006; Suskie, 2018a; Valle et al., 2003; Waage et al., 2010). However, Anderson and Krathwohl (2001), Wenzel (2000) and Adams (2015) assert that educational goals refer to broad statements of purpose and intentions for the course or module. In other words, goals have the potential to enhance learners' learning experience and performances. Correspondingly, Ambrose and Lovett (2014), Midgley (2014) and Hattie (2009) argued that research in education revealed that educational goals are crucial in maximizing learners' attainment. They also serve as one of the powerful learning interventions commonly used for enhancing learners' academic progress. Goals must be clear, specific, and attainable. Similarly, Latham and Locke (2007) suggested that goals be clear, challenging, and specific in such a way that they provide clear success criteria and evaluative processes that can be used to ascertain students' progress. This is suggesting that when educational goals are written down and clear, they might have the potential of improving students' learning experiences, particularly when learning Natural Sciences using WhatsApp. Further to this, Hattie (2009) and Mento et al. (2017) stated that learners should be encouraged to participate in goal setting processes to enhance their learning experiences and to connect learning goals-setting to learners' aspirations and interests. Studies such as those of Berkvens, Van den Akker, and Brugman (2014a), Kennedy et al. (2009) and Redelius et al. (2015) states that educational goals are divided into aims, objectives and learning outcomes.

2.11. Assessments

Assessment of learning (AOL) is normally used for grading purposes at the end of the learning process. According to studies such as those of Black and William (1998); Biggs (1989); Vaden-Goad (2009); DoE (2011a) and Houston and Thompson (2017), assessment of learning refers to the recording of the overall achievements of a learners in a systematic way. Moreover, Brookhart, Moss, and Long (2007), and Perera, Nguyen, and Watty (2014) are in line with the

above authors in stating that when assessment activities are used to record a judgment of competence and performance of the student, such serves a summative purpose. Similarly, Harlen (2006) and Lam (2013) argued that assessment of learning (AOL) can be used to support and report on learning. Further to this, Beere et al. (2005) and Ellis (2017) suggested that Assessment must be reliable and valid in such a way that it promotes achievement, progression, and ensures that universities are accountable to parents, students, and the public for the achievement of every student. These above studies claimed that assessment of learning (AOL) is predominant in learning activities because the students' strong conceptualizations of assessment are strongly linked to tests, assignments, and examinations. This claim suggests that students' actions are informed by written-centred experience because written procedures and guidelines are given on how assessment of learning should be conducted. As the natural sciences course outline (2018) state students must attain a Dual Performance (DP) of 40 % before they can sit for examinations. This is conducted following procedures and guided by written policies and principles such as subject assessment guidelines.

2.12. Assessment for Learning

Assessment as learning (also known as peer-assessment) refers to the assessment of students' work by their peers of equal status. According to the literature from these studies (Brown, 2015; Brown & Knight, 2012; G. Brown, 2015; DoE, 2011a; Norcini, 2003; Reinholz, 2016; Shih, 2011; Topping, 1998, 2009), assessment as learning involves students taking responsibility for evaluating the work of their peers against set assessment standards. Similarly, Topping (2009), Sandvoll (2014), and Reinholz (2016) describe assessment as learning in the form of participatory assessment learners grade and provide feedback on the work of other learners. Learners are afforded the opportunity to provide oral or written feedback on their peers' written drafts. The primary purpose of involving learners in this form of assessment is based on the notion that students have to be engaged in the curriculum activities, and thus learn through interaction with other students (Duncan, 2012; Suskie, 2018b). Therefore learners' actions are guided by interaction-centred experiences because their assessment activities are conducted through involvement with other students in the learning management system (WhatsApp). Learners interact with one another in the discussion forums and chats in practising natural sciences activities and in assessing one another. Further to this, Sandvoll (2014) claims that the rationale for involving learners in assessment as assessment is that learning primarily happens via interaction with others through curriculum-based activities.

The use of assessment as learning in the classroom can offer several benefits for learners. For instance, it has the potential to increase the likelihood of active learning from students. del Mar Sánchez-Vera and Prendes-Espinosa (2015), Bostock (2000) and Suskie (2018a) observed that assessment as learning allow students to receive more feedback, more immediate feedback from their fellow learners than when they depended upon their teachers. Assessment as learning has the potential to give autonomy to learners and to develop higher-order thinking skills and abilities. Innovative assessment as (Bostock, 2000; McDowell & Mowl, 1996) call it, is a new term for assessment as learning. The above researchers state that its aim is to empower students and to improve the quality of learning. This form of assessment allows learners to develop analytic and evaluation skills by using subject knowledge. Brown et al. (1994) maintained that when students evaluate other students' work, they also gain insights into their own performance and thus, develop their ability to make judgements. However, knowing the Assessment practices without understanding the learning activities is not sufficient.

2.13. Learning Activities

Learning outcomes refer to a statement of what students are expected to know, understand and/or be able to display after the completion of a learning process (Burston, 2015; Entwistle & Ramsden, 2015; Kennedy, 2006). Similarly, Gosling and Moon (2001) argued that learning outcomes can be defined as statement of what a learner is expected to know, understand and be able to demonstrate at the end of a period of learning. Moon (2002) noted that the primary aims of learning outcomes are concerned with the standard of learners' learning, and the relationship of learning outcomes and assessment. In other words, learning outcomes make it clear what the lessons must achieve and assess. Moreover, learning outcomes are what is expected that the students will be able to do to show that they have acquired competencies (Eom et al., 2006; Hartel & Foegeding, 2004; Haßler et al., 2016). For example, one of the learning outcomes could be that students would be able to apply skills of Double-entry-principles when preparing ledger accounts of companies. Moreover, Gosling and Moon (2001) as well as Araujo et al. (2016) have suggested that learning outcomes are more dominant than aims and objectives. Learning goals are informed by user-centered experience because they can influence in accommodating the needs of learners' and teachers by using WhatsApp in learning and teaching of Natural Sciences. Moreover, Moon (2002) and Araujo et al. (2016) concluded that learning outcomes must be closely related to assessment activities.

2.14. Conclusion

The study concluded that teachers may be motivated by either the semi-structured (personal need), structured (professional need), or unstructured (societal need) understanding in the teaching of mathematics. Khoza (2016) specifies that most teachers teaching mathematics are driven by structured (professional need) understanding because they teach according to the book (what is written from the policy document). Therefore, their understanding of teaching is based on the documents (such as ATP, CAPS) for them to effectively teach such as annual teaching plans (ATPs) and CAPS. When teachers are driven by semi-structured (personal need) understanding they are guided by ideological ware; but, without hardware and software teaching will not be effective (Khoza & Mpungose, 2020). Likewise, Khoza and Mpungose (2020) support that when teachers are driven by unstructured (societal need) understanding they rely on departmental officials (subject advisors) for ways of teaching mathematics during COVID-19. The literature has explored levels of reflection as the phenomenon of this study. The literature further explored ten curriculum concepts, which are: rationale; aims; objectives, learning outcomes, resources, content, role, assessment, time, and activities. The next chapter will explore how research questions will be answered through the research methodology.

Chapter Three

Research Design and Methodology

3.1. Introduction

The literature reviewed from Chapter two displayed teachers' reflections of teaching of the Natural science curriculum in KwaZulu-Natal primary school contexts. Chapter Two included matters such as the intended curriculum, the implemented curriculum and the achieved curriculum, the competence curriculum and the performance curriculum. Chapter Two also displayed the concepts of the curricular TPACK as the conceptual framework. Thus, this study intends to achieve the following objectives:

1. To explore Natural Science teachers' experience of using WhatsApp for teaching in KwaZulu-Natal primary schools.
2. To explain lessons from Natural science teachers' experiences of using WhatsApp for teaching and learning.

The study intends to establish the above objectives by answering the following questions:

1. What are Natural Sciences teachers' experience of using WhatsApp for teaching in KwaZulu-Natal primary schools?
2. How do Natural Sciences teachers' cope with the use of WhatsApp for teaching in Primary Schools?

Therefore, the main purpose of this study is to explore teachers' experiences of teaching Natural Sciences per the use of WhatsApp in KwaZulu-Natal primary schools. Hence, this chapter intends to cover the research paradigm (interpretivism), research style/approach (qualitative), sampling (purposive, convenience), data generation methods (reflection activity, one-on-one semi-structured interviews, Zoom discussions), trustworthiness/authenticity (credibility, dependability, transferability, confirmability), data analysis, ethical issues and study limitations.

3.2. Research Paradigm: Interpretivism.

A research paradigm is defined as various ways of seeing and understanding the social world. According to Bertram and Christiansen (2014a), the research paradigm refers to ways of observing and grasping social phenomena. Cresswell (2009, p. 6) defines the research paradigm as "worldviews which refers to general orientation about the world and the nature of research that the researcher holds" whereas Ramrathan et al. (2017) portray the research

paradigm as a way of knowing and a set of lenses through which one can view the world around one in search of social reality. Paradigms consist of the following aspects: methodology, methods, ontology, and epistemology (Burrell & Morgan, 1979; Punch & Oancea, 2014; Scotland, 2012; Yilmaz, 2013).

(Brooke 2013) defines a paradigm as a way of looking at the world, various expectations about what the world is like, and how we can understand or know about it. In addition to this definition, a paradigm is also interpreted as an “accepted model or pattern” of doing research (Arndt, 1985, p. 23). Moreover, the word paradigm is further defined by Lincoln et al. (2011) as the “basic belief system of world view that guides the investigation”. The study further asserts that for a researcher to understand real life events, he or she must become immersed in the investigation and move to the culture of organisation being studied and experience. The researcher must experience what it is like to be part of it, rather than looking at one portion of reality that cannot be split or unitised (Guba & Lincoln, 1994). Therefore, for better reflection on any practice, the researcher should be physically involved in the teaching and learning, to gain first-hand information.

Methodology is described as a plan of action which rests behind the choice and use of research methods (Creswell & Creswell, 2017; Crotty, 1989; Scotland, 2012). Thus, methodology is concerned with what, why, from where, when, and how data is generated and analysed. Guba and Lincoln (1994b) maintain that methodology asks the question how the researcher may go about finding out whatever they believe can be known. On the other hand, methods are described as specific procedures and techniques used to gather and analyse data (Bertram & Christiansen, 2014b; Crotty, 1989).

Furthermore, this study adopted the interpretive paradigm since it endeavours to explore teachers’ experiences on their practices in the teaching of Natural Sciences in KwaZulu-Natal Primary Schools, at West Park School by capacitating them with best experiences of practice in their teaching.

In this study, the researcher is adopting an interpretive research paradigm. Bertram and Christiansen (2014), and Cohen and Manion (2013) state that the interpretive paradigm is the base because it helps the researcher to describe and comprehend the way people understand and give meaning to their world and their actions, instead of guessing what people will do. Furthermore, Sarantohos (2005) believes that the interpretive paradigm focuses on cultural and historical interpretations based on a person’s social life and experiences. In addition to this, the greatest aspects given in this paradigm are ontology and epistemology. According to Lincoln & Guba (1985), ontology speaks about the question of what the form of the nature of reality is

or what is it that can be known. Crotty (1998) believes that it is important to understand what we know. This study will use the interpretivist paradigm in an ontological manner to seek subjective experiences and ideas of the teachers on the use of WhatsApp as a resource in Natural sciences, considering that teachers have different experiences. On the other hand, epistemology examine the social aspects of the teachers when they use WhatsApp in their Natural Sciences' teaching methods. This guided me to choose this paradigm to gain understanding of teachers' experiences on the teaching of Natural Sciences in grade six WhatsApp.

3.3. Qualitative Research Approach

The qualitative research approach as understood by Creswell (2014) is the approach for understanding and exploring the meaning of groups or individuals involved in a social problem. Denzin And Lincoln (2017) maintains that the qualitative approach to research includes the study and the use of diverse empirical materials which could include experiences, case studies, life stories, and interviews. Qualitative research gives the researcher insight into the meaning and or experience of the participants (teachers) in a real-life situation, together with their practices (integration of technology such as WhatsApp into Natural Sciences). In other words, teachers must think about how relevant their use is of practical examples that they are using to teach the learners. The teachers must explain how the current examples they are using to teach the learners relate to the learners' current circumstances.

According to Anderson (2010), the strength of a qualitative approach is that the problem explored can be examined in detail so that the researcher can gain full insight into the teachers. The researcher can understand why the teacher may be having trouble using technology or how the technology has helped the teacher. This study is using this strength to complete an intense examination of the Natural Sciences teachers' experiences when using WhatsApp as a resource in natural sciences teaching and learning.

Additionally, the methodology approach is befitting for this study since the purpose is to explore teachers' reflections on the teaching of Natural Sciences using WhatsApp. Such may assist teachers' knowledge growth in their practices. Creswell (2012) declares that qualitative researchers deal with socially constructed realities and qualities that are complex and indivisible into discrete variables. Conversely, Babbie (2004) outlined that the aim of qualitative research is to promote better self-understanding and to increase insight into teachers' reflective practices. Gonzalez et al. (2008) articulates the strength of the qualitative research approach in that it provides in-depth, intricate, and detailed understanding of meaning, actions, non-observable practices, as well as observable phenomena, attitudes, interactions, and

behaviours; and these will be served by the naturalistic enquiry. I therefore used a qualitative approach to socially construct all teachers' experiences when teaching Natural Sciences, through studying their various levels of reflection, which are personal, verbal and written reflection. This led me to gain an in-depth of understanding of how teachers teach Natural Sciences. Thus, through this study, teachers were able to reflect for empowerment of their practices. However, the rationale of this study is to explore reflections, which are observable phenomena of the teachers teaching Natural Sciences using WhatsApp. However, Trochim (2000) agreed with Denzin (2017) by outlining that qualitative researchers do not assume that there is a single unitary reality apart from our insight. I did not rely on a single reflection. I explored and exhausted all propositions of reflection, which are verbal, written, and personal, to arrive at the concrete conclusion using action-research style.

3.4. Research Design

This study was situated within a case-study research design. According to Rule and John (2011) and Bertram and Christiansen (2014a), case studies refer to a systematic and in-depth study of one case in its context. Cohen et al. (2013), and Ramrathan et al. (2017) are in agreement with the above studies and describe case-study methodology as the process of exploring a phenomenon within a restricted organisation of operation, such as school, person, organisation or country. On the other hand, Cohen et al. (2013) and Yazan (2015) describe case study research methodology as a specific instance that is often designed to illustrate a more general principle. It can be considered a study of instance in action. Case-study methodology takes a particular situation as given; and tries to find out what it means to the participants. Further to this, case-study research methodology is aimed at gaining better insight into and understanding of a detailed situation (Ary, Jacobs, Irvine, & Walker, 2018; Maree, 2007). There are different types of case study idiographic case studies, inductive case studies, theory-guided case studies, and hypothesis-generating case studies (Levy, 2008; Meyer, 2015). However, this study used a descriptive case study of five teachers teaching Natural Sciences at a KwaZulu-Natal School. Cresswell (2009) and (Yin, 2003, 2017) remark that descriptive case studies (providing narrative account) are more suitable for studies that are undertaken to understand the particular case in question. Similarly, Ramrathan et al. (2017) argue that this research methodology helps in understanding the phenomenon as it exists; and is influenced by context and social realities wherein it is found. Thus, a descriptive case study was relevant to this research because the study was intended to explore and understand Grade Six teachers' experiences of teaching natural Sciences using WhatsApp. Thus, this research style helped the researcher to gain an in-depth understanding of experiences, whether user-centred, interaction-centred, or written-

centred, driving the use of WhatsApp during the learning process. As Yin (2018, p. 237) stresses, “the main purpose of this research style is to investigate a contemporary phenomenon (experiences) in depth and in its real-world context.” One of the shortcomings of this research methodology is that it may contain bias towards verifications, and it may lack rigour (Ledford & Gast, 2018). To overcome this limitation, this study used multiple sources of data, such as one-on-one, semi-structured interviews, reflective activity, and document analysis.

3.5. Sampling

Sampling is described by Christiansen et al. (2010), and Etikan, Musa, and Alkassim (2016), as a selection process of a particular group of people, location, actions, and activities for the study. Kutlubaev and Hackett (2014) further state that sampling is the process used to select a segment of the population for study. Sampling was relevant to this study to acquire the information I needed and to interact with teachers from my current school teaching Grade Six natural sciences per WhatsApp and asked them to engage in this study.

3.5.1. Purposive Sampling

Purposive sampling describes the process of selecting a particular group of people to be included as a sample because they meet a certain criterion (Christiansen et al., 2010). I had decided to select five grade six Natural Science teachers from the school that I had chosen. These were teachers that I can work with easily as they are teaching the same content area and have experience in sharing information with learners about Natural Sciences via WhatsApp. The other Criteria outlined by Etikan et al. (2016) referred to the selection of resources, time available and study objectives as well as the use of WhatsApp to teach Natural Sciences in Primary School. However, the teachers’ experiences do not represent the wider group of Natural Sciences Teachers experiences of teaching Natural Sciences with the use of WhatsApp. The results can therefore not be generalised beyond the sample group. Furthermore, I selected qualified teachers who are on post level 1, and who have in-depth experience of Natural Sciences taught per WhatsApp.

3.5.2. Convenience Sampling

Duggleby et al. (2016) states that convenience sampling refers to a particular group of participants easily contacted by the researcher. My sampling is the convenience type in that I chose a group of teachers easily accessible to me at my school, whom I can contact or meet regularly without any difficulty. Etikan et al. (2016) outlined the reasoning for convenience sampling. It would be superlative to use the whole population; however, in most cases it is not possible to include every subject because the group is limited to just one school. I chose teachers who are dedicated to teaching Natural Sciences with the use of WhatsApp, those who

would gain more knowledge by being part of this study. I also assumed that these teachers were mature enough; therefore, I was confident that they could be part of this journey. However, the selected school for this study is conveniently West Park School, at which I currently teach. This allowed me to avoid financial constraints. Travelling expenses had been reduced on my side.

3.6. Data generation methods

Wahyuni (2012) outlines that data generation is in the form of primary data. Therefore, this study used primary data to explore teachers' experiences using WhatsApp to teach Natural Sciences in KwaZulu-Natal Primary Schools. The study adopts the following three techniques in data generation: reflective activity (open ended question), one-on-one semi-structured interviews, and Zoom interviews.

3.6.1. Reflective activity.

Reflective activity is defined as the process of learning through and from experience towards gaining new insight into self and/or practice (Cohen et al., 2011). Moreover, Cohen et al. (2011) and Marcos, Miguel, and Tillema (2009) described reflective activity as a written activity that requires a participant to answer a series of questions about the phenomenon in research. Therefore, this study took reflective activity as the first method, with the aim that participants could share their experiences, to lay a foundation for their future actions and behaviour. Teachers were given an opportunity to reflect on their teaching experiences in the teaching Natural Sciences using WhatsApp. This activity is guided by the TPACK method as a conceptual framework of the study.

Cohen et al. (2011), Valli (2009) and Milam (2008) describe the reflection activity as teachers going through a series of short questions about the phenomenon. This study is focusing on the experiences of teachers using WhatsApp to teach Natural Sciences. Teachers will focus on their experiences and reflect on how they can improve on their teaching and learning methods for the future.

Concepts	Questions	Propositions
Rationale	What resources do you use in your teaching of Natural Sciences?	Personal, Professional, Cultural rationale
Accessibility	Who is teaching Natural Sciences using?	Cultural, Financial, Physical
Goals	Which goals are you aiming at in teaching Natural Sciences?	Aims, Objectives, Learning outcomes
Content	What are the content topics that you are teaching in Natural Sciences?	Topics, Practical work, Subject content
Activities	What activities are you teaching in Natural Sciences?	Teacher-centred, learner-centred, content-centred
Locations	Where are you teaching Natural Sciences?	Formal, Informal, Blended.
Role	What role are you teaching in?	Instructor, Facilitator, Assessor
Resources	What hardware resources do you use in teaching of Natural Sciences? What software resources do you integrate on your teaching?	Hardware, Software, Ideological ware.
Time	When do you teach Natural Sciences?	Weekly, daily, time.
Assessment	How do you assess your learners using technological resources? (Assessment)	Formative and Summative, Assessment

Table:1 Table of concepts

The questions above are used as a tool for teachers to gain control over the use of WhatsApp and to encourage their learners to engage in the lesson. The above questionnaire is a guide for teachers to use to share their experiences using of WhatsApp to teach Natural Sciences. According to Zhang (2003), questions promote learning as its primary purpose. In this study, the reflective activity is used to explore teachers' experiences using in WhatsApp to teach Natural Sciences in Primary Schools.

The first question that the teachers are asked is to reflect on why they are teaching Natural Sciences CAPS. The question is based on three Propositions (personal, cultural and professional); hence teachers were expected to speak about their excitement for teaching Natural Sciences using WhatsApp. The teachers are encouraged to further explain their relationship with the community regarding the learning process. Lastly, the teachers should reflect on their knowledge on the content of the subject (Natural Sciences) based on their qualifications.

The second question focuses on teachers' accessibility in the teaching of Natural Sciences through WhatsApp. To answer this question, teachers must speak about cultural, financial, and physical accessibility. Cultural access refers to social, political and religious interferences when they teach Natural Sciences using WhatsApp. Financial access refers to how the funds are used to access software/apps such as WhatsApp and data in and out of school. The last one is physical access. This refers to the cell phone and WhatsApp needed to reach the learners and the teacher.

The third question refers to the goals that teachers aim towards when teaching Natural Sciences using WhatsApp. Teachers are expected to give answers on aims, which are long-term goals, and objectives that are short-term goals; and learning goals and declarations that must be achieved after teaching and learning has taken place using WhatsApp.

The fourth question asks teachers to articulate on the content which they teach or have taught learners in Natural Sciences CAPS using WhatsApp.

Question Five asked about the activities the teacher engaged learners in while teaching Natural Sciences in Grade Six using WhatsApp. Teachers (participants) were expected to respond on tasks whether teacher-centred, learner-centred or content-centred - classwork, homework, group work, and individual work.

Furthermore, in Question Six, teachers were expected to respond on the availability of venues when they teach Natural Sciences using WhatsApp whether inside or outside the classroom, in

the Natural Sciences lab, venues such as playgrounds, or at home. Teachers were expected to respond based on formal, informal or blended learning.

Question Seven asked teachers how they perceive their role as Natural Sciences teachers. Teachers were expected to respond on the three propositions under the heading role, which are being an instructor, a facilitator and an assessor. Hence, this role was meant to equip teachers with what was expected of them in and outside the classroom.

