THE AVAILABILITY, USE, AND IMPACT OF INSTRUCTIONAL MATERIALS IN THE TEACHING AND LEARNING OF LIFE SCIENCES IN SECONDARY SCHOOLS IN THE EHLANZENI DISTRICT, MPUMALANGA

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DISSERTATION

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DEDICATION

To my parents, to Endy Tau, Lungelo Nkambule, Zwelithini Mahlalela and to my colleagues at Ehlanzeni District.

DECLARATION

I, SUNYBOY ROWELL MATHABA, declare that the dissertation; THE AVAILABILITY, USE, AND IMPACT OF INSTRUCTIONAL MATERIALS IN THE TEACHING AND LEARNING OF LIFE SCIENCES IN SECONDARY SCHOOLS IN THE EHLANZENI DISTRICT, MPUMALANGA submitted to the University of Limpopo for the degree of Master of Education in Science Education has not previously been submitted by me for a degree at this or any other university; that is my work in design and in execution, and that all material contained herein has been duly acknowledge.

_____ **24/03/2023**

MATHABA, SR (Mr) **Date**

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ABSTRACT

The teaching and learning of Life Sciences requires teachers to use various teaching tools, but it becomes a challenging task when the resources are not available or when they are available but are not being utilised. To promote the conducive teaching and learning of Life Sciences, it is necessary for educators to improvise and utilise instructional resources in their classrooms. This study was conducted in the Ehlanzeni School District, in Mpumalanga to determine the availability, use and impact of instructional resources in the teaching and learning of Life Sciences. The study adopted cross-sectional survey research design in which closed-ended questionnaire was administered to 75 Life Sciences teachers; randomly selected from the 15 Education circuit. The data was collected for a period of seven weeks. A Statistical Package for the Social Sciences (SPSS) Version 27 was utilised for analysing the data.

Descriptive statistics were used and resulted presented in form of graphs, percentages as well as frequency counts. Inferential statistics were utilised to make inferences and generalisations of the research findings. All the inferential statistics tests were calculated at a $p < 0.05$ level of confidence. The results from this study showed that there were more visual instructional resources in secondary schools than audio and audio-visuals. For instance, the study found out that there were 98.7% textbooks, 90.7% chalkboards and 84.0% charts that were available in Ehlanzeni District's secondary schools. The findings also revealed that there is a statistical significance between the availability and utilisation of instructional materials as $x^2(4) = 38.865$, $p = <.001$. Through the utilisation of various instructional materials, the learners might improve their academics and educational efficacy in the Life Sciences. The findings illustrated that projectors, models and microscopes were available in schools yet they resources were rarely used and some of the teachers lacked skills in using some of the instructional materials. The research recommends that the Department of Basic Education must support the schools by providing them with audio-visual instructional materials especially smartboards and Edu boards. The educators must also be equipped through training on how to effectively utilise the various teaching materials during the delivery of the lessons.

Key Words: academic performance, educational efficacy, effective teaching and learning, impact, instructional materials, resource availability and utilisation.

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LIST OF ACRONYMS

CAPS - Curriculum and Assessment Policy Statement

DBE - Department of Basic Education

ESD - Ehlanzeni School District

FET - Further Education and Training

IDT - Instructional Design Theory

IM - Instructional Materials

KZN - Kwazulu-Natal

MDE - Mpumalanga Department of education

SPSS - Statistical Package for the Social Sciences

TREC - Turfloop Research and Ethics Committee

ICT - Information and Communication Technology

CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

In South Africa, there are many challenges in the teaching and learning of science subjects in the school curriculum. One of the challenges is the unavailability or the lack of instructional materials to support conducive teaching and learning. Thus, the learners in under-resourced schools usually perform poorly in science subjects such as Life Sciences (Effiong and Igiri 2015). The Department of Basic Education (DBE) in Kwazulu-Natal (KZN) was worried about the poor performance in science subjects in the Further Education and Training (FET) band, particularly in Grade 12 (Majozi, 2013). In 2021 the DBE diagnostic report revealed that the percentage of learners who are achieving at 40% and above in Life Sciences is at 51.3 % which is still low (DBE, 2021).

The Grade 12 learners' inadequate achievement in Life Sciences in KZN was influenced by the lack of resources, which included but was not limited to science equipment, textbooks, and inadequate lesson delivery by the teachers (Majozi, 2013). Kwashu (2015) asserts that the study of science subjects is affected by the non-utilisation of effective instructional resources to support teaching and learning, resulting in poor performance of leaners in science subjects.

Njuguna (2018) concurs with Kwashu's (2015) views that there a dwindling trend in the achievement of both the educators and the learners. This shows that the instructional materials are indispensable in the teaching and learning of Life Sciences. There is a strong connection between utilising instructional materials, the learners' academic performance as well as effective teaching and learning. Life Sciences should be taught by employing instructional materials to boost the learners' academic achievement and to support ideal teaching and learning. The utilisation of instructional materials as explained by Folorunso (2018) allows the teachers to explain the scientific concepts and convey the messages to the learners in simple and practical ways.

The instructional materials help the educators to motivate the learners to achieve their learning objectives and preferences in terms of lesson delivery in the classroom by using resources that cater for the sight and hearing senses (Tuimur and Chemwei, 2015). Aina (2013) highlights that the instructional materials are essential because they include visual materials that can add value to the learners understanding of the

content and ensure that it lasts longer in their memory. Therefore, when instructional materials are lacking, schools and teachers should improvise to improve the learners' thinking capacity and participation. Adeniran (2006) concurs that the improvisation of instructional materials exposes the learners to creativity, and it makes them curious as well as innovative which is what is required for the teaching and learning of science. Thus, for the teachers to accomplish the effective teaching and learning of Life Sciences there is a need to improvise and to use instructional materials that are in line with the content.

Sengai and Mokhele (2021) assert that teachers should have more access to instructional materials which allow them to teach effectively in their classroom and enable the grasping of concepts by the learners. However, the teachers face challenges in schools which include the learners' poor academic performance, even more so in the science subjects, and the lack of support from the education stakeholders who do not provide the teachers with appropriate instructional materials which prevents conducive teaching and learning (Kwashu, 2015).

Hence, to succinctly address some of the challenges in the school environment, the education stakeholders should improvise the instructional materials in the schools, and these should be accessible to both the teachers and the learners. Kupar (2018) accentuates that the provision and use of instructional materials in schools enhances the students' academic performance and allows students to acquire a clear comprehension of concepts. The teachers should utilise the instructional materials to make teaching and learning more exciting, which may assist the learners to; stimulate their learning interest, maintain order for effective learning, facilitate their understanding and encourage creative thinking (Mudiartana, Margunayasa and Divayana, 2021). However, although it is important to use instructional materials, these materials should be in line with the curriculum to increase learners' motivation to learn (Suzuki *et a*l., 2020)

1.2 BACKGROUND OF THE STUDY

Amos Comenius first introduced the use of instructional materials in the 17th century when he used pictures to help in teaching and learning. In his book, *Orbis Sensualium Pictus*, the author displayed some drawings that supported the learning process (Comenius, 1780). Pestalozzi (1756-1827) and Jean Rousseau (1712-1788) proved

that the regular use of instructional materials enhanced the learners' curiosity in the learning area, as it inspired self-activity that led to in-depth teaching as well as learning. It can therefore be concluded that use of resources in the teaching and learning of Life Sciences dates back to the 17th century. Effiong and Igiri (2015) applaud the fact that the resources enhanced the students' memory level and were essential in teaching and learning.

Instructional materials are resources that can be utilised by teachers to encourage and promote teaching and learning in a classroom (Abdulkadir *et al*., 2021). Ikerionwu (2000) highlights that the instructional materials are devices or objects that support the educator in exposing the learners to meaningful learning. Effiong and Igiri (2015) view instructional resources as hard copy and soft copy objects that help the learners to acquire knowledge in teaching and learning. The authors state that the objects comprise of video recordings, pictures, and textbooks. There are several affordable scientific equipment, materials, or resources for teaching Life Sciences in schools, thus the teachers should utilise them to improves learners interest in science which assist learners for an in-depth learning (Omariba, Ongâ & Ondigi, 2017). Romiszowski (1994) describes these resources as teaching aids, thereby suggesting that the resources were indispensable in the teaching and learning process. Abubakar et al. (2021) affirm that the utilisation of the materials in the teaching and learning process assisted the teachers to teach and the learners to acquire knowledge easily. Kochhar (2012) also attests that the instructional materials are significant teaching as well as learning tools and the teachers must find suitable resources for teaching to complement the textbooks to widen the concepts and stimulate the learners' interest in the subject.