Question Eight asked teachers to respond on the kind of materials or resources they used during the teaching and learning process. Therefore, teachers were expected to reflect on resources such as hard-ware (books, chalkboards, chalk, etc.) which are any tools or machine used during teaching; soft-ware resources (electronic devices such as computers, tablets, calculators, etc.) which are components that display information, and lastly, ideological-ware (methods or strategies used in Natural Sciences) meaning those elements in teaching which cannot be seen or touched.

Question Nine asked teachers to reflect on how they utilise prescribed the time in their teaching and learning to cover the content of Natural sciences. Teachers were to respond on time at their disposal, which is framed by three propositions that are weeks, days, and hours. Teachers were also expected to reflect on when they are planning how much time is needed for specific topics and when they are doing their lesson preparation.

The last question examined how teachers assess learning. Their replies were expected to include formative assessment (assessment for learning). For this question teachers had to reflect on group-work, classwork, homework and oral assessment. In summative assessment (assessment of learning), teachers were expected to respond on examinations, tests, assignments, and projects. For continuous assessment (assessment as learning) teachers had to respond on peer assessment with the aim of measuring learners' strengths and weaknesses. As the reflective activity needed time and energy for a person to respond, I allowed teachers the time to answer, at least two weeks before the interview. This was in line with Cohen et al. (2011) who believed that the researcher should design and provide questions so that participants can readily respond. Teachers' reflective activities may prove weaknesses participants might not reflect honestly on their questions. I safeguarded that participants gave their best through the professionalism they possess, which is in line with the professional code of ethics. I also allowed teachers to contact me whenever they need clarity on the questions. Moreover, for verification of answers, I instituted one-on-one semi-structured interviews to ensure that teachers responded were valid, substantial and factual.

3.6.2. One-on-one semi-structured interview.

Cohen et al. (2011) and Mcmillan and Schumacher (2010) define a semi-structured interview as a conversation between a researcher and a participant in which information is stimulated on how participants make sense and meaning of their experiences in their lives. Moreover, Kallio, Pietilä, Johnson, and Kangasniemi (2016) outline that semi-structured interviews involve the use of predetermined questions on which the researcher is free to seek clarification. In addition to the above, the researcher is free to vary the order and wording of the questions (Doody & Noonan, 2013), depending on the direction of the interview, and to ask additional questions. I had conducted the interviews with the teachers after school during non-contact time. This took me about a week to complete as we had an hour every day after our teaching time to complete the interviews.

3.7. Observations

Observation is the systematic process of recording the behavioural patterns of participants, objects and occurrences without necessarily questioning or communicating with them (Chaboyer et al., 2010). The advantage of observation is that it leads the researcher to attain information about the educational environment, including the different learning styles, resources, and interactions that are evident amongst the learners; and between the teacher and learners. Observation were undertaken to see how content was delivered to learners, with the aim of checking whether teachers change their practices in class. Hence, this was a way of checking whether the idea of using WhatsApp to share information with the learners was working. I observed the teachers in their classroom a set appointment made with them. I was able to sit for at least half an hour in each classroom and to ask questions for the last ten minutes. I had to stick to the appointments given as the teachers were busy with lessons and activities. This did make it difficult to go in detail; we had our meetings later in the day to gain feedback when I was able to ask for more information.

3.8. Data Analysis

Qualitative data analysis is defined by Seuring and Gold (2012) as creating a sense of data in terms of the participants' definition of the situation, noting patterns, themes, categories and regularities. Biggam, Hough, Kay, and Simmons (2011) outline that data analysis is about bringing together the evidence, breaking it into manageable units, fusing it, and searching for patterns, while discovering what is important and what is to be learned. Therefore, this proposes checking what the data says, and understanding how to present the findings to the readers. Kothari (2004) reasoned that data also needs to be organised into groups based on common characteristics. Therefore, based on their realistic framework, I extracted explanations, assertions, and understanding of teachers' experiences of using WhatsApp to teach Natural

Sciences. In this qualitative action research, data analysis was classified into deductive and inductive reasoning processes. Hence, I used guided analysis in this study with deductive and inductive reasoning. Christiansen et al. (2010) acknowledged that inductive reasoning includes the logic of reasoning proceeding from fact to a general conclusion, meaning beginning with receiving the raw data generated; whereas deductive reasoning involves readings from general principles and related to logical deduction. I then began with detecting patterns from research methodology (reflective activity, semi-structured interview and observation) and used this to draw some conclusion. Therefore, related themes in the data were grouped together. Themes were then embraced by concepts from the curricular TPACK, which is the conceptual framework for the study. This study had ten themes, that is, rationale, goals, accessibility, content, time, resources, role, location, activity, and assessment. Data analysis has massive financial implications to those who hire a transcriber to transcribe and is very time-consuming. Thus, this could lead transcribers to write using their own words, which might distort the information. To defeat this trial, I spent time transcribing to gain all relevant information from cell-phone recording, using my own words. Furthermore, I employed all ethical considerations to avoid affecting participants' rights in this study.

3.9. Ethical Issues

Loutzenhiser (2016) defines ethics as an endeavour which seriously examines morals, questioning its rules, and seeking focuses, which are well thought out and correct. The study further asserts that ethics uses analysis to reveal the errors of logic and contradiction of the reasoning and seeks to go beyond them. Moreover Loutzenhiser (2016, p. 2), asserts that “ethics deals with what we should or should not do, but it does so by applying reasoning, for or in contrast to in order to decide on the conduct to be taken when faced with a moral problem”. To meet the ethical conditions of this study, I requested permission in writing to conduct a study from the Department of Basic Education through the KwaZulu-Natal Circuit Management Centre. Thereafter, I applied for ethical clearance from the University of KwaZulu-Natal prior to the research. Hence, the Circuit Manager on behalf of the Department of Basic Education, KwaZulu-Natal, granted permission to conduct a study in the school (Annexure B). The school principal also granted me permission to conduct the research in the respective school (Annexure A). I visited the teachers who are teaching Natural Sciences using WhatsApp, to ask them to be part of the study (Annexure C). They signed the consent and commented what transpired in the study.

3.10. Trustworthiness

Trustworthiness is defined by Morrow (2005) as the way a researcher can convince the reader that the findings of the study are precise and of high excellence. Likewise, the study further outlined that credibility, transferability, dependability and confirmability should be considered in qualitative research study as the four propositions. Cohen et al. (2011) outlined that trustworthiness is associated with the principle of truth, value and refusal to take sides in the research. Guba and Lincoln (1994) further convey that, paying more attention to these dimensions (credibility, transferability, dependability, and conformability) increase trustworthiness of the study.

Cope (2014) defined credibility as the findings reflecting the ‘reality’ and lived experiences of the participants and for the research to be trustworthy. Therefore, credibility was accomplished through relationships already built between me, the researcher, and teachers as participants. This association made interviews relaxed, with trustworthiness of questions prevailing.

Confirmability is concerned with whether the findings reflect the experiences and ideas of the participants (teachers) (Anney, 2014). I encouraged participant to respond on what was being researched. Likewise, Anney (2014) noted that transferability is the obligation of the person wanting to transfer findings to another situation and not the researcher of the original study. I tried to make sure that precise findings and proposals on the teaching of Natural Sciences using WhatsApp are well saved and can be applied at a later stage by other teachers.

Dependability describes the consistency of research findings (Cohen et al., 2011). Furthermore, Anney (2014) anticipated that the dependability criterion relates to the consistency of findings. Mpungose (2016) asserts that dependability is about giving accurate and direct information in the study. Hence, dependability was improved by returning raw data and interpretations back to the participants for accuracy confirmation and for the clarity of the captured data. In addition, interviews were audio-recorded through my cell phone to enhance accuracy and validity of the findings; bias was eliminated during transcription. Triangulation was used to make sure that certification was enhanced.

3.11. Limitations.

I acknowledged my situation as a teacher at the school where I am conducting my research. It may be seen as having pre-determined knowledge in contradiction of certain interviews conducted with teachers teaching Natural Sciences using WhatsApp and it is likely to be prejudice to the study. I attempted to maintain professionalism by not revealing private and personal information to teachers. Additionally, I held back my emotions and avoided communicating my ideas or views about the study. I guarded against untrue responses from participants, or their efforts to please the researcher. As I am involved in qualitative research,

I am aware that results of the study are subjective, personal and contextual, which means that they cannot be generalised. In other words, other teachers may refer to findings if applicable to their own perspectives.

3.12. Location

The study was conducted for teachers' experience on teaching Natural Sciences using WhatsApp in primary schools in the KwaZulu-Natal, Malvern, Umlazi District. I had selected this primary school because they have poor socio-economic status, and they were easily accessible to me. Most of the learners in these schools depend on social grants for living; others live with grandparents. Classes for these schools cater for Grade R to Grade 7. The map of where the study is located is shown below.

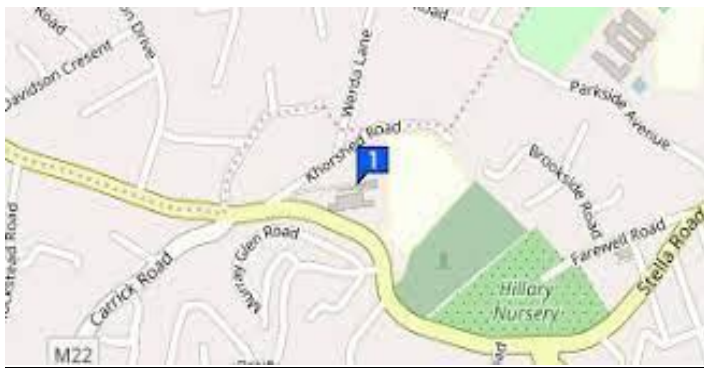


Figure:5



Figure: 6

3.13. Conclusion

Chapter Three developed on the research design and methodology of this study. Therefore, this chapter defined the research paradigm, research approach, sampling, data-generation methods, data analysis, trustworthiness, ethical issues and limitations of this study. All these stated methods distinctly outline the way this study was guided and how it plans to answer the research questions. Likewise, the teachers' experiences on the teaching of Natural Sciences using WhatsApp were investigated using the above-mentioned methods. Additionally, difficulties of the different methods used were also tackled. The focus of chapter four is to

present the research findings through examination that follows the data analysis defined earlier in this chapter.

Chapter Four

Research Findings and Discussions

4.1. Introduction

In this chapter attention is on the analysis of the data acquired by using data generation methods explained in Chapter Three. This presents key findings from the data within the conceptual framework and literature context discussed in Chapter Two. The curriculum processing sections selected for this study were used as a base from which to present the research findings. The five teachers (participants) (E1, E2, E3, E4, E5) worked at one school (B1). This chapter will allow me to interpret the findings and to outline the teachers' experiences using WhatsApp to teach. This is not simply going to be a summary of the results; at this stage I will demonstrate the original context of the participants. I will firstly, demonstrate what is already known in my area of study; and secondly, I will outline what is new, comparing it to what is already known. The study applied the following research questions to guide the process of data generation:

1. What are Natural Sciences teachers' experience of using WhatsApp for teaching in KwaZulu-Natal primary schools?
2. How do Natural Sciences teachers' experience the use of WhatsApp for teaching in KwaZulu-Natal Primary Schools?

The data from the five participants involved were classified reflecting emerging themes. Ten primary themes emerged in relation to teachers' experiences of using WhatsApp to teach Natural Sciences in school under teaching time (when do you integrate WhatsApp and Natural Sciences into your teaching?)

The findings are presented under each theme in some cases by means of direct passages or quotations and corroborated with discussions; therefore, to re-contextualise them within the relevant literature. The data that addressed these questions were generated through unstructured observations, reflective activity and one-on-one semi-structured interviews. This chapter will articulate the teachers' perceptions of their practices.

4.1.1. Theme 1: Perceptions

Why are you integrating WhatsApp into your classroom lessons?

Presentation and Discussion of findings: -

The participants have a view on the integration of WhatsApp into their Natural Sciences lessons that they have taught, hence this study focused on their experiences that the teachers' have shared. The participants had to respond to the above displayed question to show the three worlds of perceptions which are: personal perceptions, social perceptions, and professional perceptions. Participant E3 seemed to lean more toward social perceptions by stating that he integrates WhatsApp into his teaching because it is easy to gain access to the platform, thus sharing information quickly; and that it will improve the standard of teaching and learning. Participant E3; *"I use the smart board, projector and Microsoft to share information with the learners. All my information gets recorded and upload onto WhatsApp for the learners to have easy access to information."* Participant E3 also expressed that the integration of technology in the classroom and extending it to WhatsApp has helped the learners to work from home more effectively: learners are better able to understand concepts.

Participants E2 and E1 also looked at the state of the learners' society before decided to integrate WhatsApp into their teaching of Natural Sciences.

Participant E4 shared her experience of professional observations by stating that WhatsApp helped her in the teaching of her subject. *"I would look at what is easy access for most of our learners. Resources such as smart devices which includes smart phones and laptops as well as projectors may not be easy access for learners from unstable backgrounds. Also, I would select and adapt content from the CAPS curriculum that would be best suited according to the learners' levels."* However, Davis et al. (1989) also highlighted that the professional use of WhatsApp in and outside the classroom improves the teachers' teaching of Natural Sciences. Individual experiences included looking at her personal gain when adopting WhatsApp in her teaching of Natural Sciences. Pinar (2012) calls this being self-conscious. For social perceptions. Participant E4 reflected on how her learners would gain if she integrated computers into her teaching.

During the unstructured observations I observed participants' normal, everyday settings and events as they occurred naturally. Perceptions cannot be understood through interviews or explored by open-ended questions (reflective activity) only. This was intended to answer the question: What informs the perceptions of the teachers on the integration of WhatsApp in school? The situations of the five participants (E1, E2, E3, E4 and E5) at school were similar in that the school had one cell phone per class on which to share information via WhatsApp with the learners. The teachers could use the cell phone to find information to share via

WhatsApp directly from the computer. Teachers could gain access from their phones; and the software and hardware had been updated to cater for the needs of the teachers and the learners.

Most of my participants seem to have positive social perceptions of the integration of WhatsApp in teaching Natural Sciences. However, the literature (Abas, 1995; Arnheim et al., 1971; Janaway, 1989) leans towards professional perceptions. Thus, Janaway (1989) argues that reasoning can give a solution to a problem only after it has been received. Without information on what is occurring in time and space, the brain cannot work. Subsequently, Participants E1, E2 and E3 are in agreement to widen their knowledge in the field of WhatsApp in order to have better professional insight. Arnheim et al. (1971) agreed with Janaway (1989), by adding that the mind, in order to cope with the world, must fulfil two functions: it must gather information, and it must process such. Participants E1, E2, and E3 should therefore seek professional help so that they can go further with sharing information.

Very few teachers are driven by professional perceptions on the incorporation of WhatsApp into their teaching of Natural Sciences. Teachers still had difficulties integrating WhatsApp in their teaching since those phones were part of their resource centres. This discourages teachers from even wanting to integrate WhatsApp into their teaching. Thus, Abas (1995) argues that personal perceptions are caused by nervousness. Participants have personal experiences of incorporating WhatsApp into their teaching school. Teachers thus have personal perceptions of integrating WhatsApp into their teaching, not only in heeding the demands of the subject curriculum (no professional perceptions). Findings from the teaching of Natural Sciences using WhatsApp outlined (2018, P.1) reveal that teachers should be clear with the information being shared when teaching Natural Sciences on WhatsApp

4.1.2. Theme 2: Resources

What are you teaching with?

Hard-ware resources: Professional Perceptions

All participants have stated that besides WhatsApp being used to teach Natural Sciences, they also adopt a variety of other resources in their lessons to make the lesson enjoyable and exciting for the learners. I would say that this is a professional perception on incorporating WhatsApp into other technology equipment. This is in terms of my unstructured observation and not according to my participants' views. Khoza (2015b) refers to hard-ware resources as those that can be seen and touched. Participants E1 and E4 gave their professional perceptions;

Participant: *“I prefer to look at what is the most easily accessible form of media available to most of our learners, this is the usage of basic smartphones, as a laptop and projector is not easily accessible to learners from indigent socio-economic backgrounds. Also, I would select and adapt content from the curriculum that would be best suited for the learner’s level/ability.”* Participant E1 stated that, *“I prefer using the following tools in my teaching, Smart Phone, laptop, interactive white board. Microsoft programmes, google and Microsoft teams.”*

Soft-ware resources: Social perceptions

These studies (Druin & Solomon, 1996; Khoza, 2015b ; Niess, 1992; Watson, 2001)) refer to soft-ware resources as those resources that can be seen but not touched. Participants E1 and E4 have shown in their reflections that they use soft-ware resources. Participants E1 and E4 are also driven by social perceptions in choosing the resources to use for the integration of computer technology into their classrooms. Participant E1: *“I use the Microsoft Suite of programmes for teaching and learning, to supplement WhatsApp.”* Participant E4 said, *“I prefer to look at what is the most easily accessible form of media available to most of our learners, this is the usage of basic Software to download WhatsApp so that they can access information. It is not easily accessible to learners from indigent socio-economic backgrounds.”* The literature in Chapter Two suggests that a teacher can encourage learners to use the internet databases as resources from which to access massive quantities of information (Druin & Solomon, 1996).

Ideological ware: Personal perceptions

Khoza (2015ba) describes ideological-ware resources as resources that cannot be seen or touched. Additionally, Khoza (2015ab) refers to ideological-ware resources as the educational theories that should be known by teachers before teaching can commence. Thus, ideological-ware resources are influenced by personal perceptions. Such resources also influenced by the ethos of the school and by individual past experiences. Participant E4: *“As part of my improvement at school, I go to teacher training workshops that boost my knowledge and I completed a few online courses in robotics last year to increase my knowledge to help the learners.”* Participant E1: *“I did robotics training, Microsoft course.”* However, E3: *I did a short course on robotics and coding online and hence I was able to improve myself.”* Teachers’ ideology serves as a resource in the classroom that is influenced by personal perceptions, in that it addresses the personal needs of each individual teacher.

According to my unstructured observations, not all my participants have access to hard-ware resources. All teachers used the online system for all their teaching and learning and they were

able readily to share information with learners quickly with their learners. Regardless of that participants can gain access to convenient resources such as, Smart phones that learners bring to school. On the contrary, for their safety, participants do not allow learners to bring any device to school. Participants had laptops and cell phones that they use in class with their learners. They did not completely rely on their school's resources, only using what they had available to them.

This shows that participants are driven by professional perceptions (as discussed above in the use of hardware resources) which gives them a great advantage in their teaching. Ullah (2014) argued in that literature, WhatsApp being used to teach as a hardware resource, can solve more than one kind of problem in the classroom if properly used. Participants should find a way of integrating WhatsApp into their teaching by various hardware resources available in schools; teachers should learn the proper way of using them. This challenges teachers to seek professional help, to attend teacher training workshops to cover all aspects of teaching in their teaching. Under social perception (software resources), as Dyrli and Kinnaman (1996) put it in the literature, WhatsApp promotes learners' sharing of ideas through the influence of the teacher's social perception. Personal perceptions (ideological-ware resources) as Khoza (2015ab) refers to ideological-ware resources are the educational theories that should be known by teachers before teaching can commence. Participants E1 and E4 considered the importance of their personal perceptions before they approached their teaching. According to my unstructured observation, participant could access the computers and other equipment in order to share their information via WhatsApp with the learners.

The literature leans more towards the hardware resources, which relates to the professional perceptions. This is emphasised in the literature (Chapter Two) in that a computer, as a hardware resource, allows of information transfer between a teacher and a learner. Moreover, Ullah (2014) adds that computer hardware is a general device that can solve more than one kind of a problem in the classroom if properly used. Participants still find the means to integrate computer technology into their classroom lessons. This helps them solve many problems particularly if they use new developments such as computer artificial intelligence. Participants can improve for the benefits of their learners through changing perceptions to professional perceptions. Abas (1995) argued that it takes a change of perceptions for teachers to start adapting to change.

There are still teachers who are resistant to change and who view teaching from personal perceptions, ignoring professional perceptions. This is also due to the lack of professional development given by, the Department of Education, for teachers to integrate computer technology into their teaching using hard-ware resources. As much as CAPS DOE (2012) mentions that computer technology resources can be used to enhance teaching and learning, there is still no clear conceptual framework for integrating computer technology into schools.

4.1.3. Theme 3: Accessibility

How is the integration of WhatsApp accessible?

Financial access: Personal perceptions

According to my unstructured observations of the five participants, all participants have the resources to work with the learners; However, when it comes to the use of the smart boards and projectors, three of the teachers must share with the other two which means they have the same predicament of needing resources. Hence, my participants find it difficult to integrate computer technology into their teaching. Participant E1: *“The school has internet connection, and the infrastructure of the school helps me to carry around the laptop to my classroom, in this way I can share some information using the laptop with the learners in the class and I convert the files that are user friendly and easy to open onto WhatsApp for the learners to use at home.”* Participant E1: *“The school does not want to put in computers and equipment in all classes especially in the upstairs classrooms as they are afraid of theft.”* Participant E2 gave the same reflection as Participant E1.

Physical access: Professional perceptions

According to my observations, participants, arrive on time at school. Should participants arrive late in the morning they were probably held up by traffic due to load shedding in the area where the school is located. This causes them to arrive at school after period one has begun; this alone disadvantages curriculum delivery. Two of the participants live in the area and have young families to see to before arriving at work. The other three participants do not live in the area and must travel a little further from their homes to school. Each one of them has sacrificed something to further their education and to understand the use of technology in class. Working with the learners that have special needs is difficult: and the use of technology has made these learners a little easier to teach. Stockall et al. (2012) argue that curriculum should develop teaching methods that enable all teachers with diverse needs, including those with disabilities and cultural differences, to have equal access to the classroom curriculum. This allows teachers the ability to deal personally with accessibility to the curriculum. Participant E2: *“Our classrooms have smaller numbers to work with and that makes it conducive for us to integrate*

technology in our teaching, on the days the learners must to use more than one computer to share information to themselves via WhatsApp, we have access to go into the computer room.”

However, Participant E4: *“Our school were sponsored with laptops by the department which consisted of 20 laptops and internet connection, these can be used in all classrooms, and we follow a timetable, the information that is taught for that lesson for that day or week then gets transferred into smaller files and then shared to the learners via WhatsApp.”* Participant E4: *“even if you do manage to take them to your classroom, it is very difficult for the learners to remember that they shouldn’t bump into it.”* DOE (2012) specified that teachers should be able to use computer technologies to enhance their teaching in the classroom.

Cultural access: Social perceptions

According to the unstructured observations, participants, had a very good computer networking structure and access to WhatsApp on their laptops. The computer classroom, together with the few other classrooms, were set up so that they were well networked and had good software updates. This helped the teachers more quickly to teach and share their knowledge. Our school culture does encourage motivation for teachers to integrate technology in their teaching. People need basic access to and understanding of the technological world (Khoza, 2013). Teachers not only need the rapid evolution of new information and communications technologies, they must also keep pace with the rapid changes imposed on the social structures at work.