The lack of support from the Department of Basic Education to provide schools with adequate teaching aids and interference from the teacher unions affects the standard of education (Mthiyane, Bhengu and Bayeni, 2014). Mwangi (1985) states that the availability of resources was one of the important pillars that increased the learners' academic performance. Fuller (1986) likewise emphasises that sufficient resources improve the value of learning and curiosity in science, as they enhance academic achievement among the learners. As such laboratory resources were highly recommended for teaching science subjects such as Life Sciences because of their positive impact on the learning activities (Mukwa & Jowi, 1988).

In Zimbabwe a study by Shumbo (1993), found that an insufficient supply of instructional materials for practical work, contributed to the poor understanding of Life Sciences, hence the learners believed that science was problematic. Likewise, a study conducted by Inaltekin (2020) in Turkey confirmed that the learners had difficulties in learning science, and learners lost motivation to study as they lacked technology based instructional materials such interactive boards, smartboard and mobile phones. Majozi (2013) revealed that the Grade 12 learners in the KZN secondary schools performed poorly in Life Sciences, and it raised a number of concerns in the government.

The learners' negative attitudes toward Life Sciences and low performance in KNZ are both caused by the notion that science is difficult (Majozi, 2013). To encourage secondary school learners to develop a good attitude toward Life Sciences, it is necessary to provide and use the available instructional resources. This served as the impetus for a study on the availability, use and impact of resources in the teaching and learning of life sciences in order to advance educational effectiveness and involve students in heuristic learning in the Ehlanzeni District. This would help the teachers to create a suitable environment for teaching and learning. Secondly, it would support the schools to promote the operative teaching and learning of Life Sciences to improve academic performance among the learners. These assertions support what Arum (2015) reported that instructional materials promote educational efficacy by supporting quality teaching and learning.

Every subject must have instructional materials since they are essential in the school syllabus because they permit learners to make connections with symbols, words, and concepts whereby they advance reading, writing, listening, viewing, speaking, and skills for solving problems (Bukoye, 2019). In this study, the researcher viewed instructional materials as the backbone for Life Sciences, and they positively stimulate the learners to develop the zest for learning and become critical thinkers. Hence, the utilisation of instructional materials allows the learners to apply English skills such as reading, speaking, and writing across the Life Sciences curriculum. This is also aligning with the Life Sciences Curriculum and Assessment Policy Statement (CAPS) document that stipulates that learners should apply English skills in order for them to understand science concepts (DBE, 2012).

The study sought to establish whether the secondary schools in the Ehlanzeni District are equipped with instructional materials. Although it might happen that some of the schools are equipped with such materials, it will be ascertained by means of this study whether the teachers in the schools are using the obtainable materials to teach Life Sciences. The study also revealed the impact of the utilisation of teaching resources in the teaching and learning of Life Sciences and some recommendations were made, based on the research results.

1.3 STATEMENT OF THE PROBLEM

Life Sciences is one of the essential science subjects that are offered in secondary schools, starting from Grade 10 to Grade 12. Despite the significance of teaching and learning Life Sciences in high schools, the learners have a bad attitude towards science due to the notion that Life Sciences is difficult. Esiobu (2005) points out a decreasing interest in science among secondary school learners over the past few years as learners perform poorly in science subjects, including Life Sciences. Adalikwu and Iorkpilgh (2013) likewise outlined a high incidence of poor performance in science among secondary school learners. This is why science education is not achieving the desired goals of producing quality results.

In South Africa, there were 264 819 learners who wrote the Life Sciences external examination in 2011 and 73.24% obtained a level 2 pass, which represented a very low pass rate (30 to 39%) and only 26.76% obtained level 3 to level 7 which was rated between 40% to 100%. This displayed a poor performance in 2011 (DBE, 2011). The 2018 diagnostic report revealed a slight decrease in level 3 from 52,1% to 51,7% in Life Sciences (DBE, 2018). Thus, the results revealed that the schools in South Africa were performing poorly in science subjects. Majozi (2013) elucidated that in terms of learner performance in science subjects, South Africa was still rated among the lowest performing countries in the world.

Although there are many complex factors that triggered the decline in learners' performance, which include, but not limited to, lack of support from DBE, level of commitment from teachers and learners and socio-economic factors (Mthiyane *et al*., 2014). Overcrowded classes and an increase in teachers' workload such as administrative duties and other extra-curricular also contributed to learners' poor performance in Life Sciences. Although many factors affect performance in Life

Sciences (Ndioho and Chukwu, 2017), instructional materials are crucial, as Effiong and Igiri (2015) revealed that the learners found it challenging to master what was being taught if the teachers were not using instructional materials to teach. Hence, a better performance could be achieved if suitable instructional materials were made available in schools and were used appropriately in the teaching and learning of science (Adalikwu & Iorkpilgh, 2013).