Participant E1: *“There are computers available for teachers in school, teachers who teach various subjects, can use technology in their classrooms and adapted according to their needs. Many of the teachers teaching Natural Sciences work together and share the smart boards and power points via WhatsApp to make teaching and learning exciting.”* This suggest that the society of the school has come to an understanding that all other subjects can make good use of WhatsApp and other technologies. Participants E1: *“teachers are not resistance to change.”*

According to my unstructured observations the five participants find it difficult to integrate computer technology into their teaching. Stockall et al. (2012) argue that the curriculum should develop teaching methods that enable all teachers with diverse needs, including those with disabilities and cultural differences, to have equal access to the classroom curriculum. This allows teachers the ability to deal themselves with accessibility to the curriculum. Participant E2 had a very good structure of WhatsApp networking. The computer software and hardware were well networked with software update; however, the computers and cell phones being used were very old. People need basic access to and understanding of the technological world (Khoza, 2013). Teachers not only need the speedy development of new information and

communications technologies, but they must also keep pace with the rapid changes imposed on the social structures at work.

Schools are not adequately funded; and the cost of education is too high for many parents to afford (Bush & Heystek, 2003). CAPS DOE (2012) specified that teachers should be able to use computer technologies to enhance teaching in the classroom. People need basic access to and understanding of the technological world (Khoza, 2013). Teachers not only need the rapid evolution of new information and communications technologies, but they must also keep pace with the brisk changes imposed on the social strictures at work. The cost of education in wealthy public schools is too high for lower-income parents to afford (Bush & Heystek, 2003). This places teachers in the situation where they cannot perform to their best during their teaching. Costello (2013) argues that the lack of funding in these indigent schools, and the imposition of high school fees in wealthy schools ought to be contextualised within the broader hegemonic tendencies that continue to marginalise teachers in less affluent schools. Basic infrastructure such as electrical reticulation and communications, essential pillars for economic growth, has not even been planned for many township schools in South Africa (Phillipson, 1996). Geographic location should not place limitations on access to information and the use of the internet, which are considered vital to the promotion of learning, training, and business development in developing communities (Costello, 2013).

4.1.4. Theme 4: Goals

Towards which goals are you integrating WhatsApp into your teaching?

Presentation of findings

Aims: Personal perceptions

According to D. Kennedy et al. (2009), the aim of the curriculum is a broad general statement of teaching intentions, which indicates what the teacher intends to cover in a block of learning.

Participant E1: *“I use my smart board and projector as well as my smart phone to teach learners. The learners find it easier when I share the days lesson via WhatsApp with them. The learners can watch the lesson taught for the day at home and they can revise at home to get a better understanding. This is also a way for me to better my technology skills.”* Participant E1 has personal reasons for integrating the computer into his class. He is driven by the passion for the subject. E1 further says that it is essential for him to use all available technology in his class because it helps the learners gain a better understanding of the content. Participant E3: *“I prefer to look at what is the most easily accessible form of media available to most of our learners, this is the usage of basic smartphones, as a laptop and projector is not easily accessible to*

learners from indigent socio-economic backgrounds. Also, I would select and adapt content from the curriculum that would be best suited for the learner's level/ ability." Therefore, Khoza (2015b) argues that aims assist teachers to be driven by love and passion in order to design a learning programme using prescribed content.

Objectives: professional perceptions

D. Kennedy et al. (2009) argue that objectives are usually precise statements of teaching purposes which show the exact area that the teacher intends to cover in a block of learning. Participant E4: *"The method normally taken is I integrate the technological resources in the beginning of the lesson to excite learners about how energy is moving from one object to the next and use at the end as a reward."* Participant E4 is driven by professional insights since his use of WhatsApp addresses the needs of his subject. In addition, E2 said, *"using Computer technology helps my learners to access information easily from the internet."* Participant E4: *using computer technology provides students with lots of up-to-date information via the internet."*

Outcomes: Social perceptions

J. Berkvens et al. (2014b), arguing from the viewpoint of skills, stated that teachers should have social insights into encouraging learners to create opportunities to continue studying or finding a job, building self-esteem and being successful learners. Hence, Participant E4: *"I select the digital technology which are accessible to both myself and my learners. I also align learner needs/ability to the type of technology selected and adapt the curriculum to suit. I also take special needs teaching techniques into consideration."* D. Kennedy et al. (2009) argue that outcomes are used to express what learners are expected to demonstrate in their achievement. Participant E1: *"These resources and the availability of data assist with resource sharing amongst teachers and supports progress in the field."* Thus, Participants E1 and E4 have social perceptions towards the integration of computer technology into their teaching.

Discussion of findings

There seems to be a balance of perceptions with the five participants. For example, the participants seem to be driven by personal perceptions and social perceptions towards the goals of integrating computer technology into their teaching. Participants focus more on the aims and outcomes and not on objectives. Participants concentrate on the broad general statement of teaching intentions (personal perceptions) together with the specific statement of teaching (professional perceptions) (D. Kennedy et al., 2009).

Though the literature seems to lean towards personal perceptions (D. Kennedy et al., 2009; Khoza, 2016b; Nkohla, 2016; Romiszowski, 2016). According to Kennedy, Hyland and Ryan (2005), the aim of the curriculum is a broad general statement of teaching intention, which indicates what the teacher intends to cover in a block of learning. The aims are written from the teacher's point of view to indicate the general content and direction of the curriculum. This suggests that the teacher teaching Natural Sciences using WhatsApp should exhibit personal perceptions in making choices about what to cover in each plan of work. Personal perceptions could have supported Participant E4 to design a learning programme or lesson plan using prescribed content, teaching methods, deciding on the assessment plan needed to embark on the teaching and learning process (Khoza, 2015b). The latter would give Participant E4 a clear understanding of the wider purpose of incorporating WhatsApp into his teaching (Nkohla, 2016). Thus, Romiszowski (2016) further claims that the aims of education are expressed more in terms of the teacher. This advises that it is important for teachers to know their learners as they unpack the aims of the learning programme for Natural Sciences according to the ability of the learners in their classes. Romiszowski (2016) argues that most teachers are against prearranged aims. They consider it to be the learner who must present their own aims with only a minimal guidance from a teacher. Very few teachers are not driven by personal perceptions. Thus, more teachers have a clear understanding of the wider purpose of integrating WhatsApp and technology into their teaching (Nkohla, 2016).

4.1.5. Theme 5: Content

What are you teaching during the integration of WhatsApp?

According to the literature in Chapter Two, a well-considered vision, articulated aims, and objectives can guide decisions on the content of subject/ This is, as long as they reflect subject knowledge as truly crucial to the fundamentals of the subject while also taking present-day developments in the subject into account (J. Berkvens et al., 2014b, P. 16). Participant E1 teaches Natural Sciences which comprise both theory (professional perception) and practical (social perception) thus training the skills sets of the learners. This encourages Participant E1 to be driven by social perceptions in her teaching. Participant E2 teaches Natural Sciences: *“My subject comprises of both theory and practical, but it is easier for me to teach the theory more practically using audio visuals as this caters for the special needs learners.”* Participant E2 has professional perceptions in teaching Natural Sciences. The participants teach theory and practical work and projects. Therefore, participants have social and personal perceptions of their teaching. However, Participant E4 also teaches experiments which give learners practical

skills using the correct equipment to conduct experiments. There is therefore evidence of social perceptions in his teaching. There is other literature on curriculum such as written by, Eisner (1969); Khoza (2015b, 2016b); Van den Akker (2004), and J. Berkvens et al. (2014b). These studies highlight the need for curriculum developers to consider the three basic sources from which content can be drawn: individual, society, and subject matter. Here their particular concern is that a wide variety of specific sources, such as learner interests and community needs, be given equal deliberation with traditional academic disciplines. Thus, J. Berkvens et al. (2014b); define content as knowledge, skills, attitudes, and values. The knowledge (professional perceptions) in this context can represent the subject matter (theory); skills represent the personal perceptions (projects); and attitude represents the society (social perceptions) (practical assessment tasks).

According to my unstructured observation, all my participants are qualified teachers in their fields. During the unstructured observation, Participants E1, and E2 gave more attention to theory during their teaching in class. However, Participants E3 and E4 teach practical work as well because learners cannot achieve without conducting practical work.

However, the literature (J. Berkvens et al., 2014b; Eisner, 1969; Khoza, 2015a, 2016a; Loewenberg Ball et al., 2008; Van den Akker, 2004) leans towards the body of knowledge and information that teachers teach and that learners are expected to learn in a given subject (Loewenberg Ball et al., 2008). Participants are supposed to be driven by professional perceptions when dealing with content for integrating computer technology into school work. This is in line with the findings; participants have shown that they were also driven by professional perceptions. Social and personal perceptions are also important, since they place more emphasis on the learner and community needs (J. Berkvens et al., 2014b; Eisner, 1969; Khoza, 2015a, 2016a; Van den Akker, 2004), what ultimately takes precedence is the core of the subjects' need (J. Berkvens et al., 2014b). Most teachers are driven by professional perceptions when choosing content for integrating computer technology into their teaching.

4.1.6. Theme 6: Activities

How do you integrate WhatsApp into your teaching?

Teacher-centred activities: Personal perceptions

According to the literature in Chapter Two, teacher-centred activities are referred to as direct instruction, deductive teaching, or expositive teaching (Killen, 2012). This approach of

teaching requires personal insights because in these teaching activities, the teacher has direct control over what is taught and how learners are presented with information as they learn. Participant E3: *“I always look for examples from my daily life which makes it seem as if everything is about me.”* This indicates that Participant E3 has personal experiences of teaching. Kember (1996) argues that teacher-centred activities taking place in the classroom convey information; teaching is purely a transfer of information.

Learner-centred activities: social perceptions

Learner-centred activities place a much stronger emphasis on the learners' role in the learning process (Kember, 1996). E4 allows learners to conduct demonstrations using the cellphone to share information safely from the computer to the phone. This gives him an opportunity to stand aside and judge whether learners have achieved the intended goal. Participant E4: *“Many of the learners find it difficult to express themselves due to language barrier, so by grouping the learners with their friends helps and they can share information and make charts and power points to later share via WhatsApp”* In Participant E4's classroom, learners are the centre of attention. Thus, Participant E4 has social perceptions of teaching in his classroom. Participant E1: *“I use worksheets and discussions, magazines and other visuals to aid the learners.”* However, Tyler (2013a) explains that learning must stem from properly organised lessons. No teaching activity is wrong if it is properly planned. Hence, Participants E4 and E1 have social perceptions of their teaching.

Content-centred activities: professional activities

Literature (Goodson, 2013; Kember, 1996; Tyler, 2013a) defines content-centred activities as the body of knowledge and information that teachers teach and that learners are expected to learn in a given subject, such as English, mathematics, and natural sciences (Goodson, 2013). All my participants have professional training in their respective subjects. Participant E1: *“I teach Natural Sciences and it's important for me to work with the knowledge that my learners know and move forward thereafter.”* Participant E2: *“My subject content is important, but the teaching of practical activities is more important.”* Participants E3, E4 and E5: *“Natural Sciences stresses that we focus more on the practical content than anything else.”* All my participants have professional perceptions of teaching activities in their classrooms.

According to my unstructured observations, half of my participants (Participants E1 and E2) did not involve learners in their lessons. They would stand at the front of the classroom for the entire period and explain concepts. As an explanation for this, they complained that the classrooms are overcrowded and there is limited movement space. However, Participants E3,

E4, and E5 involved learners more often, while they also facilitated the learner's learning. Their teaching activities would change from that of learner-centred to that of teacher-centred.

The literature leans towards learner-centred activities which in this case, recommends that teachers have social perceptions towards the activities in integrating WhatsApp into their teaching (Goodson, 2013; Kember, 1996; Tyler, 2013a). As Kember (1996) argued, learner-centred activities place a much stronger emphasis on the learner's role in the learning process. The role of participants had to shift from the teacher-centred towards the one-off helping the learner to learn. Thus, all my participants should be driven by social perceptions. In saying so, according to the findings, all my participants have professional training in their respective subjects. Therefore, all my participants have professional perceptions of teaching activities in their classrooms. Such does not seem to be the problem because Tyler (2013a) specified in the literature that each learning experience should be built upon earlier ones, as in vertical organisation (professional perceptions); and should be emphasised by activities in other subject's horizontal organisation (social perceptions). However, participants seem to be driven by social, professional, and personal perceptions in their teaching activities. Teachers use learner-centred activities in their teaching together with content and teacher-centred activities. In other words, their focus is more on the learners and on the practical content that they teach.

4.1.7. Theme 7: Teaching Environment

Where do you integrate WhatsApp?

Face-to-face teaching environment: professional perceptions

The teaching environment refers to the diverse physical locations and contexts in which teachers teach (Lage et al., 2000). According to the unstructured observations, most teachers were fully satisfied with meeting their learners face-to-face in teaching them; however, they also wanted a way in which they could share information with the learners. Participants: *"It is good to have the learners in class regularly but having WhatsApp to share the days lesson with the children makes it easy for them to revise and learn."* Participants believe that other methods of teaching could work with their learners and that it is better to make lessons practical.

Online teaching environment: social perceptions

Participants: *"We have a WhatsApp group with my learners and parents; therefore, I am able to communicate information with them online and also receive their feedback."* Similarly, Participant E1: *"There is a Vodacom App that works on a smartphone that has all the subjects, I usually get the content that is relevant to the children and share it via WhatsApp with them."* Participants therefore have social perceptions towards their teaching.

Blended teaching environment: personal perceptions

According to my unstructured observations, as much as participants said that they use social media and Smartphone apps with the learners when away from school, at school they still use the face-to-face setting. Thus, participants use combined teaching settings. Participants therefore have personal perceptions of teaching. Participants seemed to have an understanding of the mixed teaching setting; they are more relaxed in the traditional teaching environment in order to gain control over their learners.

The literature outlines that most teachers prefer the use of a merged teaching setting because it makes their life easier; and this shows the drive of personal insights into their teaching (J. Berkvens et al., 2014b; Khoza, 2015b; Killen, 2007; OECD, 2002). Participants should be able to effectively bring resources to comfortable spaces within the learners' learning setting (Khoza, 2015a) Participants therefore use a blended teaching environment. Teachers are driven by personal insights/experience to use these of settings in integrating WhatsApp into their teaching. The blended setting is applied to the practice of using both online and face-to-face teaching surroundings when teaching learners (OECD, 2002). Participants attend to the psychological aspects of the setting in which learning is supposed to take place (Killen, 2007, p. 162). Furthermore, participants were not only concerned with face-to-face settings, but focused on the physical aspects of the setting in which learning was taking place. As J. Berkvens et al. (2014b) argued in the literature, learning experiences in motivating environments also exist outside school, and are more natural than those inside the classroom. The literature further affirms that teachers should not only hold on to the formal and traditional learning surroundings that could sometimes be uninteresting to today's learners; teachers should also use integrated approaches that would arouse learners' learning and explore various learning settings (J. Berkvens et al., 2014b; OECD, 2002).

4.1.8. Theme 8: Teacher role

How do you facilitate the integration of WhatsApp in your teaching?

Mediator of learning: social perceptions

According to the literature in Chapter Two, Killen (2007) argues that the teacher will mediate learning in a manner that is conscious of the diverse needs of learners, constructing learning environments that are suitably contextualised and inspirational, and communicate effectively; giving credit to and respect for the differences of others. Teachers should accommodate the individual needs of learners. In so doing a teacher negotiator must have social experience of his or her teaching in the classroom. Hence, Participant E1: *"I use The laptop and WhatsApp in my classroom to keep learning interesting in my classroom, this helps learners to gain*

confidences in what they are doing in class and it helps them learn new information.” Participant E1 has social perceptions of teaching in his classroom, displaying such in catering for varied learning abilities using computer technology. On the contrary, Participant E2: *“Mixing technology in my classroom will get me closer to the learners because I would not have to write notes on the board but help them admittance to information via WhatsApp.”* J. Berkvens et al. (2014b) stated that teachers should show changes in their portrayal and their thinking while teaching in the classroom.

Designers of learning programmes and materials: personal perceptions

Killen (2007) claims that the teachers will understand and interpret provided learning programmes, projecting original learning programmes, classifying the supplies for a specific background of learning, and choosing and preparing suitable written and visual possessions for learning. The teacher should have personal perceptions of teaching. Therefore, the teacher will also select, sequence, and pace the learning in a manner sensitive to the differing needs of the subject. Participant E4: *“I use school Wi-Fi, laptop, smartboard and projector, and cell phones as resources for my lessons.”* Participant E1 takes control of the learning materials in his classroom using material that seems appropriate for his lessons. Participant E4: *“I try to team my learners together for them to gain confidence using the different types of technology. By doing this they learn new skills from each other.”* This assumes that Participant E4 sees the importance of knowing his learners’ different learning abilities, thus designing learning programmes and choosing learning materials for his teaching. Participant E1: *“Using WhatsApp in my lessons helps encourage digital literacy amongst my learners and helps with different learning techniques.”* Therefore, participants use WhatsApp to design appropriate learning programmes.

Leader, administrator and manager: professional perceptions

According to the literature in Chapter Two, Killen (2007) argues that teachers make decisions appropriate to the level, managing WhatsApp incorporation into the teaching and learning in the classroom. Participant E3: *“I incorporate WhatsApp in my lesson to show and share the practical activities with the learners so that my load of planning is lessened. Also, it helps to share work that be used as additional help.”* Participant E3 is able to manage his role as a teacher according to the requirements of the Department of Education CAPS for NATURAL SCIENCES DOE (2012) Such requires that teachers use several technologies to create productivity in the work-place. Participant E3 has a professional perception of integrating

laptops, SMART Boards, WhatsApp and Microsoft Teams into his lessons. Participant E3 adds that using WhatsApp will make his paperwork and feedback controllable.

Scholar, researcher and lifelong learner: professional perceptions

Baylor and Ritchie (2002) argue that technology will not be beneficial unless teachers have the motivation skills, knowledge, and willingness to use and infuse these into the curriculum. These researchers recommend that teachers renew their skills if they are still at the Department of Education, the department of education should also host teacher development workshops to facilitate teacher development. Participant E3: *“At our school we are so lucky to have weekly teacher development courses that are related to technology. It helps our staff to gain more knowledge and improve themselves.”* Adding to that, Killen (2007) argues that the teacher will accomplish ongoing personal, academic, occupational, and professional growth through following reflective study and research in the area of using WhatsApp to teach Natural Sciences; in broader professional and educational matters; and in other related fields. Participants E1 and E3 have professional perceptions using their skills to infuse such into the curriculum (through teacher development workshops). Hence, Participant E2: *“In relation to working with LSEN learners, it is very important that I explore many ways to teach the learners. Each of them has adapted to various means of technology to learn and making this easily available to the learners is most important. I also feel it is important for me to explore the situation and work with learners likes and improve from there.”* Participant E4 has also grasped that we are living in an information age; therefore, he finds it essential to blend WhatsApp in his teaching of Natural Sciences.

Community, citizenship and pastoral role: social perceptions

Davis et al. (1989) argue that when learners feel a sense of connection with their teachers and other learners, and they know that someone is available to assist them if required, their feelings of social presence are increased. Participant E1: *“It is easy to talk to our learners in class and give them our undivided attention, although having the use of WhatsApp has helped us connect with the learners outside the class and share information beyond the classroom.”* There is therefore a pastoral role shown in the class by Participant E1. On the contrary Participant E4: *“I make my lesson very basic with the learners and explaining concepts that are personal in a practical manner makes is easy. For example, getting the learners that washing of hands before eating and after using the toilet is important, hence, I do a demonstration.”* Hence, Killen (2000) agrees that the teacher will practice and encourage a critical, dedicated, and moral attitude towards inculcating a sense of respect and responsibility for others. Such an attitude

extends to the use of technology, one that supports the Constitution, and encourages democratic values and practices in schools and society.

Assessor: professional perceptions

Crosby (2000) argues that assessment of the learner's competence is one of the most important tasks facing the teacher. However, good teachers know how they must assess their learners' learning. Participant E1: *"I encourage my learners to type assignments and projects, this helps them learn how to use WhatsApp and other technological aids as they work."* Participant E1 is more into social perceptions.

Moreover, Perrenoud (1991) argues that the insights and experiences about teaching and learning, about their role as assessors and about the ability and projections of their learners, will affect their understandings of their learners' learning work, and will thereby regulate the quality of their formative assessment. Killen (2007) states that teachers will understand that assessment is a serious feature of the teaching and learning development and must therefore know how to incorporate technology into this process. The teacher will have an insight into the purpose, methods, and effects of assessment and be able to provide valuable feedback to the learners, meeting the requirements of endorsing bodies. The teacher will keep detailed and diagnostic records of assessment. The teacher will be able to understand how to understand and use assessment results to feed into the process for the improvement of learning programmes. CAPS for NATURAL SCIEINCES DOE (2012) suggests that Natural Sciences can also be used to help with assessment. Nevertheless, during assessment teachers could have personal perceptions of what to assess. Worthy teachers may have both personal and social perceptions as assessors in order to cater for various learning needs.

Learning area, subject discipline specialist: professional perceptions

It is not easy to launch something on your subject when sound knowledge of the subject is absent. However, according to my observations, all my participants (E1, E2, E3, E4 and E5) are subject specialists. All of them are teaching their major subjects. Participant E1 teaches Natural Sciences and Robotics, Participant E2 teaches English and Natural Sciences, Participant E3 teaches Motor mechanics and Natural Sciences, Participant E4 teaches Natural Sciences and Geography and; Participant E5 teaches Natural Sciences and life skills. As I was observing, all participants have computer skills; Participant E3: *"I am computer literate, therefore, it was easy for me to use computer in my classroom and share information via WhatsApp."* Participant E1 had computer training which made it easy for him to integrate the computer into his teaching.

Furthermore, Killen (2000) contends that the teacher will be well grounded in the knowledge (professional perceptions), skills (personal perceptions), values (social perceptions), principles, methods, and actions relevant to the discipline, subject, learning area, phase of study. The teacher will know about different styles of teaching and learning and how these may be used in ways that are suitable to the learner and the context. ‘Moreover, professional insights, change suggestions for the teachers’ pedagogical content knowledge. (Thijs & Van den Akker, 2009c, P. 34). Killen (2007) also adds that the teacher will have a well-developed understanding of the content knowledge appropriate to the specialist subject.