This study aimed at establishing the types of teaching materials that are available in secondary schools in the Ehlanzeni District. Secondly, it focused on analysing whether the instructional materials could promote the conducive teaching and learning of Life Sciences.

1.4 MOTIVATION OF THE STUDY

The study was motivated by the fact that in South Africa, there are many difficulties in the teaching and learning of science subjects in the school curriculum. This includes but not restricted to the unavailability or the shortage of instructional tools in schools, even more so in remote areas or rural areas. A study by Adalikwu and Iorkpilgh (2013) outlined a high incidence of poor performance in science among secondary school learners because of the unavailability and the under-utilisation of instructional materials. The learners ended up losing interest in science as Esiobu (2005) revealed that there was a slightly decreasing interest in science among the secondary schools' learners over the past few years because of the notion that science subjects are difficult.

Although there are studies that were conducted by other researchers which revealed that utilisation of instructional materials improved the learners' academic performance (Omariba *el al*., 2017; Danjuma & Adeleye, 2015; Ifeoma, 2013), little has been done to check whether the instructional materials would promote the conducive teaching and learning of Life Sciences (Njuguna, 2018). Thus, the researcher was motivated to conduct research on availability, as well as the use and the impact of the resources in the teaching and learning of Life Sciences.

1.5 THE PURPOSE OF THE STUDY

The purpose of the study was to determine the availability, the use, and the impact of instructional materials in the teaching and learning of Life Sciences. The primary aim

of doing so was to recommend the best resources the educators can utilise to promote the effective teaching and learning of Life Sciences to improve the learners' academic achievement and promote educational efficacy in Life Sciences. Lastly, to determine if gender influence teachers' preferences and use of instructional materials to teach Life Sciences.

1.6 THE OBJECTIVES OF THE STUDY

In order to achieve the purpose of this study, the objectives are as follows:

- To identify the types of instructional materials that are available in secondary schools in the Ehlanzeni District.
- To examine the extent that teachers use instructional materials to teach Life Sciences.
- To determine if gender influence teachers' preferences and use of instructional materials to teach Life Sciences.
- To determine the impact of using instructional materials in the teaching and learning of Life Sciences, and whether it promotes effective teaching, learning and educational efficacy.

1.7 RESEARCH QUESTIONS

1. Which types of instructional materials are available in secondary schools in the Ehlanzeni District?

2. To what extent do teachers use instructional materials to teach Life Sciences?

3. How does the use of instructional materials impact the teaching and learning of Life Sciences?

1.8 SIGNIFICANCE OF THE STUDY

The study conducted by Effiong and Igiri (2015), titled, *Impact of instructional materials in teaching and learning of Biology in Senior Secondary Schools in Nigeria,* exhibits that the instructional materials improved the learners' academic performance. Similarly, the studies by Njuguna (2018), Omariba et al. (2017), Danjuma and Adeleye (2015) and Ifeoma (2013) revealed that the utilisation of instructional resources improved the learners' academic achievement in Biology. In contrast, little has been done to find out how to use the obtainable instructional materials advance the

productive teaching and learning of Life Sciences, and to find the types of teaching tools that are suitable for particular Life Sciences concepts. Thus, the study strives to establish the availability, the use, and the impact of instructional materials in the teaching and learning of Life Sciences. The study will assist teachers to improve their teaching methods by integrating the different instructional materials in their classroom when teaching. It explored how to offer an alternative approach of promoting the productive teaching and learning of Life Sciences and creating an environment that is conducive to teaching and learning.

Furthermore, it may guide the education sectors including the Department of Basic Education on how educators should use the available instructional materials in the school curriculum to enhance the learners' academic performance in Life Sciences. In addition, this study adds to the existing knowledge concerning the utilisation of instructional resources to promote science educational efficacy in South African schools as well as schools that found beyond the South African borders. This study also seeks to motivate the learners to develop a higher quality of understanding of science and engage in heuristic learning with the use of instructional materials by teachers. Conversely, the study contributes towards future research to uncover critical areas concerning the utilisation of instructional materials in educational methods that need to be explored.