The literature specifies that all teacher roles must be balanced amongst teachers (Killen, 2007; Thijs & Van den Akker, 2009c). Thijs and Van den Akker (2009c) affirmed that, during this period of curriculum invention, teachers should also show changes in the acting and their thinking (change of perceptions). All my participants seem to understand their roles as teachers in the incorporation of WhatsApp into their teaching. Therefore, participants have demonstrated professional experiences by producing sound knowledge of their subject contents and various principles, strategies, and resources appropriate to teaching. However, participants have established personal, professional and social perceptions of the integration of WhatsApp into their teaching. Therefore, within the school, the teacher will demonstrate the ability to develop a supportive and empowering environment for learning, responding to the educational and other needs of learners and fellow teachers. Thus, the teacher will have social and personal perceptions of the integration of computer technology into his teaching as supportive relations are developed with parents and other key persons and organisations, based on a critical understanding of community development issues.

4.1.9. Theme 9: Assessment

Why do you assess by integrating WhatsApp?

According to James and Pedder (2006), the strategies teachers and learners develop and use to support learning are called assessment for learning. Furthermore, James and Pedder (2006) contend that when teachers and learners use assessment information for supporting improvement in teaching and learning, they are satisfying the professional perceptions of assessment. The purpose of assessment, according to Harlen (2007), is to notify decisions about teaching and learning experiences and story on what has been achieved. In adding, Black and Wiliam (2003) contend that assessment in education must, first, serve the purpose of supporting teaching and learning. Harlen (2007) brings in assessment of learning, which he describes as the most essential part of education, in that it takes numerous roles. Henceforth, assessment is

used to refer to make decisions about learners' achievement in education (Harlen, 2007, P. 4). On the other hand, Black and Wiliam (2003) claim that assessment is an important aspect of teachers' classroom work; and that attention to improving its practice can enhance the learners' achievement. Furthermore, the design of tests useful for the instructional decisions made in the classroom requires an integration of testing and instruction. Such also requires a clear commencement of the curriculum, the goals, and the process of instruction. And there must be a theory of the cognitive processes of learners (Linn, 1989). Reed et al. (2012) argue that these terms describe three ways of designing assessment (formative, summative, and peer assessment) and of using the results of assessment (Bloom, 1971).

Formative assessment: Personal perceptions

Participant E3: *"I ask my learners to complete a practical task that they can relate to the theory. This makes it all that easier for the learners to understand."* Participant E3 seems to have no planned programme in his assessment using WhatsApp. Formative assessment gives information to help learners to grow and to make progress. In Gardner and Gardner (2012) it was found that for majority of teachers, formative assessment was not a well-recognised aspect of practice. Formative assessment seeks teachers to have professional experiences when engaging with assessment in their classrooms. Thus, Participant E3 must reconstruct the teaching contract so as to counteract the habits acquired by his learners (Perrenoud, 1991, P. 92).

In favour of assessment of learning rather than assessment for learning, Harlen (2007) argues that content knowledge can readily be found from the information sources widely available through the use of WhatsApp and especially the internet. Hence, Participant E4: *"I use tutorials provided by the smart phone apps, we write quiz tests from the internet and plot graphs using the internet apps."* This shows that Participant E4 has a purpose to his use of computer technology and WhatsApp. Marsh and Willis (1995) add that what is needed are the skills to access these sources, and the understanding to select what is relevant and to make sense of it. Participant E4 has professional perceptions of integrating WhatsApp into his assessment.

Harlen (2007) further argues that formative learning occurs when teachers adopt teaching styles that highlight transmission teaching of knowledge. This is accomplished through favouring those learners who prefer to learn and understanding information presented. Assessment of learning disadvantages the learner's self-esteem of those who prefer more active and creative learning experience.

Sadler (1989) outlines key evidence that for students to advance, they must develop the ability to monitor the excellence of their own work during real production. This in turn demands that students possess an idea of high quality of work, that they have the evaluative skills necessary to compare with some objectivity the quality of what they are producing in relation to the higher standard; and that they develop a store of plans or moves which can be drawn upon to adapt their own work. It is contended that these skills can be developed by providing a direct authentic evaluative experience for students.

Summative assessment: professional perceptions

If the teacher asks a learner a question in order to decide whether the learner can be promoted to the next grade, this implies summative assessment (Harlen, 2007). Summative assessment enables a teacher to tell how much a learner has achieved by a certain stage. Sadler (1998) added that summative assessments are given occasionally to determine at a certain point what learners know or do not know. According to my observations, only Participant E1 used computer technology in his summative assessment. Participant E1: *“At our school, 75% of the assessment is practical and the other 25% is theory. We base our assessments on the levels of the learner’s knowledge.”* According to CAPS for NATURAL SCIENCES DOE (2012), summative assessment at the district and classroom level is an accountability measure that is generally used as part of the grading process. This type of assessment seems to be falling under the personal perception, since assessment is used to achieve the goals of the state. Participant E4 has professional perceptions towards integrating computer technology into his summative assessment.

Peer to peer assessment: social perceptions

In peer assessment, a collective teaching and learning technique, learners evaluate their peers’ work and have their work evaluated by peers (Bruffee, 1993). Participant E4: *“In my classroom, that I assign learners who seem to understand quicker than the others to walk around and checking other learners’ work on learners to share the correct information with their peers.”* Thus, learning becomes more social and centred on learners. This furthers suggests that Participant E4 has social experience of his teaching in the classroom. Archer et al. (2008) contend that peer assessment is often used as a learning tool and gives learners feedback on the quality of their work, often with ideas and strategies for improvement. At the same time, evaluating peers’ work can improve the evaluators’ own learning and self-confidence (Fischhoff & Slovic, 1978). Thus, peer contribution personalises the learning experience, potentially motivating continued learning.

When used in grading, peer assessment can give the teacher needed information on learner performance. Especially for large online classes, such may allow inclusion of assignments where learners' creative work could not be graded reliably through automation or efficiently by teachers (Boud et al., 2014).

O'Donnell and O'Kelly (1994) state that learners learn a great deal by explaining their ideas to others and by contributing to activities in which they can learn from their peers. Boud et al. (2014) further add that learner's develop skills in organising and planning learning activities, working collaboratively with others, giving and gaining feedback, and assessing their own learning. Peer assessment is thus an important part of many subjects and is being used in a variety of contexts and disciplines in many schools. However, when peer assessment is used strategically, learners unacquainted with this approach of assessment become confused about what they are supposed to be doing. Learner's then altogether miss opportunities for learning altogether and fail to develop the skills expected of them. Much peer learning occurs casually without teacher involvement; learners who are already effective learners tend to benefit more.

Formalised peer assessment can help learners learn effectively (Biggs, 1996). At a time when school resources are stretched, especially in South African township schools, and demands upon teachers are cumulative, such offers students opportunities to learn from each another. This gives them significantly more practice than traditional teaching and learning methods. Taking responsibility for their own learning and methods and generally learning how to learn.

Most participants seem to understand how to integrate WhatsApp into their formative assessment. My participants are driven by professional perceptions. This suggests that teachers are in favour of assessment of learning rather than the assessment for learning. Such is affirmed by Harlen (2007) who argued that content knowledge can readily be found from the information sources widely available through the use of computers and especially the internet. Marsh and Willis (1995) added that what is needed are the skills to access these sources; and the understanding to select what is relevant and to make sense of it. Harlen (2007) further claims that in formative assessment, teachers adopt teaching styles that emphasise transmission teaching of knowledge. Such is achieved, through favouring those learners who prefer to learn mastering information presented successively assessment of learning, this disadvantages of those who prefer a creative teaching and learning experience. However, the literature seems to be driving the assessment unit towards social perceptions or peer-to-peer assessment (Archer et al., 2008; Biggs, 1996; Boud et al., 2014; Bruffee, 1993; Fischhoff & Slovic, 1978;

Gronlund, 1998; O'Donnell & O'Kelly, 1994). Most of the participants must reconsider their perceptions when scrutinising assessment during their integration of computer technology into their teaching. This will require teachers to formalise peer assessment which can help learners learn effectively.

4.1.10. Theme 10: Time

When do you integrate WhatsApp in your teaching?

Contact time: professional experiences.

Participant E1: *“for me to teach content, skills and practical work for Grade 6 Natural Sciences, I have taken at least four to six weeks to do the practical work in order for the learners to understand. Once this is done the learners have a better understanding of the theory.”* For example, Grade Six Natural Sciences DOE (2012) is allocated a total of 70 hours to teach Natural Sciences content. Teaching of practical work prevails on the teaching of theory, hence, the learners are prepared for skills set in Natural Sciences using WhatsApp. Participant E1, the above is a standard; thus, this requires participant E1 to have professional insights to effectively unpack the planned curriculum. The other participants also had to follow their contact time as indicated by CAPS (DOE, 2012).

Spare time: personal experience

Participant E3: *“I usually encourage my learners to go on the internet during their spare time at home and research on the topics of their projects, fir the learners that do not have access to internet at home, I allow them to do their research at school.”* Hence, digital and online learning options can also be used as spare learning time (Brady et al., 2010). While learners have long completed homework assignments or projects outside of regular school hours, teachers can introduce new learning technologies such as WhatsApp to allow for instructional interactions that go well beyond reading and assignment completion. For example, Participant E4 watches videos and recorded lessons, communicates with learners electronically (WhatsApp) thus supporting learners as they work through a problem, task, or assignment. This shows that all participants are driven by personal perceptions as they are dedicating themselves to extra learning time to improve their effectiveness in dealing with the learners.

4.1.11. Conclusion

This chapter presented the teachers' experiences of the incorporation of WhatsApp in their teaching of Natural Sciences. The findings were analysed and discussed according to themes and categories that were entrenched in curriculum processing units. Effective units (words) for all the themes were entrenched in the three worlds of perception: personal, social, and

professional perceptions. Findings from this study showed a positive association between all the themes and reflected how each theme represented the other in the curriculum practices. The findings indicate that all experiences are obvious in current Grade Six teachers' teaching in special needs schools. Such applies to teaching goals, teaching resources, teacher role, teaching activities, teaching environment, content, assessment, teaching time, and accessibility. Having discussed the ten main themes emerging from the data in this chapter, the next chapter presents a synthesis of the data and the conceptual understandings.

Chapter 5

Study Summary, Summary of Findings.

5.1. Introduction

The study explores teachers' experiences of the teaching of Natural Sciences using WhatsApp in Grade Six in KwaZulu-Natal Primary Schools. This chapter discusses the findings by comparing the literature, the Natural Sciences CAPS document, and data generated from ten conceptual frameworks, which are considered themes supported by three categories (personal reflection, verbal reflection and written reflection). The data-generation method involved reflective activity, one-on-one semi-structured interviews and zoom an interview. The study also tracked the investigation of teachers' 'experiences on the teaching of Natural Sciences using WhatsApp in Grade Six by answering to the following research questions,

1. What are Natural Sciences teachers' experience of using WhatsApp for teaching in primary schools?
2. How do Natural Sciences teachers' cope with the experiences of using of WhatsApp for teaching in primary Schools?

The study responds to the following research objectives:

1. To explore Natural Science teachers' experience of using WhatsApp for teaching in Primary Schools.
2. To explain coping methods used to teach Natural science teachers' experiences of using WhatsApp for teaching and learning.

5.2. Summary of the Chapters

5.2.1. Chapter One (the overview, content and background)

Chapter One presented a general background of the projected study. Firstly, the chapter presented the title of the study, which is "The Use of WhatsApp in Primary Schools: Natural Sciences Teachers' Experiences." The chapter also presented a school in the KwaZulu-Natal, Malvern area. My personal reasons for conducting the study were to attain the rationale, also the phenomenon (teachers' experiences) in its propositions (personal experiences, verbal experiences and written experiences) as well as the focus of the study, which is the teachers' experience of teaching Natural Sciences using WhatsApp. The objectives of the study are also classified, which are:

1. What are Natural Sciences teachers' experience of using WhatsApp for teaching in primary schools?

2. How do Natural Sciences teachers' cope with the experiences of using of WhatsApp for teaching in primary Schools?

I introduced the research design and methodology by articulating the research paradigm (interpretivist paradigm), research style (qualitative approach), sampling (convenience and purposive), research methods (reflective activity, one-on-one semi-structured interviews, Zoom group discussions), data analysis, ethical issues, and trustworthiness (credibility, trustworthiness, confirmability and dependability); and lastly, anticipated problems. The location of the study had also been mentioned, a special needs school in Malvern, Durban, KwaZulu-Natal province.

5.2.2. Chapter Two (literature review)

This chapter covered the literature review concentrated on the teaching of Natural Sciences using WhatsApp. The chapter opened by discussing the phenomenon and its propositions, and dwelt on the curriculum presentation (intended, implemented and attained curriculum). The curriculum design approach (instrumental, communicative and interpretivist approach) was also expressed. The proposed study also compared the horizontal curriculum with the vertical curriculum. Moreover, the chapter established that the TPACK framework had been used to organise the reviewed literature. This was broken down into ten concepts: rationale, goals, accessibility, content, activities, resources, role, location, time and assessments (Voogt et al., 2009)

5.2.3. Chapter Three (Research design and methodology)

The third chapter outlined in detail the research design and methodology. The chapter also speaks of the qualitative research design approach which employs the interpretivist paradigm, research style, (action research), sampling, data-generation method (reflective activity, one-on-one semi-structured interview, Zoom group interview) and data analysis. This chapter also adopted guided analysis, which included both inductive and deductive reasoning in analysing the data. Added to this, the aim of the study was to understand teachers' experiences of using WhatsApp to teach Natural Sciences, thus helping learners to perform better.

5.2.4. Chapter Four (Research findings)

Chapter Four explored and presented findings from Natural Sciences teachers' experiences of their usage of WhatsApp to teach Natural Sciences. The data generated through the themes were broken down and were then related to teachers' experiences. This chapter presented, discussed and analysed the action research findings from five different participants: Participants E1, E2, E3, E4, E5.

5.3. Summary of Findings.

This section provides the summary of the findings that were generated in chapter four of the study following the ten themes of the TPACK curriculum (rationale, goals, accessibility, content, activities, location, time, role, resources and assessment) on, which teachers have shared their experiences.

5.3.2. Rationale

Kaliisa & Dolonen (2023) believe that, because of the growing demand for technology and through the great improvements made in technology, there has been a higher demand to use technology and to involve both teachers and students into using technology for teaching and learning both face-to-face and online. When teachers embrace their rationale of teaching Natural Sciences using WhatsApp, this can enhance effective teaching and learning. Khoza (2016) argues that in teaching and learning, there can be no successful implementation of the curriculum should there not be “why” questions. Moreover, the above studies also outline that the rationale behind the teaching of any subject is important, being at the centre of all the curriculum concepts of teaching any subject. That the rationale is therefore the driving force behind the teaching of Natural Sciences using WhatsApp because it is the foundation of all ten themes in the TPACK curriculum.

The findings from the data analysis revealed that the participants for teaching of Natural Sciences using WhatsApp is based on the societal rationale. Furthermore, participants’ experiences also revealed that the professional rationale prompted their teaching of Natural Sciences using WhatsApp in Primary schools. Williams (2016) stated that, based on (whose?) assertion, it is suggested that teachers are more driven by written and verbal experiences than by personal experiences in the teaching of Natural Sciences using WhatsApp in Primary Schools. This answers the first question and its respective objective, namely: What are Natural Sciences teachers’ experiences of using WhatsApp for teaching in KwaZulu-Natal primary schools? To understand/explore Natural Sciences teachers’ experiences of using WhatsApp for teaching in KwaZulu-Natal Primary Schools.

5.3.3. Accessibility

The literature review referring to Berkvens, Van den Akker, et al. (2014) outlined that, accessibility of teaching Natural Sciences using WhatsApp is based on three categories of accessibility, which include physical accessibility, cultural accessibility, and financial accessibility. Thus, when teachers can identify all access to education, there could be better

prospects for learners to attain the best education without any prejudice whatsoever. In leading up to this, Ngubane-Mokiwa and Khoza (2016) concur with Onwuagboke, Singh, and Onwuagboke (2014) who maintained that accessibility in education provides quality education to learners. In saying so, accessibility allows learners to be catered for in the teaching of Natural Sciences using WhatsApp, despite their background. Furthermore, every learner who is at school deserves good education from teachers. At the same time, teachers must not be denied access to meeting learners for curriculum distribution. Further reviewed literature reveals that accessibility in education, remains an important part of the post-2015 education agenda (Berkvens, Van den Akker, et al., 2014). In adding to the above (Khoza, 2017b) showed that accessibility is a underlying right every child should possess. Teachers must be driven by personal reflection in order to assist learners to gain access to education when they are taught. As a result, the first research question and the second research objectives are addressed; What are Natural Sciences teachers' experiences of using WhatsApp for teaching in KwaZulu-Natal primary schools? To find/explain lessons from Natural sciences teachers' experiences of using WhatsApp for teaching and learning.

The findings revealed that real-time accessibility dominates teachers when they are teaching Natural Sciences using WhatsApp, particularly in Grade Six. Teachers are aware of accessibility when teaching Natural Sciences. Moreover, findings also revealed that learners whom they teach often come from poor socio-economic backgrounds. This suggests that teachers understand the community in which they teach in and the parents have no stable salary.

5.3.4. Resources

The reviewed literature outlines that a resource is any object or person that facilitates teaching and learning (Khoza, 2012). Moreover, Khoza (2015) asserts that resources have three categories: hardware resources, software resources, and ideological-ware resources. Additionally, Krishna et al. (2014) assert that resources make teaching and learning successful. If teachers can reflect critically and positively on their experiences using resources such as WhatsApp when teaching Natural Sciences, their lesson can be successful. In other words, resources supply a backup for teachers when they teach their lessons successfully. Reddy. E.V, Reddy, P, Sharma. B, Reddy. K, Khan. M.G.M (2023) have stated that the advancements of technology in the education system have aided many learners and teachers. Reddy. E.V, Reddy, P, Sharma. B, Reddy. K, Khan. M.G.M (2023) state that mobile devices such as cellphone are more accessible to the learners and teachers than laptops and tablets. Teachers can thus share valuable information and other resources in a simple manner to the learners via WhatsApp which becomes a digital resource. Learners relied on teachers to make learning successful. In

other words, if teachers fail to be good resources for learners, learners might find it difficult to understand the teacher.

The findings revealed that teachers use hardware resources as their main resources, followed by software resources. This suggests that written reflections dominate their teaching of Natural Sciences followed by verbal reflections. Teachers are good at using integrating textbooks and internet resources into their teaching. Teachers must convert information to concrete examples to make the learners understand. Learners may not be able to follow a worksheet; however, drawings and practical activities can be used to demonstrate lessons to learners.

5.3.5. Goals

DBE (2011) is verbal about aims, objectives and learning outcomes. Aims are clarified as general aims; while objectives are seen as specific aims, and learning outcomes as specific skills (DBE, 2011).

Teachers should be driven by personal experiences in the integration of aims when teaching their lessons using WhatsApp. It is imperative that teachers understand the difference between aims and objectives because these drive the lesson and direct the teacher to the desired learning outcome. Khoza (2014b) also argued that if there is no observable outcome, there will be no successful teaching and learning of Natural Sciences using WhatsApp. Hence, learning outcomes are less dominant when teachers teach Natural Sciences using WhatsApp in primary schools.

Teachers should be driven by personal experiences when effect aims, objectives and learning outcomes when preparing their Natural Sciences lessons. Furthermore, Kennedy et al. (2006) outline that aims are broad general declarations whereby the teacher specifies what to cover in the process of teaching and learning of Natural Sciences. In other words, aims attend to the whole chapter to be taught. On other hand studies by Kennedy et al. (2006) further articulate that objective are the specific statement of teaching targets. Objectives are specific to the Natural Sciences topics that they teach in Natural Sciences. Moreover, Mooney et al. (2014) agreed with Van Manen (2016) that teachers must be more aware of thinking on learning outcomes when developing Natural Sciences practices. Literature outlines that aims and objectives are dominating when teachers teach Natural Sciences using WhatsApp to teach in Primary Schools.

5.3.6. Content

Berkvens, Van den Akker, et al. (2014) define content as knowledge, skills, attitudes and values that culminate in learning activities experienced by learners both in and outside the class; together with the teachers' experiences of teaching Natural Sciences using WhatsApp. The

literature outlined that for teachers to circulate content, they should familiarise themselves with two suggestions about the Natural Sciences content the practical work and the subject knowledge. Hoadley (2013) suggested that teachers who teach Natural Sciences content must have pedagogical content knowledge on the topic they are teaching. Teachers must be driven by written reflection on their experiences using WhatsApp when they teach Natural Sciences. In other words, before a teacher can go further to unpacking the topic. There must be a clear reflection on what is expected of them so that learners can better understand the work. Luneta (2014) reasoned that most of the teachers lack basic knowledge of Natural Sciences content.

Findings from data analysis from Phase One show that when teachers teach Natural Sciences, they teach content aligned with the CAPS documents. Teachers therefore use a content-centred approach, which dominates their teaching of Natural Sciences. Likewise, teachers use the CAPS document as their guide when they teach Natural Sciences. Hoadley (2012) concurs with the claims made by stating that the CAPS document outlines the content teachers should teach. Furthermore, studies revealed that since CAPS is performance-based, it is dominated by both the teacher-centred and the content-centred approach. Also, the DBE (2011) is specific on which content teachers should use when they teach Natural Sciences. Teachers must make sure that when they are teaching Natural Sciences using WhatsApp, they must make the content more practical so that the learners can understand the content. Teachers are following the CAPS documents because the CAPS is a performance-based curriculum. The DBE (2011) issued a pacesetter or Annual Teaching Plan (ATP) giving the content teachers should embark on when teaching Natural Sciences. Teachers should be driven by their experiences of teaching Natural Sciences via WhatsApp, content being the core function of teaching and learning.

5.3.7. Teaching activities/roles

According to the literature reviewed, three roles are prominent when teachers teach Natural Sciences using WhatsApp (Khoza, 2015). The studied literature define that roles are classified under three levels of teaching and learning: the instructor, the facilitator, and the assessor. The instructor and assessor roles dominate the facilitator role in teaching. The teacher can be an instructor, facilitator, and assessor (Kudryashova et al., 2016). Teachers should be driven by verbal reflection when they play their role of enabling the teaching of Natural Sciences. Learners should be able to comprehend what they learn. The teacher's role is determined by the method that teachers apply in the teaching of Natural Sciences. The reviewed literature also expresses that teachers' roles are not limited.

The DBE (2011) outlines activities a teachers should engage in when teaching Natural Sciences using WhatsApp. These are teacher-centred and content-centred activities. Similarly, the Department of Basic Education (DBE) also issued Natural Sciences workbooks, created by Sasol, the company. These workbooks are available as online books and can be shared via WhatsApp. Teachers can via these workbooks, to obtain various activities for learners. These workbooks are aligned with activities a teacher needs and that address the needs of the subject content when embarking on teaching or presenting a lesson. Thus, teachers should be driven by written and personal experiences when crafting activities that must to be done in the teaching.

5.3.8. Location

Location is the social, psychological and pedagogical context in which learning and teaching takes place (Martins & Santos, 2012). In other words, location is about where teachers are teaching (Khoza, 2013; Killen, 2007). Moreover, teachers need not to be confined to a single location when they teach Natural Sciences; they should reflect on other locations which might cater for all learner needs. Teachers have started using WhatsApp as a way of teaching learners: this has had a major impact. Personal experience should motivate teachers when they teach Natural Sciences, because not all learners are able to learn comfortably in the classroom.

However, findings from data analysis revealed that most of the Natural Sciences teachers executed their duties both inside the classroom (formal location) and outside (WhatsApp) the classroom. According to the findings made by (Reddy. E.V, Reddy. P, Sharma. B, Reddy. K & M.G.M Khan, 2023), mobile learning and teaching is on the increase. Learners can access information at their fingertips and the low-income communities have improved in their education skills and learning. This indicates that teachers were driven by verbal reflection in their teaching, allowing learners to engage with a teacher by speaking, discussing, and raising questions whenever they needed to. Moreover, few teachers use blended locations. Teachers seemed driven by personal experiences in ensuring that learners acquire more knowledge in their teaching. Therefore, the first research question was: What are Natural Sciences teachers' experiences of using WhatsApp for teaching in primary schools? The first research objective is, to understand/explore Natural Sciences teachers' experiences of using WhatsApp for teaching in KwaZulu-Natal Primary Schools.

5.3.9. Time

The studied literature defined time as when and for how long a teacher should teach learners (Khoza, 2013b). Girelli et al. (2011) categorise time into three propositions, which are contact time, extra time, and holiday time. Contact time and extra time dominate teaching and learning

time in the teaching of Mathematics, while holiday time is not prioritised. Meddings and Thornbury (2017) outline that contact time is when learning and teaching is taking place.

Findings from data analysis revealed that teachers teach for approximately three-and-a-half hours per week, and they utilised prescribed time when they teach Natural Sciences lessons. This suggest that teachers are influenced by written reflections on their practice of Natural Sciences, since they refer to timetables per week. Data analysis also revealed that when schools are closed, they do not engage their time to prepare lesson beforehand. Thus, the second research question is posed: How do Natural Sciences teachers' cope with the experiences of using WhatsApp in teaching in primary school? The second research objective, to find/explain lessons from Natural science teachers' experiences of using WhatsApp for teaching and learning.

5.3.10. Assessment

The findings from data analysis revealed that formative assessment dominated teaching in the assessment of Natural Sciences using WhatsApp. Teachers were driven by personal experiences in the assessment with the learners. Summative assessment became the next dominant assessment type when teachers assess learners for progression and promotion processes. Further to this, teachers' assertions agree with the CAPS document in suggesting that they use formative and summative assessment when they assess learners in Grade Six. Hence, the first research question: What are Natural Sciences teachers' experiences of using WhatsApp for teaching in primary schools? The second research objective is to find/explain lessons from Natural science teachers' experiences of using WhatsApp for teaching and learning, was also addressed.

Suggestions And Recommendations

5.4. Suggestions for further research

The following suggestions have been made for further research:

I suggest that there should be further research made on Quintile 1-2 schools in the teaching of Natural Sciences using WhatsApp, especially in previously disadvantaged areas. Teachers should be made aware about propositions of themes in the curricular TPACK to improve their practices. A further study should be conducted on the importance of experiences when teachers are teaching Natural Sciences CAPS in the Intermediate Phase (Grades 4-6). The literature review indicates that there is adequate focus on teachers' experiences of Natural Sciences. Hence, it may be sensible to spread this type of research to other rural districts to understand how they cope with limited resources and into sharing information via WhatsApp.

5.5. Recommendations

It was apparent from the findings that most teachers teaching Natural Sciences using WhatsApp were not drawing much from the professional rationale. Teachers then adjusted their methods of teaching to be more practical. Teachers were lacking written reflections. The Department of Basic Education must revisit the notion that every teacher can teach Natural Sciences using WhatsApp in primary schools. The DOE should employ properly qualified teachers to teach Natural Sciences. The Department of Basic Education should equip those teachers who are already in the system by offering them Natural Sciences content in capacity-building workshops: thus, helping to improve, especially in special needs schools.

5.5.1. Recommendation 1: Rationale

It was apparent from the findings that most teachers teaching Grade Six were not drawing much from the professional rationale; they did not follow the policy document in their teaching. As a result, teachers were lacking written reflections on their experiences of teaching Natural Sciences using WhatsApp. The study recommends that teachers should understand the professional rationale for teaching Natural Sciences in Grade Six by furthering their studies.

5.5.2. Recommendation 2: Accessibility

It was apparent that teachers were not focusing on the cultural needs of the community when they taught Natural Sciences, cultural accessibility was overlooked. It is recommended that the Department of Education prepares teachers by organising workshops whereby in which “the issues of human rights, inclusivity and social justice will be unpacked for an example race, religion, language, age, disability, and other factors” (DBE, 2011, p. 5). Natural Sciences teachers in Grade Six should be driven by written reflections on their experiences of using WhatsApp to teach Natural Sciences so that teachers can encourage a non-discriminatory school environment amongst the school community. It is then proposed that when teachers call learners during weekends, they should understand the norms and religious practices of the community they serve.

5.5.3. Recommendation 3: Resources

When teachers were circulating content to the learners, ideological ware seemed to be ignored. Khoza (2015) defined ideological ware as driving any lesson; learning is not only about material things but is about ideology in learning. This suggests that teachers should be driven by personal and written reflections on their experiences of using WhatsApp to teach Natural Sciences. The policy document will enable teachers to know what methods to incorporate into their teaching. It is then advised that the school departmental heads should ensure that before a teacher supplies a lesson, methods that should be used are clearly defined in lesson

preparation to achieve the objectives of the intended curriculum. For example, a teacher should use various methods such as using a video or practical example when teaching to explain energy and change. Learners will be instructed to investigate the relationship between how they get energy and how this energy is converted for different uses (DBE, 2011). The teachers must thus continue to use WhatsApp as their main source of communication with their learners. All activities such as practical work, worksheets, videos, and the recording of the lesson must be shared to the WhatsApp chat group so that the learners have access to the information. Teachers can create links for the lessons and share these to WhatsApp; this would make it easy for learners to understand. The teachers have also worked in grade groups so that when the information is shared it goes to everyone; the learners can also work in groups at home, especially those have a problem connecting to internet. When they work in groups learners will gain the information without any issues and everyone will have equal access to the information.

5.5.4. Recommendation 4: Goals

It was found that teachers were clear about aims; however, they were not clear about the difference between objectives and learning outcomes. As a result, when teaching Natural Sciences using WhatsApp, teachers confused objectives and learning outcomes. In addition, written reflections were lacking in their teaching. Teachers also found difficulty when it came to sharing large amounts of the lesson via WhatsApp because they could not send large files. As a result, some of the lessons were truncated or left out. It is suggested that the Department of Education conduct workshops for teachers to clarify between objectives and learning outcome. Teachers must know how to recognise objectives and learning outcomes in the policy document when they prepare for Natural Sciences using WhatsApp teaching. When it comes to the outcomes, the Department of Education should combine some of the goals and outcomes to make the teaching and learning process easy. Thus, if teachers ignore learning outcomes this indicates that learning was mostly about facilitators' satisfaction, not about that of learners: aims and objectives are about facilitators' goals (O' Sullivan, Moneypenny, & McKimm, 2015).

5.5.5. Recommendation 5: Content

It was found that teachers were clear about the content they teach in Natural Sciences. It is recommended that during the time when teachers attend workshops, topics should be on how teachers can gain in-depth understanding of topic knowledge in Natural Sciences using WhatsApp to teach. Teachers must also remember that WhatsApp is a tool used to share information with the learners. Teachers can record a simple lesson and share it over WhatsApp. Showing learners, a picture and recording a voice over it before sharing with the learners via

WhatsApp will also be helpful. In other words, some topics need different approaches for learners to understand. For instance, Natural Sciences content should be made more relevant by assisting learners to acquire practical skills.

5.5.6. Recommendation 6: Activities

It was discovered from the findings that most teachers were utilising learner-centred activities when they were teaching Natural Sciences using WhatsApp to teach. Hence, their practices encouraged verbal reflection. In other words, teachers did draw attention by utilising learner-centred activity. It is then recommended that the Department of Education organise capacity-building workshops for Natural Sciences teachers that will deal specifically with learner-centred activities, these being essential to the teaching of learners. Jang, Reeve, and Deci (2010) concurred with the above claim by stating that a learner-centred activity is important because learners become responsible for their own learning when given the chance to discover and be engaged in their own learning development.

5.5.7. Recommendation 7: Teacher Roles

It was revealed that teachers drew attention to the facilitator roles when they teach Natural Sciences using WhatsApp to teach. Teachers rely on verbal reflection when they teach Natural Sciences using WhatsApp. It is recommended that the Department of Education conduct in-service training workshops that will prepare teachers with facilitation roles during the teaching and learning process. Additionally, the department should also establish in-service guidance involvement to check whether teachers utilise the knowledge they gain (Jansen & van der Merwe, 2015).

5.5.8. Recommendation 8: Location

The findings revealed that most of the teachers use a formal location when they teach Natural Sciences per WhatsApp. Informal locations were also used by most of the teachers. It is evident that personal reflection was not given much attention in their teaching. It is recommended that teachers utilise informal locations when they teach Natural Sciences lessons, by integrating formal and informal location to meet the requirements of the 21st century. Moreover, the department should empower teachers with technology skills in order for them to effect blended learning when they teach Natural Sciences using WhatsApp. Thus, Ceylan and Kesici (2017) outlined that blended learning provides more effective learning outcomes enriching through modern technologies.

5.5.9. Recommendation 9: Time

It was evident that when teachers were teaching Natural Sciences using WhatsApp, they used contact time when they teach. There is therefore a need for teachers to utilise time to complete

their Annual Teaching Plan for Natural Sciences teaching. Findings revealed that teachers do not use holiday time. It is suggested that teachers utilise extra time for teaching Natural Sciences to cater for those learners who are struggling with Natural Sciences content.

5.5.10. Recommendation 10: Assessment

The findings revealed that teachers do not administer continuous assessment when they teach Natural Sciences using WhatsApp. It is recommended that the Department of Education conduct workshops for Natural Sciences teachers specifically for continuous assessment training. Teachers can then do justice to the marks obtained by learners. Thus, “Teachers must be able to use continuous assessment abundantly and logically both for learning and as learning. This recommends that most essential considering continuous assessment in the classroom as vital pedagogical tool i.e., one which teachers and learners alike can employ to check and guide their progress continuously in a constructive way” (Muskin, 2017, p. 46).

5.6. Study Limitations

This is a qualitative study; findings cannot be generalised. However, any one can use findings to improve the teaching of Natural Sciences using WhatsApp. According to (Emmennial V. Reddy¹, Pritika Reddy², Bibhya Sharma¹, Karuna Reddy¹ & Khan¹, 2023) there is a growing demand for learners to access their information in order to improve their learning experiences. The concept of teachers using online learning and adapting it to WhatsApp has made the process easier for both teachers and learners.

5.7. Conclusion

The purpose of this study was to explore The Use of WhatsApp in KwaZulu-Natal Primary schools giving Natural Sciences Teachers’ Experiences. Two research questions were asked, 1. What are Natural Sciences teachers’ experiences of using WhatsApp for teaching in KwaZulu-Natal primary schools? and 2. How do Natural Sciences teachers’ experience the use of WhatsApp for teaching in KwaZulu-Natal Primary Schools? The research questions were asked concomitantly with the research objectives, which are 1. To understand/explore Natural Sciences teachers’ experience of using WhatsApp for teaching in KwaZulu-Natal Primary Schools. 2. To find/explain lessons from Natural sciences teachers’ experiences of using WhatsApp for teaching and learning.

This chapter presents a summary of outcomes from literature, data analysis, and comparison with the Intermediate Phase Natural Sciences CAPS document specifically for Grade Six. The study further brings endorsements for all concepts from the data analysis. Findings were that if teachers reflect on their experiences of intended, implemented, and attained curriculum could

be achieved. This was apparent in the second phase of action in this study. Therefore, well informed and experienced teachers can overcome all hurdles in the KwaZulu-Natal circuit.

References

- Adler, J., Ball, D., Krainer, K., Lin, F.-L., & Novotna, J. (2005). Reflections on an emerging field: Researching mathematics teacher education. *Educational studies in mathematics*, 60(3), 359-381.
- Alexova, D. (2015). Solidarity tourism, Education and volunteering—socially responsible practices in bulgaria. *Innovation in Environmental Education: ICT and intergenerational learning*, 124.
- Allan, A., & Love, A. (2010). *Ethical practice in psychology: Reflections from the creators of the APS Code of Ethics*: John Wiley & Sons.
- Allman, M. J., Teki, S., Griffiths, T. D., & Meck, W. H. (2014). Properties of the internal clock: first-and second-order principles of subjective time. *Annual review of psychology*, 65, 743-771.
- Alsulami, N. M., & Taylor, P. (2012). Adapting transformative educational research for exploring mathematics education in/for Saudi Arabia.
- Amedeker, M. (2014). The Contributions of Continuous Assessment to the Improvement of Students' Learning of School Science Indigenist African Development and Related Issues (pp. 91-100): Springer.
- Anney, V. N. (2014). Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria. Anthony, Lesh, R., & Baek, J. (2014). *Handbook of design research methods in education: Innovations in science, technology, engineering, and mathematics learning and teaching*: Routledge.
- Anderson, C. (2010). Presenting and evaluating qualitative research. *American journal of pharmaceutical education*, 74(8).
- Anney, V. N. (2014). Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)*, 5(2), 272-281.
- Akker, & Thijs. (2009). Curriculum in development *Netherlands institute for curriculum development*, 25(3), 49-58.
-
- Akker, V. d., & Thijs, A. (2009). Curriculum in development. *Netherlands institute for curriculum development*, 25(3), 49-58.
- Abas, Z. W. (1995). Attitudes towards using computers among Malaysian teacher education students. *World Conference on Computers in Education VI*,
- Adams, N. E. (2015). Bloom's taxonomy of cognitive learning objectives. *Journal of the Medical Library Association: JMLA*, 103(3), 152.

- Akker, & Thijs. (2009). Curriculum in development *Netherlands institute for curriculum development*, 25(3), 49-58.
- Akker, V. d., & Thijs, A. (2009). Curriculum in development. *Netherlands institute for curriculum development*, 25(3), 49-58.
- Alben, L. (1996). Defining the criteria for effective interaction design. *Interactions*, 3(3), 11-15.
- Alben, L. (2011). Quality of Experience: Defining the Criteria for Effective Interaction Design, *Interactions. Massachusetts*, 3(1), 255-268.
- Amory. (2010). Education technology and hidden ideological contradictions. *Journal of Educational Technology & Society*, 13(1), 69.
- Amory. (2012). Tool-mediated authentic learning in an educational technology course: a designed-based innovation. *Interactive Learning Environments*, 2, 1-17.
- Araujo, M. C., Carneiro, P., Cruz-Aguayo, Y., & Schady, N. (2016). Teacher quality and learning outcomes in kindergarten. *The Quarterly Journal of Economics*, 131(3), 1415-1453.
- Archer, J., Norcini, J., Southgate, L., Heard, S., & Davies, H. (2008). mini-PAT (Peer Assessment Tool): a valid component of a national assessment programme in the UK? *Advances in Health Sciences Education*, 13(2), 181-192.
- Arnheim, N., Sobel, J., & Canfield, R. (1971). Immunochemical resemblance between human leukemia and hen egg-white lysozyme and their reduced carboxymethyl derivatives. *Journal of molecular biology*, 61(1), 237-250.
- Bertram, C., & Christiansen, I. (2014). Understanding research. *An introduction to reading research. Pretoria: Van Schaik Publishers.*
- Bitsch, V. (2005). Qualitative research: A grounded theory example and evaluation criteria. *Journal of agribusiness*, 23(345-2016-15096), 75-91.
- Brantlinger, A. M. (2007). Geometries of inequality: Teaching and researching critical mathematics in a low-income urban high school. Northwestern University.
- Bobbitt, F. (2013). Scientific method in curriculum-making Curriculum Studies Reader E2 (pp. 21-28): Routledge.
- Boehm, B., & Hansen, W. J. (2000). *Spiral development: Experience, principles, and refinements*. Retrieved from
- Burston, J. (2015). Twenty years of MALL project implementation: A meta-analysis of learning outcomes. *ReCALL*, 27(1), 4-20.
-
- Braslavsky, C. (2003). The Curriculum: Definition of the Concept of Curriculum. *Faculty of Philosophy and Literature Journal*, 3(1), 211-2119.
- Blanchard, J. (2009). *Teaching, learning and assessment*. London: McGraw-Hill Education (UK).
- Boehm, B., & Hansen, W. J. (2000). *Spiral development: Experience, principles, and refinements*. Retrieved from

- Bostock, S. (2000). Student peer assessment. *Learning Technology*, 5(1), 245-249.
- Bourrier, Y., Jambon, F., Garbay, C., & Luengo, V. (2016). *An Interaction Centred Approach to the teaching of Non-technical Skills in a Virtual Environment*. Laboratoire d'Informatique de Paris 6; Laboratoire d'Informatique de Grenoble, Paris.
- Bowen, H. R., & Fincher, C. (2018). *Goals: The intended outcomes of higher education Investment in learning*. London: Routledge.
- Brandl, K. (2005). Are you ready to “Moodle”. *Language Learning & Technology*, 9(2), 16-23.
- Battarbee, K. (2004). *Co-experience: understanding user experiences in interaction*. Aalto University.
- Baylor, A. L., & Ritchie, D. (2002). What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms? *Computers & Education*, 39(4), 395-414.
- Berkvens, Van den Akker, & Brugman. (2014). Addressing the quality challenge: Reflection on the post-2015 UNESCO EDUCATION AGENDA. *National Commission for UNESCO*, 5(1), 1-30.
- Berkvens, J., Van den Akker, J., & Brugman, M. (2014a). Addressing the quality challenge: Reflection on the post-2015 UNESCO EDUCATION AGENDA. *National Commission for UNESCO*, 5(1), 1-30.
- Berkvens, J., Van den Akker, J., & Brugman, M. (2014b). Addressing the quality challenge: Reflections on the Post---2015 UNESCO Education Agenda. *Netherlands National Commission for UNESCO*.
- Bernstein, B. (1999). Vertical and Horizontal_discourse. *British Journal of Sociology of Education*, 20(2), 157.
- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3), 347-364.
- Black, P., & Wiliam, D. (2003). ‘In praise of educational research’: Formative assessment. *British educational research journal*, 29(5), 623-637.
- Bloom, B. S. (1971). *Handbook on formative and summative evaluation of student learning*.
- Bostock, S. (2000). Student peer assessment. *Learning Technology*, 5(1), 245-249.
- Boud, D., Cohen, R., & Sampson, J. (2014). *Peer learning in higher education: Learning from and with each other*. Routledge.
- Bourrier, Y., Jambon, F., Garbay, C., & Luengo, V. (2016). *An Interaction Centred Approach to the teaching of Non-technical Skills in a Virtual Environment* [Laboratoire d'Informatique de Paris 6; Laboratoire d'Informatique de Grenoble]. Paris.
- Brady, K. P., Holcomb, L. B., & Smith, B. V. (2010). The use of alternative social networking sites in higher educational settings: A case study of the e-learning benefits of Ning in education. *Journal of Interactive Online Learning*, 9(2).
- Brandl, K. (2005). Are you ready to “Moodle”. *Language Learning & Technology*, 9(2), 16-23.
- Braslavsky, C. (2003). The Curriculum: Definition of the Concept of Curriculum. *Faculty of Philosophy and Litterature Journal*, 3(1), 211-2119.
- Brown. (2015). *Self and peer assessment. Paper presented at the Assessment & Grading Seminar Series*.
- Brown, & Knight. (2012). *Assessing learners in higher education*. Routledge.

- Brown, Rust, & Gibbs. (1994). *Strategies for diversifying assessment in higher education*. Oxford Centre for Staff Development.
- Brown, G. (2015). Self and peer assessment. Assessment & Grading Seminar Series,
- Bruffee, K. A. (1993). *Collaborative learning: Higher education, interdependence, and the authority of knowledge*. ERIC.
- Burston, J. (2015). Twenty years of MALL project implementation: A meta-analysis of learning outcomes. *ReCALL*, 27(1), 4-20.
- Bush, T., & Heystek, J. (2003). School governance in the new South Africa. *Compare: A Journal of Comparative and International Education*, 33(2), 127-138.
- Chiappetta, M. (2017). The Technostress: definition, symptoms, and risk prevention. *Senses and Sciences*, 4(1).
- Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*. routledge.
-
- Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (eight edition).
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.
- Creswell, J. W. (2014). *A concise introduction to mixed methods research*. SAGE publications.
- Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Sage.
- Clark, D. J., Crowe, J. A., Martin, J. L., Morgan, S. P., & Murphy, E. (2012). A user-centred approach to requirements elicitation in medical device development: a case study from an industry perspective. *Applied ergonomics*, 43(1), 184-190.
- Clark, & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*: John Wiley & Sons.
- Carrington, V., & Robinson, M. (2009). *Digital literacies: Social learning and classroom practices*. sage.
- Chai, C. S., Koh, J. H. L., Tsai, C.-C., & Tan, L. L. W. (2011). Modeling primary school pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) for meaningful learning with information and communication technology (ICT). *Computers & Education*, 57(1), 1184-1193.
- Clark, D. J., Crowe, J. A., Martin, J. L., Morgan, S. P., & Murphy, E. (2012). A user-centred approach to requirements elicitation in medical device development: a case study from an industry perspective. *Applied ergonomics*, 43(1), 184-190.
- Costello, P. J. (2013). *Thinking skills and early childhood education*. Routledge.
- Criticos, C., Long, L., Moletsane, R., & Mthiyane, N. (2002). *Getting practical about outcomes based teaching*. Oxford University Press.
- Criticos, C., Long, L., Moletsane, R., & Mthiyane, N. (2005). *Getting Practical: about Outcomes Based Teaching. A learning guide*. Oxford University press.
- Crosby, R. H., Joy. (2000). AMEE Guide No 20: The good teacher is more than a lecturer-the twelve roles of the teacher. *Medical teacher*, 22(4), 334-347.
- Davids, M. N. (2013). "'Can Foucault come to the rescue?'--From dogma to discourse: deconstructing the History of education for democratic education'. *TYesterday and Today*, 108-124.

- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8), 982-1003.
- del Mar Sánchez-Vera, M., & Prendes-Espinosa, M. P. (2015). Beyond objective testing and peer assessment: alternative ways of assessment in MOOCs. *International Journal of Educational Technology in Higher Education*, 12(1), 119-130.
- Dell'Era, C., & Landoni, P. (2014). Living Lab: A methodology between user-centred design and participatory design. *Creativity and Innovation Management*, 23(2), 137-154.
- DoE. (2008a). *Subject Assessment Guidelines ,Accounting Grade 10-12*. Pretoria: Government Printers
- DoE. (2011a). *Curriculum and Assessment Policy Statement Grades 10-12, Accounting*. Pretoria: Government Press
- DoE. (2011b). *Curriculum and assessment policy statement grades 10-12: Accounting*. Pretoria: Government Press
- DOE. (2012). Curriculum Assessment Policy Statement (CAT) [Department of Education Document]. 126. www.kzndoe.gov.za (Department of Education)
- Dougiamas, M., & Taylor, P. (2003). Moodle: Using learning communities to create an open source course management system.
- Dourish, P. (2004). *Where the action is: the foundations of embodied interaction*. MIT press.
- Druin, A., & Solomon, C. (1996). *Designing Multimedia Environments for Children: Computers, Creativity, and Kids*. ERIC.
- Duncan, N. (2012). Beyond testing: towards a theory of educational assessment. In. London: Taylor & Francis.
- Dyrli, O. E., & Kinnaman, D. E. (1996). Gaining the Online Edge. Part 2: Energizing the Classroom Curriculum through Telecommunications. *Technology & Learning*, 16(4), 65-70.
- Davies, R. S., Sprague, C. R., & New, C. (2008). Integrating technology into a science classroom. *DW Sunal, EL Wright und Sundberg C. (Hg.): The impact of the laboratory and technology on learning and teaching science K-16. Charlotte, NC: IAP Information Age Publishing*.
- Denzin, N. K., & Lincoln, Y. S. (2017). *The SAGE handbook of qualitative research*. 5: e uppl.
- Department of Basic Education. (2011). *Curriculum and Assessment Policy Statement. Business studies. Pretoria: Department of Basic Education*.
- Decker, F. (2002). *Fundamentals of Curriculum Passion and Professionalism*. New York: Routledge.
- Dewey. (1934). *Art as Experience*. New York: Perigree.
- Dewey, J. (1933). How we think: a restatement of the relation of reflective thinking to the educational Process. Lexington, MA: Heath.
- Dewey, J. (1933). How we think: A restatement of the relation of reflective thinking to the educational process. Lexington, MA: Heath, 35, 64.
- Dewey, J. (2013). *The school and society and the child and the curriculum*: University of Chicago Press.

- DoE. (2011). *Curriculum and Assessment Policy Statement Grades 4-6, Natural sciences and technology*. Pretoria: Government Press.
- DoE. (2012). *Curriculum and assessment policy statement grades 7-9: Natural Sciences*. Pretoria: Government Press.
- Eisner, E. W. (1969). *Teaching art to the young: A curriculum development project in art education*. Stanford University.
- Ellis, A. K. (2017). *Teaching, learning, and assessment together: Reflective assessments for elementary classrooms*. Routledge.
- Emmenuel V. Reddy¹ · Pritika Reddy² · Bibhya Sharma¹ · Karuna Reddy¹, & Khan¹, M. G. M. (2023). Readiness and Perception of Pacific Students to Mobile Phones for Higher Education. *Springer*(28), 1113-1132.
- Entwistle, N., & Ramsden, P. (2015). *Understanding student learning (Routledge revivals)*. Routledge.
- Eom, S. B., Wen, H. J., & Ashill, N. (2006). The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation. *Decision Sciences Journal of Innovative Education*, 4(2), 215-235.
- Ellis, A. K. (2017). *Teaching, learning, and assessment together: Reflective assessments for elementary classrooms*. New York: Routledge.
- Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *SAGE open*, 4(1), 2158244014522633.
- Emmenuel V. Reddy¹ · Pritika Reddy² · Bibhya Sharma¹ · Karuna Reddy¹ and M. G. M. Khan¹ (2023). "Readiness and Perception of Pacific Students to Mobile Phones for Higher Education." *Springer* (28): 1113-1132.
- Fenton, K. N., Cardarelli, M., Molloy, F., & Novick, W. M. (2019). Ethics in humanitarian efforts: when should resources be allocated to pediatric heart surgery? *Cardiology in the Young*, 29(1), 36-39.
- Fenton, K. N., Cardarelli, M., Molloy, F., & Novick, W. M. (2019). Ethics in humanitarian efforts: when should resources be allocated to pediatric heart surgery? *Cardiology in the Young*, 29(1), 36-39.
- Forlizzi, & Battarbee, K. (2004). *Understanding experience in interactive systems*. Paper presented at the Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques.
- Forlizzi, & Ford, S. (2000). The Building Blocks of Experience: An Early Framework for Interaction Designers. *Interactions*, 2(1), 419-423.
- Frailich, M., Kotzer, S., Elran, Y., & Scherz, Z. (2011). A mediated visual-based computerized environment for investigation-based learning about solubility. *The 4th knowledge cities world Summit Proceedings KCWS p*, 5(3), 105-111.

- Fallman, D. (2003). Design-oriented human-computer interaction. Proceedings of the SIGCHI conference on Human factors in computing systems, New York, NY, USA.
- Fischhoff, B., & Slovic, P. (1978). *A little learning... Confidence in multicue judgment tasks*. Decision Research.
- Forlizzi, & Battarbee, K. (2004). Understanding experience in interactive systems. Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques,
- Forlizzi, & Ford, S. (2000). The Building Blocks of Experience: An Early Framework for Interaction Designers. *Interactions*, 2(1), 419-423.
- Gill, M. J., Gill, D. J., & Roulet, T. J. (2018). Constructing trustworthy historical narratives: Criteria, principles and techniques. *British Journal of Management*, 29(1), 191-205.
- Gudanescu, N. (2010). Using modern technology for improving learning process at different educational levels. *Procedia-Social and Behavioral Sciences*, 2(2), 5641-5645.
- Graham (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, 57(3), 1953-1960.
- Greenwood, J. (1998). The role of reflection in single and double loop learning. *Journal of advanced nursing*, 27(5), 1048-1053.
- Gardner, J. N., & Gardner, J. (2012). *Assessment and learning*. Sage.
- Goodson, I. F. (2013). *School subjects and curriculum change*. Routledge.
- Goodwin-Jones, B. (2003). E-books and the Tablet PC. *Language Learning & Technology*, 7(1), 4-8.
- Govender, N., & Khoza, S. B. (2017). Technology in Education for Teachers. In i. L. Ramathan, L. L. Grange, & e. P. Higgs (Eds.), *Eduaction Studies for Initial Teacher Development*. Juta & Company (PTY) Limited.
- Gronlund, N. E. (1998). *Assessment of student achievement*. ERIC.
- Han, I., Shin, W. S., & Ko, Y. (2017). The effect of student teaching experience and teacher beliefs on pre-service teachers' self-efficacy and intention to use technology in teaching. *Teachers and Teaching*, 23(7), 829-842.
- Hatch, J. A. (2002). *Doing qualitative research in education settings*. Suny Press.
- Hoadley, U. & Jansen, J. (2013). *Curriculum: Organizing knowledge for the classroom* (3rd ed.). Cape Town: Oxford University Press.
- Hoadley, & Jansen. (2013). *Curriculum: Organizing knowledge for the classroom*. New York: Oxford University Press Southern Africa.
- Hoadley, & Jansen, J. (2013). *Curriculum: Organizing knowledge for the classroom* (3 ed). Cape Town: Oxford University Press Southern Africa.
- Harlen, W. (2007). *Assessment of learning*. Sage.
- Hartel, R., & Foegeding, E. (2004). Learning: Objectives, Competencies, or Outcomes? *Journal of Food Science Education*, 3(4), 69-70.

- Haßler, B., Major, L., & Hennessy, S. (2016). Tablet use in schools: A critical review of the evidence for learning outcomes. *Journal of Computer Assisted Learning*, 32(2), 139-156.
- Henderson, M., Selwyn, N., & Aston, R. (2017). What works and why? Student perceptions of 'useful' digital technology in university teaching and learning. *Studies in Higher Education*, 42(8), 1567-1579.
- Herring, M. C., Koehler, M. J., & Mishra, P. (2016). *Handbook of technological pedagogical content knowledge (TPACK) for educators*. Routledge.
- Hoadley, & Jansen. (2013). *Curriculum: Organizing knowledge for the classroom*. Oxford University Press Southern Africa.
- Hoadley, & Jansen, J. (2013). *Curriculum: Organizing knowledge for the classroom (3 ed)*. Oxford University Press Southern Africa.
- Hohr, H. (2013). The concepts of experience by John Dewey revisited: conceiving, feeling and "enlivening". *Studies in Philosophy and Education*, 32(1), 25-38.
- Hutchison, A., & Woodward, L. (2014). A planning cycle for integrating digital technology into literacy instruction. *The Reading Teacher*, 67(6), 455-464.
- Ingram, J. B. (2014). *Curriculum integration and lifelong education: A contribution to the improvement of school curricula* (Vol. 6). Elsevier.
- Ile, C. M., & Nwosu, N. A. (2019). Assessment of Subject Knowledge Pedagogical Competencies Demonstrated by Business Studies Teachers in Anambra State. *Nau Journal of Technology and Vocational Education*.2(1),74-82.
- Isulami, N. M., & Taylor, P. (2012). Adapting transformative educational research for exploring mathematics education in/for Saudi Arabia.
-
- Iqbal, M. Z., & Jumani, N. (2015). Professional reflection a cradle of student teacher's professional development. *Mediterranean Journal of Social Sciences*, 6(3 S1), 376.
- Johnson, & Lester, J. C. (2016). Face-to-face interaction with pedagogical agents, twenty years later. *International Journal of Artificial intelligence in education*, 26(1), 25-36.
- Johnson, Rickel, J. W., & Lester, J. C. (2000). Animated pedagogical agents: Face-to-face interaction in interactive learning environments. *International Journal of Artificial intelligence in education*, 11(1), 47-78.
- Johnson, & Van Wyk. (2016). *Approaches to teaching EMS: The teacher-centred approach*: Oxford University Press.
- Johnson., Rickel., & Lester. (2000). Animated pedagogical agents: Face-to-face interaction in interactive learning environments. *International Journal of Artificial intelligence in education*, 11(1), 47-78.
- Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of basic and clinical pharmacy*, 5(4), 87.

- Jita, T. (2018). Exploring pre-service teachers 'opportunities to learn to teach science with ICTs during teaching practices. *Journal of Education (University of KwaZulu-Natal)*, (71),73-90.
- James, M., & Pedder, D. (2006). Beyond method: Assessment and learning practices and values. *The Curriculum Journal*, 17(2), 109-138.
- Janaway, C. (1989). Self and world in Schopenhauer's philosophy.
- Kember, D. (1996). The intention to both memorise and understand: Another approach to learning? *Higher Education*, 31(3), 341-354.
- Kennedy. (2006). *Writing and using learning outcomes: a practical guide*. University College Cork.
- Kennedy, Hyland, & Ryan. (2009). Learning outcomes and competences. *Introducing Bologna Objectives and Tools*, 2.3-3.
- Kennedy, D., Hyland, A., & Ryan, N. (2009). Learning outcomes and competences. *Introducing Bologna Objectives and Tools*, 2.3-3.
- Khoza. (2011). Who promotes web-based teaching and learning in higher education? *Progressio*, 33(1), 155-170.
- Khoza. (2013a). Can they change from being digital immigrants to digital natives? *Progressio*, 35(1), 54-71.
- Khoza. (2015a). Using a curricular spider web to explore a research facilitator's and students' experiences: articles. *South African Journal of Higher Education*, 29(2), 122-143.
- Khoza, S. (2013). Awareness learning is a function of educational technology in e-learning. International Conference on e-Learning,
- Khoza, S. (2015a). Student teachers' reflections on their practices of the curriculum and assessment policy statement. *South African Journal of Higher Education*, 29(4), 179-197.
- Khoza, S. (2015b). Using a curricular spider web to explore a research facilitator's and students' experiences: articles. *South African Journal of Higher Education*, 29(2), 122-143.
- Khoza, S. (2016a). CAN EDUCATIONAL TECHNOLOGY BE DEFINED FROM SOUTH AFRICAN UNIVERSITY FACILITATORS' UNDERSTANDING...? *Empowering the 21st Century Learner*.
- Khoza, S. (2016b). Is teaching without understanding curriculum visions and goals a high risk? *South African Journal of Higher Education*, 30(5).
- Khoza, S. (2016c). Is teaching without understanding curriculum visions and goals a high risk? *South African Journal of Higher Education*, 30(5), 104-119.
- Killen, R. (2000). *Teaching Strategies for outcome-based Education* (1 ed.). Juta & Co.
- Killen, R. (2007). *Teaching strategies for outcomes-based education*. Juta and Company Ltd.
- Killen, R. (2012). *Teaching strategies for quality teaching and learning*. Juta and Company Ltd.
- König, J., & Kramer, C. (2016). Teacher professional knowledge and classroom management: On the relation of general pedagogical knowledge (GPK) and classroom management expertise (CME). *ZDM*, 48(1-2), 139-151.
- Kop, R., & Carroll, F. (2011). Cloud computing and creativity: Learning on a massive open online course. *European Journal of Open, Distance and E-learning*, 14(2).
- Killen, L. (1989). Reflecting on reflective teaching. *Journal of Teacher Education*, 40(2), 49–52.
- Killen, R. (2007). *Effective teaching strategies for OBE teaching*: Boston: Social science press.

- Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education*, 193(3), 13-19.
- Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary issues in technology and teacher education*, 9(1), 60-70.
- Koehler, M. J., & Mishra, P. (2006). What happens when teachers design educational technology? The development of Technological Pedagogical Content Knowledge. *J. Educational Computing Review*, 32 (2), 131-152.
- Khoza, S.B. (2012). Who helps an online facilitator to learn with students in a day? *Mevlana International Journal of Education*, 2(2), 75-84.
- Khoza, S.B. (2013a). Can they change from being digital immigrants to digital natives? *156 Progressio: South African Journal for Open and Distance Learning Practice*, 35(1), 51-68.
- Khoza, S.B. (2013b). Learning Outcomes as Understood by "Publishing Research" Facilitators at a South African University. *Mevlana International Journal of Education*, 3(2), 1-11.
- Khoza. (2011). Who promotes web-based teaching and learning in higher education? *Progressio*, 33(1), 155-170.
- Khoza. (2013a). Can they change from being digital immigrants to digital natives? *Progressio*, 35(1), 54-71.
- Khoza. (2015a). Using a curricular spider web to explore a research facilitator's and students' experiences: articles. *South African Journal of Higher Education*, 29(2), 122-143.
- Khoza. (2016). Can curriculum managers' reflections produce new strategies through Moodlei visions and resources? *South African Journal of Education*, 36(4), 1-9.
- Khoza, S. (2016). Is teaching without understanding curriculum visions and goals a high risk? *South African Journal of Higher Education*, 30(5), 104-119.
- Khoza. (2015a). Using a curricular spider web to explore a research facilitator's and students' experiences: articles. *South African Journal of Higher Education*, 29(2), 122-143.
- Khoza, S. B. (2016). Can curriculum managers' reflections produce new strategies through Moodle visions and resources? *South African Journal of Education*, 36(4), 1-9.
- Khoza, S. B. (2018). Can Teachers' Reflections on Digital and Curriculum Resources Generate Lessons? *Africa Education Review*, 15(4), 20-35.

- Korstjens, I., & Moser, A. (2018a). Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis. *European Journal of General Practice*, 24(1), 9-18.
- Korstjens, I., & Moser, A. (2018b). Series: practical guidance to qualitative research. Part 4: trustworthiness and publishing. *European Journal of General Practice*, 24(1), 120-124.
- Kelly, A.V. (2016). Developing Teacher Knowledge and Reflection Online Learning Networks for Pre-Service and Early Career Teachers (pp. 31-41): Springer.
- Liu, N.F., & Carless, D. (2006). Peer feedback: The learning element of peer assessment. *Educational research*, 11(3), 279-290.
- Loughran, J.J. (1996). Effective reflective practice in search of meaning in learning about teaching. *Journal of a teacher education*, 53(1), 33-43.
- Lewin, K. (1947). Frontiers in group dynamics: Concept, method and reality in social science; social equilibria and social change. *Human relations*, 1(1), 5-41.
- Li, Y. W. (2016). Transforming conventional teaching classroom to learner-centred teaching classroom using multimedia-mediated learning module. *International Journal of Information and Education Technology*, 6(2), 105.
- Lewis, W., Agarwal, R., & Sambamurthy, V. (2003). Sources of influence on beliefs about information technology use: An empirical study of knowledge workers. *MIS quarterly*, 657-678.
- Lewis, W., Agarwal, R., & Sambamurthy, V. (2003). Sources of influence on beliefs about information technology use: An empirical study of knowledge workers. *MIS quarterly*, 657-678.
- Lincoln, Y., & Guba, E. (1985). Thousand Oaks. *Naturalistic Inquiry*, 290-296.
- Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education*, 31(1), 30-43.
- Latham, G. P., & Locke, E. A. (2007). New developments in and directions for goal-setting research. *European Psychologist*, 12(4), 290-300.
- Linn, R. L. (1989). Current perspectives and future directions. *Educational measurement*, 3, 1-10.
- Liu. (2012). *Self-regulated Learning in an Online Learning Environment: A Design Research Study* University of Georgia].
- Locke, E. A., & Latham, G. P. (2006). New directions in goal-setting theory. *Current directions in psychological science*, 15(5), 265-268.
- Loewenberg Ball, D., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of teacher education*, 59(5), 389-407.
- Marsh, C. J., & Willis, G. (1995). *Curriculum: Alternative approaches, ongoing issues*. Merrill Englewood Cliffs, NJ.

- McDowell, L., & Mowl, G. (1996). Innovative assessment: its impact on students. *Improving student learning through assessment and evaluation*, 131-147.
- McNeil, J. D. (2014). *Contemporary curriculum: In thought and action*. John Wiley & Sons.
- Mento, A. J., Steel, R. P., & Karren, R. J. (2017). A meta-analytic study of the effects of goal setting on task performance: 1966–1984. *Organizational behavior and human decision processes*, 39(1), 52-83.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers college record*, 108(6), 1017.
- Moon, J. (2002). *The module and programme development handbook: A practical guide to linking levels, learning outcomes and assessment*. Kogan Page
- Mpungose, C. (2018). *Exploring Lecturers' Reflections on the Use of Moodle to Teach Physical Science Modules at a South African university* University of KwaZulu-Natal]. Durban.
- Mercado, N. L., Panganiban, J. M., & Ramos, M. I. (2019). Technology integration in teaching science using TPACK among pre-service science teachers of St. Bridget College, Batangas City, Philippines. Panganiban, Vivien and Myriene I. Ramos, Tricia, *Technology Integration in Teaching Science Using Tpack among Pre-Service Science Teachers of St. Bridget College, Batangas City, Philippines (March 30, 2019)*. Jeryll Nicko L. Mercado, Vivien Joy M. Panganiban, Tricia Myriene I. Ramos, 63-71.
- Martin, A., & Madigan, D. (2006). *Digital literacies for learning*: Facet Publishing.
- Mezirow, J. (1990). How critical reflection triggers transformative learning. *Fostering critical reflection in adulthood*, 1, 20.
- Mpungose, C.B. & Khoza, S.B. (2020). Postgraduate Students' Experiences on the use of Moodle and Canvas Learning Management System. *Technology, knowledge and learning*, (2022), 27:1-16. <https://doi.org/10.1007/s10758-020-09475-1>
- Neuendorf, K. A. (2016). *The content analysis guidebook*. Sage.
- Niess, M. L. (1992). Math: Winds of Change. *Computing Teacher*, 19(6), 32-35.
- Nkohla. (2016). Educators' Reflections on their Practices of Agricultural Sciences Curriculum and Assessment Policy Statement [journal]. *curriculum studies*, 174.
- Norcini, J. J. (2003). Peer assessment of competence. *Medical education*, 37(6), 539-543.
- O'Donnell, A. M., & O'Kelly, J. (1994). Learning from peers: Beyond the rhetoric of positive results. *Educational Psychology Review*, 6(4), 321-349.
- OECD. (2002). *Education at a Glance*. <https://stats.oecd.org/glossary/detail.asp?ID=5438>
- Oliva, P. F., & Gordon, W. (1988). *Developing the curriculum*. Scott, Foresman/Little, Brown College Division.
- Percival, F., & Elington, H. (1988). *A handbook of educational technology*. 2nd ed. Kogan Page.
- Perrenoud, P. (1991). Towards a pragmatic approach to formative evaluation. *Assessment of Pupils Achievement: Motivation and School Success*, 79-101.
- Phillipson, R. (1996). Linguistic imperialism: African perspectives. *ELT journal*, 50(2), 160-167.
- Pinar, W. F. (2012). *What is curriculum theory?* Routledge.
- Pinar, W. F. (2013). *International handbook of curriculum research*. Routledge.

- Padayachee, K. (2017). A snapshot survey of ICT integration in South African schools. *South African Computer Journal*, 29(2), 36-65.
- Polit, D. (2012). F. & Beck, C., T. (2012). *Nursing research: Generating and assessing evidence for nursing practice*, 9.
- Pedro, J.Y. (2005). Reflection in teacher education: exploring pre-service teachers' meanings of reflective practice, *Reflective: International and Multidisciplinary Perspectives*, 6(1), 49-66.
- Pinar, W. F. (2012). *What is curriculum theory?* New York: Routledge.
- Pinar, W. F. (2013). *International handbook of curriculum research*. London: Routledge.
- Ralph, T. W. (1949). *Basic principles of curriculum and instruction*. University of Chicago Press.
- Redelius, K., Quennerstedt, M., & Öhman, M. (2015). Communicating aims and learning goals in physical education: part of a subject for learning? *Sport, education and Society*, 20(5), 641-655.
- Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information systems research*, 19(4), 417-433.
- Redmond. (2017). *Reflection in action: Developing reflective practice in health and social services*: Routledge.
- Russell, Y. (2009). *New assessment methods in business studies in the FET phase* (Doctoral dissertation, University of South Africa).
- Richards, J. C., & Rodgers, T. S. (2014). *Approaches and methods in language teaching*: Cambridge university press.
- Richards, J. C., & Schmidt, R. W. (2013). *Longman dictionary of language teaching and applied linguistics*: Routledge.
- Reed, Y., Gultig, J., & Adendorff, M. (2012). Curriculum: organizing knowledge for the classroom. In: Cape Town: Oxford University Press.
- Reinholz, D. (2016). The assessment cycle: a model for learning through peer assessment. *Assessment & Evaluation in Higher Education*, 41(2), 301-315.
- Romiszowski, A. J. (2016). *Designing instructional systems: Decision making in course planning and curriculum design*. Routledge.
- Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional Science*, 18(2), 119-144.
- Sadler, D. R. (1998). Formative assessment: Revisiting the territory. *Assessment in education: principles, policy & practice*, 5(1), 77-84.
- Sanders, E. B. N. (2003). From user-centered to participatory design approaches. In *Design and the social sciences* (pp. 18-25). CRC Press.
- Sandvoll, R. (2014). Feeling good, but missing the mark. What happened to the assessment in peer assessment? *Journal of University Teaching & Learning Practice*, 11(1), 3.

- Shih, R.-C. (2011). Can Web 2.0 technology assist college students in learning English writing? Integrating Facebook and peer assessment with blended learning. *Australasian Journal of Educational Technology*, 27(5), 212-219.
- Shulamit, K., & Yossi, E. (2011). Development of E-Learning environments combining learning skills and science and technology content for junior high school. *Procedia-Social and Behavioral Sciences*, 11, 175-179.
- Stockall, N. S., Dennis, L., & Miller, M. (2012). Right from the start: Universal design for preschool. *Teaching Exceptional Children*, 45(1), 10-17.
- Suskie, L. (2018a). *Assessing student learning: A common sense guide* John Wiley & Sons.
- Suskie, L. (2018b). *Assessing student learning: A common sense guide*. John Wiley & Sons.
- Sanders, E. B. N. (2003). From user-centered to participatory design approaches *Design and the social sciences* (pp. 18-25). Frascara: CRC Press.
- Schon, D. A. (1983). *The reflective practitioner: how professionals think in action*. New York: BasicBooks.
- Schon, D. A. (1987). *Educating the reflective practitioner: towards a new design of teaching and learning in the professions*. San Francisco: CA, Jossey-Bass.
- Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard educational review*, 57(1), 1-23.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational researcher*, 15(2), 4-14.
- Sarantakos, S. (2005). Social Research. (3. Baskı).
- Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning*.
- Thorne, S. (2016). *Interpretive description: Qualitative research for applied practice*. Routledge. *transmissions*. London: Routledge and Kegan Paul.
- Thijs, A., & van den Akker, J. (2009a). *Curriculum in development*. New York: SLO. Netherlands institutes for Curriculum development.
- Thijs, A., & van den Akker, J. (2009b). Curriculum in development. *Enschede: Netherlands Institute for Curriculum Development.*, 6(1), 266-272.
- Thijs, A., & van den Akker, J. (2009a). Curriculum in development. *Enschede: Netherlands Institute for Curriculum Development.*, 6(1), 266-272.
- Thijs, A., & van den Akker, J. (2009b). *Curriculum in development*. SLO. Netherlands institutes for Curriculum development.
- Thijs, A., & Van den Akker, J. (2009c). Curriculum in development. *Netherlands Institute for Curriculum Development (SLO): Enschede, Netherlands*.
- Topping. (1998). Peer assessment between students in colleges and universities. *Review of educational research*, 68(3), 249-276.
- Topping. (2009). Peer assessment. *Theory into practice*, 48(1), 20-27.

- Tunks, M. (2010). Using Moodle in your classroom. *Education Today*, 3, 40.
- Tyler, R. W. (2013a). *Basic principles of curriculum and instruction*. University of Chicago press.
- Tyler, R. W. (2013b). Basic principles of curriculum and instruction. In *Curriculum Studies Reader E2* (pp. 60-68). Routledge.
- Ullah, I. (2014). COMPUTER AND STUDENTS MANAGEMENT. 12th International Conference,
- Ursavas, O. F., & Karal, H. (2009). Assessing Pre-Service Teachers' Computer Phobia Levels in Terms of Gender and Experience, Turkish Sample. *Online Submission*, 1(1), 71-75.
- Van den Akker, J., de Boer, W., Folmer, E., Kuiper, W., Letschert, J., Nieveen, N., & Thijs, A. (2009). *Curriculum in Development*. Enschede: Netherlands Institute for Curriculum Development.
- Van Manen, M. (1977) Linking ways of knowing with ways of being practical, *Curriculum Inquiry*, 6(1), 205–228.
- Van Manen, M. (2016). *Researching lived experience: Human science for an action sensitive pedagogy*: Routledge.
- Van den Akker, Branch, R. M., Gustafson, K., Nieveen, N., & Plomp, T. (2012). *Design approaches and tools in education and training*: Springer Science & Business Media.
- Van den Akker, De Boer, W., Folmer, E., Kuiper, W., Letschert, J., Nieveen, N., . . . Vaden-Goad, R. E. (2009). *Curriculum in development*. Enschede: Netherlands Institute for Curriculum Development.
- Van den Akker, & Thijs, A. (2009). Curriculum in development. *Netherlands institute for curriculum development*, 25(3), 49-58.
- Viberg, O., & Grönlund, Å. (2017). Understanding students' learning practices: challenges for design and integration of mobile technology into distance education. *Learning, Media and Technology*, 42(3), 357-377.
- Vyas, D., & van der Veer, G. C. (2005). *Experience as 'meaning': creating communicating and maintaining in real-spaces*. Paper presented at the Proceedings of the Tenth IFIP TC13 International Conference on Human-Computer Interaction.
- Valle, A., Cabanach, R. G., Núñez, J. C., González-Pienda, J., Rodríguez, S., & Piñeiro, I. (2003). Multiple goals, motivation and academic learning. *British Journal of Educational Psychology*, 73(1), 71-87.
- Van den Akker, Branch, R. M., Gustafson, K., Nieveen, N., & Plomp, T. (2012). *Design approaches and tools in education and training*. Springer Science & Business Media.

- Van den Akker, De Boer, W., Folmer, E., Kuiper, W., Letschert, J., Nieveen, N., Thijs, A., & Vaden-Goad, R. E. (2009). *Curriculum in development*. Netherlands Institute for Curriculum Development.
- Van den Akker, & Thijs, A. (2009). Curriculum in development. *Netherlands institute for curriculum development*, 25(3), 49-58.
- Van den Akker, J. (2004). Curriculum perspectives: An introduction. In *Curriculum landscapes and trends* (pp. 1-10). Springer.
- Visscher-Voerman, I., & Gustafson, K. L. (2004). Paradigms in the theory and practice of education and training design. *Educational Technology Research and Development*, 52(2), 69-89.
- Waage, J., Banerji, R., Campbell, O., Chirwa, E., Collender, G., Dieltiens, V., Dorward, A., Godfrey-Faussett, P., Hanvoravongchai, P., & Kingdon, G. (2010). The Millennium Development Goals: a cross-sectoral analysis and principles for goal setting after 2015: Lancet and London International Development Centre Commission. *The lancet*, 376(9745), 991-1023.
- Ward, P., Kim, I., Ko, B., & Li, W. (2015). Effects of improving teachers' content knowledge on teaching and student learning in physical education. *Research quarterly for exercise and sport*, 86(2), 130-139.
- Watson, D. M. (2001). Pedagogy before technology: Re-thinking the relationship between ICT and teaching. *Education and Information technologies*, 6(4), 251-266.
- Weil, S., McGuigan, N., & Kern, T. (2011). The usage of an online discussion forum for the facilitation of case-based learning in an intermediate accounting course: A New Zealand case. *Open Learning: The Journal of Open, Distance and e-Learning*, 26(3), 237-251.
- Wenzel, T. J. (2000). Defining Course Goals [Article]. *Analytical Chemistry*, 72(19), 659A. <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=3758730&site=ehost-live>
- Yin, R. (1984). case study research. Beverly Hills.
- Yin, R. (2003). K. (2003). Case study research: Design and methods.
- Zeichner, K., & Liston D. (1987). Teaching student teachers to reflect. *Harvard Educational Review*, 57(1), 23-48.
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Curriculum Studies, School of Education,
College of Humanities,
University of KwaZulu-Natal,
Edgewood Campus,

Dear Participant

Informed Consent Letter

My name is Presanthi Coopasamy. I am a master's student studying at the University of KwaZulu-Natal, Edgewood campus, South Africa. I am interested in Natural Science Teachers' Experiences of Using WhatsApp in Teaching in Primary School. I conduct this study to understand the learning platforms you used in the era of COVID-19.

Please note that:

- Your confidentiality is guaranteed as your inputs will not be attributed to you in person but reported only as a population member opinion.
- The interview may last for about 45 to 60 minutes, relevant documents will be analysed, and the reflective activity will be sent to you via e-mail.
- Any information given by you cannot be used against you, and the generated data will be used for purposes of this research only.
- There will be no limit on any benefit that you may receive as part of your participation in this research project.
- Data will be stored in secure storage and destroyed after 5 years.
- You have a choice to participate, not participate or stop participating in the research. You will not be penalized for taking such an action.
- You are free to withdraw from the research at any time without any negative or undesirable consequences to yourself.
- Real names of the participants will not be used, but symbols such as S1, S2, S3, S4, S5 etc. will be used to represent your full name.
- Your involvement is purely for academic purposes only, and there are no financial benefits involved.
- If you are willing to be interviewed, please indicate (by ticking as applicable) whether you are willing to allow the interview to be recorded by the following equipment:

	willing	Not willing
Questionnaire		
Zoom interview		
Google forms		

I can be contacted at:

Email: preshanthic@gmail.com

Cell: +27732614979

My supervisor is Dr. C.B Mpungose who is located at the University of KwaZulu-Natal
School of Education and Curriculum studies

Contact details: mpungosec@ukzn.ac.za Phone number +2731 260 3671

Discipline Co-ordinator is Dr. Ndumiso Daluxolo Ngidi,
Curriculum Studies, School of Education,
Edgewood College, University of KwaZulu-Natal
(Cell) (078) 774 1407, Email: NgidiN10@ukzn.ac.za

You may also contact the Research Office through:

HSSREC Research Office,

Tel: 031 260 4557 E-mail: HSSREC@ukzn.ac.za

Thank you for your contribution to this research.

Semi-Structured WhatsApp Interview Schedule

The Use of WhatsApp in KwaZulu – Natal Primary schools: Natural Sciences Teachers’ Experiences

Technology

Major Question	Question 1. What resources do you use in your teaching of Natural Sciences?
Sub Question	<p>What hardware resources do you use in teaching of Natural Sciences?</p> <p>What software resources do you integrate on your teaching?</p> <p>What informs your choice of modern technology resources in your teaching of Natural Sciences?</p> <p>When do you use modern technological resources in your workplace?</p>

Pedagogy

Major Question	Question 2. What are your pedagogical practices when integrating technological resources in Natural Sciences?
Sub Question	<p>What teaching approaches do you employ in your Natural Sciences pedagogical practices?</p> <p>What do you think constitute effective teaching in your classroom?</p> <p>Toward which goals do you use technological resources in your teaching?</p> <p>How do you assess your learners using technological resources? (Assessment)</p> <p>Where does teaching and learning enhanced by technological resources takes place? (environment)</p> <p>How do you perceive your role when using technological resources to teach NS?</p>

Content

Major Question	Question 3 What content are you teaching in Natural Sciences?
Sub Question	What is the subject content do you teach in Natural Sciences?

Annexure C Online reflective activity

Full name: _____

This Reflective Activity is for Exploration of Natural Sciences Teachers Experiences on the Integration of Educational Technological Resources at KwaZulu – Natal, Durban, Malvern District. Provide your experiences by following the (TPACK) framework main concept (Technology, Pedagogy and Content) as follows.

Technology

1. What hardware resources do you use in teaching of Natural Sciences?

2. What software resources do you integrate on your teaching of Natural Sciences?

3. What informs your choice of modern technology resources in your teaching of Natural Sciences?

4. When do your modern technological resources in your workplace (School)?

Pedagogy

5. What teaching approaches do you employ in your Natural Sciences pedagogical practices?

6. What do you think constitute effective teaching in your classroom?

7. Toward which goals do you use technological resources in your teaching?

8. How do you assess your learners using technological resources? (Assessment)

9. Where does teaching and learning enhanced by technological resources takes place?
(environment)

10. How do you perceive your role when using technological resources to teach NS?
(teachers' role)

Content

11. What is the subject content do you teach in Natural Sciences?

Question	What resources do you use in your teaching of Natural Sciences?
-----------------	--

Pedagogy

Question	What are your pedagogical practices when integrating technological resources in Natural Sciences?
-----------------	--

Content

Question	What content are you teaching in Natural Sciences?
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22 May 2023

Presantheni Coopasamy (209514198)
School Of Education
Edgewood Campus

Dear P Coopasamy,

Protocol reference number: HSSREC/00004877/2022

Project title: Natural Science teachers' experiences of using WhatsApp in teaching in primary school

Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 11 October 2022 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 22 May 2024.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Health Research Ethics Council (REC-040414-040).

Yours sincerely,



Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: +27 (0)31 260 8350/4557/3587 Email: hssrec@ukzn.ac.za Website: <http://research.ukzn.ac.za/Research-Ethics>

Founding Campuses: ■ Edgewood ■ Howard College ■ Medical School ■ Pietermaritzburg ■ Westville

INSPIRING GREATNESS

1/1



KWAZULU-NATAL PROVINCE

EDUCATION
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OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201
Tel: 033 392 1051

Email: buyi.ntuli@kzndoe.gov.za

Enquiries: Buyi Ntuli

Ref.:2/4/8/7235

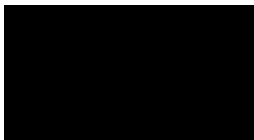
Miss Presnathi Coopasamy
17 Geisha Place
Bayview
CHATSWORTH
4092

Dear Miss Coopasamy

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **“THE USE OF WHATSAP IN KWAZULU-NATAL PRIMARY SCHOOLS: NATURAL SCIENCES TEACHERS’ EXPERIENCES”**, in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from **28th January 2022 to 31st December 2024**.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.



Dr M.J.B. Mthembu
Acting Head of Department: Education
Date: 28th January 2021

GROWING KWAZULU-NATAL TOGETHER

1/1



Lydia Weight
NTSD English Specialist
SACE No: 11135129

E-mail: lydiaweight@gmail.com

Pinpoint Proofreading Services

40 Ridge Rd

Kloof

Durban

3610

21 October 2023

To whom it may concern

This is to certify that I, Lydia Weight, have proofread the document titled: Natural sciences teachers' experiences of using WhatsApp in teaching in primary schools of KwaZulu-Natal, by Preshanthi Coopasamy. I have made all the necessary corrections. The document is therefore ready for presentation to the destined authority.

This is to certify that I, Lydia Weight, have proofread the document titled: Natural sciences teachers' experiences of using WhatsApp in teaching in primary schools of KwaZulu-Natal, by Preshanthi Coopasamy. I have made all the necessary corrections. The document is therefore ready for presentation to the destined authority.

Yours faithfully

A large black rectangular box redacting the signature of Lydia Weight.

L. Weight

Dictions: On Accessibility: Unavailable



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Natural Science Teachers' Experiences of Using WhatsApp in Teaching in Primary School

by

Name: Presanathi Coopasamy

Student Number: 209514198

Supervisor: Dr Cedric Bheki Mpungose

2023

This is submitted in fulfillment of the requirements for a master's degree in Education and Curriculum Studies

2023

University of KwaZulu-Natal

DECLARATION

I, Presanathi Coopasamy declare that:

M.Ed thesis

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Data Generation Instruments E1

Semi-Structured WhatsApp Interview Schedule

The Use of WhatsApp in Teaching Natural Sciences in Primary Schools: Teachers' Experiences

Technology

Major Question	Question 1. What resources do you use in your teaching of Natural Sciences? I use YouTube videos and worksheets
Sub Question	What hardware resources do you use in teaching of Natural Sciences? I use my smart board and projector as well as my smart phone What software resources do you integrate on your teaching? Microsoft teams, whatsApp How do you use technological resources in teaching of Natural Sciences? (ideological ware) I use the videos on YouTube for learners to better understand concepts

Pedagogy

Major Question	Question 2. What are your pedagogical practices when integrating technological resources in Natural Sciences? The method normally taken is I integrate the technological resources in the beginning of the lesson to excite learners and use at the end as a reward
Sub Question	What teaching approaches do you employ in your Natural Sciences pedagogical practices? (Teaching methods) I like to use a blended style of teaching Toward which goals do you use technological resources in your teaching? How do you assess your learners using technological resources? (Assessment) I assess using observation and questioning

	<p>Where does teaching and learning enhanced by technological resources takes place? (environment)</p> <p>Usually within the classroom as the learners are not yet prepared to be on a computer themselves</p> <p>How do you perceive your role when using technological resources to teach NS? (Role)</p> <p>My role is a facilitator and instructor as well as a role model</p>
--	---

Content

Major Question	Question 3 What content are you teaching in Natural Sciences?
Sub Question	<p>What is the subject content do you teach in Natural Sciences?</p> <p>Life skills content in the CAPS document</p>

Data Generation Instruments E2

Semi-Structured WhatsApp Interview Schedule

The Use of WhatsApp in Teaching Natural Sciences in Primary Schools: Teachers' Experiences

Technology

Major Question	Question 1. What resources do you use in your teaching of Natural Sciences?
	Answer – A range of resources can be used when teaching natural science. Resources such as physical resources are used which includes newspapers, books, worksheets and magazines. We not only use physical resources we also can make use of digital resources or technological resources which may include youtube videos, google or even social media such as educational pages. We also include interactive aids of learning such as excursions to places which are natural science related and would be beneficial to learners. Places like museums, laboratories and nature reserves. The above resources can be used when teaching natural science.
Sub Question	<p>What hardware resources do you use in teaching of Natural Sciences?</p> <p>What software resources do you integrate on your teaching?</p> <p>How do you use technological resources in teaching of Natural Sciences? (ideological ware)</p>
	<p>Answer – Hardware based resources which may be easier access includes resources such as books, magazines, newspapers and worksheets. We can also integrate technology such as projectors and smart devices.</p> <ul style="list-style-type: none"> - Software based resources which are digital media, includes youtube, google and even social media which has information on natural science that can be beneficial to the learners. - Lastly technological resources in relation to ideological ware, being in a LSEN (learners with special educational needs) based school, incorporating

	<p>a variety of teaching methodologies is vital to allow the child to absorb the information in a manner which is best suited to their specific learning needs. For example, an LSEN learner may not be comfortable to be learning in the classroom for a long period of time, therefore exposing them to natural science via outdoor activities can be more beneficial.</p>
--	--

Pedagogy

Major Question	Question 2. What are your pedagogical practices when integrating technological resources in Natural Sciences?
	Answer – I would look at what is easy access for most of our learners. Resources such as smart devices which includes smart phones and laptops as well as projectors may not be easy access for learners from unstable backgrounds. Also I would select and adapt content from the CAPS curriculum that would be best suited according to the learners levels.
Sub Question	<p>What teaching approaches do you employ in your Natural Sciences pedagogical practices? (Teaching methods)</p> <p>Toward which goals do you use technological resources in your teaching?</p> <p>How do you assess your learners using technological resources? (Assessment)</p> <p>Where does teaching and learning enhanced by technological resources takes place? (environment)</p> <p>How do you perceive your role when using technological resources to teach NS? (Role)</p>
	<p>Answer – With LSEN schools, we prefer hands on and visual based learning teaching approaches. The lesson will start with discussing learners prior knowledge which helps to unfold the new content making it easier for learners to the new content. Discussions in class with learners are very important as it allows for learners opinions and also to see if learners understand the work.</p> <p>- I utilize technology to simplify the content to the learners, as some learners understand best through visual aids, also learners enjoy visual aids more and do not find it boring giving them a better understanding as they will learn more a, this can be through the usage of a smartphone, smart board, laptop and</p>

	<p>projector.</p> <ul style="list-style-type: none"> - There educational programs available online which helps and monitor the learners as well as the work progress. -Via smart devices such as smartphones and laptop as well as projectors. - I would perceive my role as been a facilitator in the teaching-learning process in an LSEN school. LSEN learners learn best through visual aids, hands-on experience, work been put into practice. My role is mainly to facilitate these processes which ensures tat learners do understand the content as much as possible.
--	--

Content

Major Question	Question 3 What content are you teaching in Natural Sciences?
	Answer – The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum. The D-CAPS curriculum is an adapted version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.
Sub Question	<p>What is the subject content do you teach in Natural Sciences?</p> <p>Answer -The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum. The D-CAPS curriculum is an adapted version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.</p>

Online Reflective Activity

Full name:

This Reflective Activity is for Exploration of Natural Sciences Teachers Experiences on the Integration of Educational Technological Resources at KwaZulu – Natal, Durban, Malvern District. Provide your experiences by following the (TPACK) framework main concept (Technology, Pedagogy and Content) as follows.

Technology

1. What hardware resources do you use in teaching of Natural Sciences?

Hardware based resources which may be easier access includes resources such as books, magazines, newspapers and worksheets. We can also integrate technology such as projectors and smart devices.

2. What software resources do you integrate on your teaching of Natural Sciences?

Software based resources which are digital media, includes youtube, google and even social media which has information on natural science that can be beneficial to the learners. Programs on natural science can also be beneficial to learners which will help them. .

3. What informs your choice of modern technology resources in your teaching of Natural Sciences? (rational)

LSEN learners may not necessarily be able to learn academic concepts in a traditional way such as learning in a class. However they are taught and adapted at being able to successfully utilize technology, in their day to day living. Therefore I implement a variety of digital resources within my teaching, such as usage of a smartphone, laptop and projector.

4. How do the modern technological resources in your workplace (School) such as WhatsApp, help with the teaching and sharing of information?

Whatsapp has become such an important part of teaching and learning, as us educators can share and receive documents or resources instantly. This results in an effective teaching way which is beneficial to us as well as to the learners as because we can implement the best practices onto our learners..

Pedagogy

5. What teaching approaches do you employ in your Natural Sciences pedagogical practices?

With LSEN schools, we prefer hands on and visual based learning teaching approaches. The lesson will start with discussing learners prior knowledge which helps to unfold the new content making it easier for learners to the new content. Discussions in class with learners are very important as it allows for learners opinions and also to see if learners understand the work.

6. What do you think constitute effective teaching in your classroom? (Location)

Educators been able to understand and relate the situation to the personal interest of learners. Digital resources would be beneficial to teaching and learning to learners which is important as they are introduced to multiple forms of subject matter. Many learners have different styles of learning and absorbing the work. Digital media within the classroom such as smart boards, laptops and projectors greatly increase the exposure of subject matter to the learner.

7. Toward which goals do you use technological resources in your teaching

I utilize technology to simplify the content to the learners, as some learners understand best through visual aids, also learners enjoy visual aids more and do not find it boring giving them a better understanding as they will learn more a, this can be through the usage of a smartphone, smart board, laptop and projector.

8. How do you assess your learners using technological resources? (Assessment)

There educational programs available online which helps and monitor the learners as well as the work progress. The programs available online have assessments which also helps learners.

9. Where does teaching and learning enhanced by technological resources takes place?
(environment)

During classroom time, with the use of smartphone, laptop or projector.

10. How do you perceive your role when using technological resources to teach NS?
(teachers' role)

I would perceive my role as been a facilitator in the teaching-learning process in an LSEN school. LSEN learners learn best through visual aids, hands-on experience, work been put into practice. My role is mainly to facilitate these processes which ensures tat learners do understand the content as much as possible.

Content

11. What is the subject content do you teach in Natural Sciences?

The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum. The D-CAPS curriculum is an adapted version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.

Zoom Group Discussion Interview

Technology

Question	What resources do you use in your teaching of Natural Sciences?
	Answer - A range of resources can be used when teaching natural science.

	<p>Resources such as physical resources are used which includes newspapers, books, worksheets and magazines. We not only use physical resources we also can make use of digital resources or technological resources which may include youtube videos, google or even social media such as educational pages. We also include interactive aids of learning such as excursions to places which are natural science related and would be beneficial to learners. Places like museums, laboratories and nature reserves. The above resources can be used when teaching natural science.</p>
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Pedagogy

<p>Question</p>	<p>What are your pedagogical practices when integrating technological resources in Natural Sciences?</p> <p>Answer - I would look at what is easy access for most of our learners. Resources such as smart devices which includes smart phones and laptops as well as projectors may not be easy access for learners from unstable backgrounds. Also I would select and adapt content from the CAPS curriculum that would be best suited according to the learners levels.</p>
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Content

<p>Question</p>	<p>What content are you teaching in Natural Sciences?</p> <p>Answer - The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum. The D-CAPS curriculum is an adapted version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.</p>
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Data Generation Instruments E3

Semi-Structured WhatsApp Interview Schedule

The Use of WhatsApp in Teaching Natural Sciences in Primary Schools: Teachers' Experiences

Technology

Major Question	Question 1. What resources do you use in your teaching of Natural Sciences?
	Answer – A multitude of resources are utilized in the teaching of natural sciences such as physical sources, these include materials that are easily available to most students, for example newspapers, magazines and books. We can also include digital sources such as the internet which houses a vast array of natural science content, as well as youtube, for learners that retain information through visual stimulation. Lastly we can look at interactive sources of learning, via excursions to natural science museums, laboratories specializing in natural science based research, nature reserves, various conservatories focusing on either flora or fauna based research and zoos.
Sub Question	What hardware resources do you use in teaching of Natural Sciences? What software resources do you integrate on your teaching? How do you use technological resources in teaching of Natural Sciences? (ideological ware)
	Answer – In regards to hardware based resources, there are a variety of easily accessible resources such as books, magazines and newspapers. Also we can incorporate technology into the classroom via the usage of laptops, projectors and smartphones. Software based resources can be more focused towards digital media, this may include the internet, youtube clips and various educational computer programs which will contain much information on natural science. Lastly technological resources in relation to

	<p>ideological ware, being in a LSEN (learners with special educational needs) based school, incorporating a variety of teaching methodologies is vital to allow the child to absorb the information in a manner which is best suited to their specific learning needs. For example, an LSEN learner may not be comfortable to be outdoors for long periods of time, therefore exposing them to natural science via technological means such as youtube clips displayed on a projector may be more beneficial.</p>
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Pedagogy

Major Question	Question 2. What are your pedagogical practices when integrating technological resources in Natural Sciences?
	Answer - I prefer to look at what is the most easily accessible form of media available to most of our learners, this is the usage of basic smartphones, as a laptop and projector is not easily accessible to learners from indigent socio-economic backgrounds. Also I would select and adapt content from the curriculum that would be best suited for the learners level/ ability.
Sub Question	<p>What teaching approaches do you employ in your Natural Sciences pedagogical practices? (Teaching methods)</p> <p>Toward which goals do you use technological resources in your teaching?</p> <p>How do you assess your learners using technological resources? (Assessment)</p> <p>Where does teaching and learning enhanced by technological resources takes place? (environment)</p> <p>How do you perceive your role when using technological resources to teach NS? (Role)</p>
	<p>Answer – Specifically within LSEN schools, we prefer hands on and visual based learning. We would start of a majority of lessons with the learners prior knowledge and use that as scaffolding to ease learners into new content. Class discussion play a major role as well, as it allows learners to voice their opinions on certain concepts and thus they are able to absorb the information more easily, rather than being a passive learners merely observing the lesson.</p>

- There are many educational programs readily available on google and these have built in assessments which help to monitor and self adjust as the learner progress through the content.

- Most of the time it takes place in the classroom, via a smartphone, laptop or projector.

- In teaching within an LSEN school, the best teaching practice to implement is to be a facilitator in the teaching-learning process. LSEN learners learn best through visual stimulation, hands-on experience, and trial and error based practices. My role is mainly to facilitate these processes to ensure that the learners grasp concepts to the best of their abilities

Content

Major Question	Question 3 What content are you teaching in Natural Sciences?
	Answer – The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum, this is a version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.
Sub Question	<p>What is the subject content do you teach in Natural Sciences?</p> <p>Answer - The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum, this is a version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.</p>

Online Reflective Activity

Full name: _____

This Reflective Activity is for Exploration of Natural Sciences Teachers Experiences on the Integration of Educational Technological Resources at KwaZulu – Natal, Durban, Malvern District. Provide your experiences by following the (TPACK) framework main concept (Technology, Pedagogy and Content) as follows.

Technology

1. What hardware resources do you use in teaching of Natural Sciences?

In regards to hardware based resources, there are a variety of easily accessible resources such as books, magazines and newspapers. Also we can incorporate technology into the classroom via the usage of laptops, projectors and smartphones.

12. What software resources do you integrate on your teaching of Natural Sciences?

Software based resources can be more focused towards digital media, this may include the internet, youtube clips and various educational computer programs which will contain much information on natural science.

13. What informs your choice of modern technology resources in your teaching of Natural Sciences? (rational)

LSEN learners may not necessarily be able to learn academic concepts in a traditional sense, however they are adapt at being able to successfully utilize technology, in their day to day living. Therefore I implement a variety of digital resources within my teaching, such as usage of a smartphone, laptop and projector.

14. How do the modern technological resources in your workplace (School) such as WhatsApp, help with the teaching and sharing of information?

Whatsapp has become such an integral part of teaching and learning, as we are able to instantly share various resource material with teacher across the boards, this leads to more effective teaching as we are able to implement the best teaching practices onto our learners.

Pedagogy

15. What teaching approaches do you employ in your Natural Sciences pedagogical practices?

Specifically within LSEN schools, we prefer hands on and visual based learning. We would start of a majority of lessons with the learners prior knowledge and use that as scaffolding to ease learners into new content. Class discussion play a major role as well, as it allows learners to voice their opinions on certain concepts and thus they are able to absorb the information more easily, rather than being a passive learners merely observing the lesson.

16. What do you think constitute effective teaching in your classroom? (Location)

What would constitute effective teaching within the classroom is if the educator is able to relate the subject matter to the personal interest of the learners, this will prompt to the learner to retain the information more effectively. Also being able to implement digital resources would increase the effectiveness of teaching and learning, as you are exposing the learner to multiple forms of the related subject matter, rather than a single form of it. As some learners have different styles of learning and retaining information. Also digital media within the classroom such as smart boards, laptops and projectors greatly increase the exposure of subject matter to the learner.

17. Toward which goals do you use technological resources in your teaching

I utilize technology to better convey the subject matter to the learners, as some learners understand best through visual stimulation, also to get all learners accustomed to various digital forms of media, this can be through the usage of a smartphone, smart board, laptop and projector.

18. How do you assess your learners using technological resources? (Assessment)

There are many educational programs readily available on google and these have built in assessments which help to monitor and self adjust as the learner progress through the content.

19. Where does teaching and learning enhanced by technological resources takes place?
(environment)

Most of the time it takes place in the classroom, via a smartphone, laptop or projector.

20. How do you perceive your role when using technological resources to teach NS?
(teachers' role)

In teaching within an LSEN school, the best teaching practice to implement is to be a facilitator in the teaching-learning process. LSEN learners learn best through visual stimulation, hands-on experience, and trial and error based practices. My role is mainly to facilitate these processes to ensure that the learners grasp concepts to the best of their abilities

Content

21. What is the subject content do you teach in Natural Sciences?

The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum, this is a version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.

Zoom Group Discussion Interview

Technology

Question	What resources do you use in your teaching of Natural Sciences?
	Answer - A multitude of resources are utilized in the teaching of natural

	<p>sciences such as physical sources, these include materials that are easily available to most students, for example newspapers, magazines and books. We can also include digital sources such as the internet which houses a vast array of natural science content, as well as youtube, for learners that retain information through visual stimulation. Lastly we can look at interactive sources of learning, via excursions to natural science museums, laboratories specializing in natural science based research, nature reserves, various conservatories focusing on either flora or fauna based research and zoos.</p>
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Pedagogy

<p>Question</p>	<p>What are your pedagogical practices when integrating technological resources in Natural Sciences?</p> <p>Answer - I prefer to look at what is the most easily accessible form of media available to most of our learners, this is the usage of basic smartphones, as a laptop and projector is not easily accessible to learners from indigent socio-economic backgrounds. Also I would select and adapt content from the curriculum that would be best suited for the learners level/ ability.</p>
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Content

<p>Question</p>	<p>What content are you teaching in Natural Sciences?</p> <p>Answer - The content taught for Natural Science is prescribed from the CAPS curriculum, primarily the D-CAPS curriculum, this is a version of the normal curriculum that has been altered to accommodate the unique capabilities and learning styles of the LSEN learner.</p>
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E4

Data Generation Instruments Semi-Structured WhatsApp Interview Schedule The Use of WhatsApp in Teaching Natural Sciences in Primary Schools: Teachers' Experiences Technology

Major Question

Question 1. What resources do you use in your teaching of Natural Sciences? Worksheets, Microsoft programs, Internet, Interactive white board, laptop, Smart phones Sub Question What hardware resources do you use in teaching of Natural Sciences? • Smart Phone, laptop, interactive white board.

What software resources do you integrate on your teaching? • Microsoft programs How do you use technological resources in teaching of Natural Sciences? (ideological ware) • Apps from google Pedagogy

Major Question

Question 2. What are your pedagogical practices when integrating technological resources in Natural Sciences? Digital technology- which is user friendly and easy for my learners to use. Sub Question What teaching approaches do you employ in your Natural Sciences pedagogical practices? (Teaching methods) • Examine dimensions of teaching that enable effective learning about the nature of science. • Develop strategies for enquiry based science education Toward which goals do you use technological resources in your teaching? • Improve active learning • Supports Learning-Many students learn best when they have access to technology. • Provides A More Engaged Learning Environment How do you assess your learners using technological resources? (Assessment) • I assess my learners by using Microsoft programs. Example: PowerPoint presentations to demonstrate what they have learnt. • Digital camera to record the growth. Where does teaching and learning enhanced by technological resources takes place? (environment) Computer Room. Can be used in virtual, hybrid, or traditional learning environments. How do you perceive your role when using technological resources to teach NS? (Role) • To receive Active Participants in the learning process. • Provides provide learners with more tools to Support learner. Content Major Question Question 3 What content are you teaching in Natural Sciences? All content taught that is prescribed in the CAPS Curriculum.

Sub Question What is the subject content do you teach in Natural Sciences? All content taught that is prescribed in the CAPS Curriculum. Online Reflective Activity Full name:

This Reflective Activity is for Exploration of Natural Sciences Teachers Experiences on the Integration of Educational Technological Resources at KwaZulu – Natal, Durban, Malvern District. Provide your experiences by following the (TPACK) framework main concept (Technology, Pedagogy and Content) as follows. Technology

1. What hardware resources do you use in teaching of Natural Sciences? • radio programs • multimedia • digital learning resources including video, audio, text, animations and images
2. What software resources do you integrate on your teaching of Natural Sciences? • Microsoft programs • Internet- can be used either as a reference source or as a means of communication. It can provide a wealth of resources for learning and teaching.
3. What informs your choice of modern technology resources in your teaching of Natural Sciences? (rational) • Educational technology tools such as computers, data collection and analysis software, digital microscopes, hypermedia/multimedia, and interactive white boards can help students actively engage.
4. How do the modern technological resources in your workplace (School) such as WhatsApp, help with the teaching and sharing of information? • Stimulates a dynamic learning environment. Discuss ideas, share files, and work together on assignments. This is particularly useful for students who are unable to meet in person due to distance or scheduling conflicts. It allows for seamless collaboration and enhances teamwork, regardless of physical location. • Facilitator's availability and Learning anytime anywhere. Encourages real-time communication between teachers and students, and teachers and parents. Pedagogy
5. What teaching approaches do you employ in your Natural Sciences pedagogical practices? • The constructivist approach, the collaborative approach, the reflective approach, the integrative approach and the inquiry-based approach.
6. What do you think constitute effective teaching in your classroom? (Location) • Being prepared, set clear and fair expectations, having a positive attitude, being patient with your learners, and having on going assessments with teaching on a regular basis. You as a teacher being able to adjust your teaching strategies to fit both the learners and the material, recognizing that different learners learn in different ways.

7. Toward which goals do you use technological resources in your teaching • Improve active learning • Supports Learning-Many students learn best when they have access to technology. • Provides A More Engaged Learning Environment
8. How do you assess your learners using technological resources? (Assessment) • Quizizz is used in class as an engaging way to assess students and then use the information to focus on areas which need review. • PowerPoint presentations
9. Where does teaching and learning enhanced by technological resources takes place? (environment) • Can be used in virtual, hybrid, or traditional learning environments.
10. How do you perceive your role when using technological resources to teach NS? (teachers' role) • To receive Active Participants in the learning process. • Provides provide learners with more tools to Support learner. Content
11. What is the subject content do you teach in Natural Sciences? • All content taught that is prescribed in the CAPS Curriculum. Zoom Group Discussion Interview Technology Question What resources do you use in your teaching of Natural Sciences? Worksheets, Microsoft programs, Internet, Interactive white board, laptop, Smart phones Pedagogy Question What are your pedagogical practices when integrating technological resources in Natural Sciences? Examine dimensions of teaching that enable effective learning about the nature of science. Develop strategies for enquiry based science education. Content Question What content are you teaching in Natural Sciences? All content taught that is prescribed in the CAPS Curriculum

Online Reflective Activity

Full name:

This Reflective Activity is for Exploration of Natural Sciences Teachers Experiences on the Integration of Educational Technological Resources at KwaZulu – Natal, Durban, Malvern District. Provide your experiences by following the (TPACK) framework main concept (Technology, Pedagogy and Content) as follows.

Technology

1. What hardware resources do you use in teaching of Natural Sciences?

I am currently using laptop, phone, projector and smart board to teach.

2. What software resources do you integrate on your teaching of Natural Sciences?

I use Microsoft, Google. All information has been made learner friendly and is from a trusted website

3. What informs your choice of modern technology resources in your teaching of Natural Sciences? (rational)

Our learners learn better with visual stimulation and a variety of resources. It also makes it easy when when show the learners what we are trying to teach them via WhatsApp because they have easy access and their parents can help them

4. How do the modern technological resources in your workplace (School) such as WhatsApp, help with the teaching and sharing of information?

I am able to communicate easily with my learners' parents as well as passing on of information

Pedagogy

5. What teaching approaches do you employ in your Natural Sciences pedagogical practices?

I first act on prior knowledge and excite learners. Then moving on to learning of new information and main activities. Finally, I will recap all information learnt in a fun way.

What do you think constitute effective teaching in your classroom? (Location)

The use of technological resources. The Use of a variety of methods of teaching. Toward which goals do you use technological resources in your teaching use the tech resources for learning of prior or new knowledge.

6. How do you assess your learners using technological resources? (Assessment)

I assess the learners by observation as well as by asking questions. I also use their practical lessons to assess them. So I show them what they need to do and if they can copy or follow me they get marked accordingly.

7. Where does teaching and learning enhanced by technological resources takes place? (environment)

It takes place mainly inside my classroom. I then share the information via WhatsApp with parents and learners so that they can refer to the information.

8. How do you perceive your role when using technological resources to teach NS? (teachers' role)

my role is a facilitator and instructor as well as a role model.

Content

9. What is the subject content do you teach in Natural Sciences?

life skills highlighted in the CAPS document. Currently we are teaching them about energy and change that they get from their food.

Zoom Group Discussion Interview

Technology

Question	What resources do you use in your teaching of Natural Sciences? I use charts, pictures, books, videos and worksheets
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Pedagogy

Question	What are your pedagogical practices when integrating technological resources in Natural Sciences? I use technology in the beginning of the lesson to excite the learners then also at the end of the lesson as a reward
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Content

Question	What content are you teaching in Natural Sciences? Life skills outlined in the CAPS curriculum. This is based on energy and change.
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Data Generation Instruments E5

Semi-Structured WhatsApp Interview Schedule

The Use of WhatsApp in Teaching Natural Sciences in Primary Schools: Teachers' Experiences

Technology

Major Question	Question 1. What resources do you use in your teaching of Natural Sciences? I utilize worksheets, PowerPoint Presentations, u-Tube Videos, various material resources as well.
Sub Question	What hardware resources do you use in teaching of Natural Sciences? I use my smart phone, my laptop and sometimes the school projector What software resources do you integrate on your teaching? I use the Microsoft Suite of programs How do you use technological resources in teaching of Natural Sciences? (ideological ware) Ideological ware which I use a range of teaching philosophies in special needs teaching as well as specific applications available on "Google classroom"

Pedagogy

Major Question	Question 2. What are your pedagogical practices when integrating technological resources in Natural Sciences? I select the digital technology which are accessible to both myself and my learners. I also align learner needs/ability to the type of technology selected and adapt the curriculum to suit. I also take special needs teaching techniques into consideration.
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Sub Question	<p>What teaching approaches do you employ in your Natural Sciences pedagogical practices? (Teaching methods)</p> <p>I like to start from the known, leading my learners to the unknown or yet to be discovered facts/lesson. Learners enjoy the discovery method, combined with class discussions, which leads them to the facts to be learnt in the lesson.</p> <p>Toward which goals do you use technological resources in your teaching? How do you assess your learners using technological resources? (Assessment)</p> <p>I assess my learners using technology when they prepare PowerPoint presentations to demonstrate what they have learnt. They also produce letters, paragraphs and other documents which they typed using the available Microsoft suite programs.</p> <p>Where does teaching and learning enhanced by technological resources takes place? (environment)</p> <p>Generally, in the computer room but I do sometimes play videos etc. on my laptop or smart phone.</p> <p>How do you perceive your role when using technological resources to teach NS? (Role)</p> <p>My role is a facilitator of information. I like to lead and guide my learners to the facts and not force them to memorise facts for tests, as an instructor would. Learning is memorable when learners are guided to discover facts from known to unknown in practical ways.</p>
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Content

Major Question	<p>Question 3 What content are you teaching in Natural Sciences?</p> <p>All content taught is prescribed in the CAPS Curriculum</p>
Sub Question	<p>What is the subject content do you teach in Natural Sciences?</p> <p>All content taught is prescribed in the CAPS Curriculum, specifically the D-CAPS</p>

Online Reflective Activity

Full name: _____

This Reflective Activity is for Exploration of Natural Sciences Teachers Experiences on the Integration of Educational Technological Resources at KwaZulu – Natal, Durban, Malvern District. Provide your experiences by following the (TPACK) framework main concept (Technology, Pedagogy and Content) as follows.

Technology

1. What hardware resources do you use in teaching of Natural Sciences?

Personal smartphone, personal laptop and school projector

2. What software resources do you integrate on your teaching of Natural Sciences?

All software available on the Microsoft Suite.

3. What informs your choice of modern technology resources in your teaching of Natural Sciences? (rational)

We live in the digital age with 4IR/ 5IR capability which learners are exposed to in their daily lives. They are digital natives who thrive in the digital environment hence my choice of integrating technology in my teaching. Additionally, resources are freely and readily available online to support teaching using digital technologies.

4. How do the modern technological resources in your workplace (School) such as WhatsApp, help with the teaching and sharing of information?

These resources and the availability of data assist with resource sharing amongst teachers and supports progress in the field.

Pedagogy

5. What teaching approaches do you employ in your Natural Sciences pedagogical practices?

I like to start from the known, leading my learners to the unknown or yet to be discovered facts/lesson. Learners enjoy the discovery method, combined with class discussions, which leads them to the facts to be learnt in the lesson.

6. What do you think constitute effective teaching in your classroom? (Location)
Availability of digital technologies to all learners and teachers at school. For instance, tablets with smartboard connection, would greatly enhance teaching and learning.

7. Toward which goals do you use technological resources in your teaching
Development of the learners as a tool which they find interesting and have an aptitude for.

8. How do you assess your learners using technological resources? (Assessment)
(Assessment)

I assess my learners using technology when they prepare PowerPoint presentations to demonstrate what they have learnt. They also produce letters, paragraphs and other documents which they typed using the available Microsoft suite programs.

9. Where does teaching and learning enhanced by technological resources takes place?
(environment)

Computer room

10. How do you perceive your role when using technological resources to teach NS?
(teachers' role)

Facilitator , see previous answer.

Content

11. What is the subject content do you teach in Natural Sciences?

D-Caps content

Zoom Group Discussion Interview

Technology

Question	What resources do you use in your teaching of Natural Sciences? I use WhatsApp, Smart board and projector, I also use videos that are licensable, I try to get a lot of animated tools to explain to learners via WhatsApp
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Pedagogy

Question	What are your pedagogical practices when integrating technological resources in Natural Sciences? I look at what is the most accessible form of media available to most of our learners, this is the usage of basic smartphones, as a laptop and projector is not easily accessible to learners from indigent socio-economic backgrounds. I select and adapt content from the curriculum that would be best suited for the learners level/ ability.
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Content

Question	What content are you teaching in Natural Sciences? Our school follows the D-CAPS curriculum at our school and currently we are teaching learners about energy and change. This is a very difficult topic to teach but the learners are enjoying the lessons because of the practical aspects. All theory has also been converted for them to adapt themselves as well.
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