1.9 DEFINITION OF KEY TERMS

Instructional materials: These represent the teaching tools that are used by the teachers to promote ideal teaching and learning. The resources can be separated into three distinct categories, which are visual, audio and audio-visual. Examples of the visual category includes textbooks, pamphlets, charts, and whiteboards. The audio category includes the radio and record players. The audio-visual category includes projectors, smartboards, and laptops. The teaching tools can motivate the learners to engage in heuristic learning thus, enhancing their understanding of what is being taught.

Resource availability: This means access to the teaching and learning materials. It assists the teachers to effectively select the resources that are suitable for a particular content to make the lesson more interesting.

Utilisation: This is using instructional tools effectively when teaching Life Sciences.

Effective teaching: This entails the capacity of a teacher to construct a conducive environment and assist the learners in understanding the content to improve their academic performance.

Impact: This indicates the role of instructional resources to promote the effective teaching and learning of Life Sciences.

1.10 OUTLINE OF THIS STUDY

The study report consists of five chapters.

1.10.1 CHAPTER ONE

The background of the study, the statement of the problem, the purpose as well as the research objectives and questions were introduced in this chapter. The importance of this study is explained briefly to give a glimpse of what this study is about. The definition of terms is one of the key aspects that are explicated, as they give the readers more information about what to expect in this study.

1.10.2 CHAPTER TWO

The chapter represents the literature review. The primary aim of this chapter is to summarise the existing literature of different scholars, focusing on instructional materials. It begins by explaining the concept of instructional materials in detail and gives examples of the resources. Furthermore, it explicates the types of materials, which are visual, audio, and the audio-visual aids that the educators can utilise in their classrooms to facilitate the teaching and learning of Life Sciences. The chapter reveals the researchers' findings on the impact of utilising the resources on the learners' academic success. Thus, it ends by exploring the barriers in providing and utilising instructional materials and it focuses on the Life Sciences teachers' level of accessing and utilisation of instructional materials. In summary, this chapter emphasises the significance of using resources in the teaching and learning of Life Sciences.

1.10.3 CHAPTER THREE

The chapter explains the research approach to the study in detail. It also elucidates the research design, the population as well as the sampling technique. Lastly, it describes the data collection, the data analysis, and the ethical considerations.

1.10.4 CHAPTER FOUR

This chapter represents the data collected from this study by analysing and interpreting the findings. There is the utilisation of a Statistical Package for the Social Sciences to represent descriptive statistics where tables, graphs, charts, frequency count and percentages were presented. This chapter also includes inferential statistics where, the Chi-square test, the Kruskal-Wallis H and the Mann-Whitney U test were presented to make some inferences.

1.10.5 CHAPTER FIVE

The chapter presents a snapshot of the findings of this study that were presented in Chapter 4 and makes some recommendations based on the availability and the utilisation of instructional tools to promote educational efficacy in the Life Sciences. Furthermore, it could be said that the conclusions and the recommendations that were reached, were aligned with the research questions that were represented in Chapter 1. It also underscores that all the stakeholders involved in the education sector should play a role in promoting educational efficacy by capacitating teachers through workshops on the effective use of the resources, more especially on audio and audio-visuals such as smartboards, Edu boards and laptops. This can be achieved by providing schools with instructional materials and equipping the teachers to utilise the available resources in schools.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The teaching and learning of Life Sciences does not occur through osmosis. The teachers should plan before going to class and they should know the resources that are effective for a particular lesson. To succeed in making Life Sciences more understandable to the learners, the use of teaching resources should not be ignored. The utilisation of instructional resources inspires the collaboration between the learners and the teachers and encourages the cooperative learning activities among the learners (Okobia, 2011). In addition, Sengai and Mokhele (2021) affirm that the capacity of educators to teach productively in their classroom should be strengthened by the access to instructional resources that would assist the learners in grasping the concepts.

In the last few years, Okafor and Udeani (2012) noted an increasing responsiveness in teaching and learning by incorporating instructional tools to support the learners in the comprehending of scientific notions and this improved learners' academic success. Hence, the instructional material can be used as a tool to promote ideal teaching and the learning of Life Sciences. One of the objectives of a Life Science educator is to be an active enabler of the learners' involvement in scientific procedures by the utilisation of a suitable teaching approach and resources as the learners' academic performance depend on their abilities to understand the subject material (King, 2018).

2.2 Views concerning instructional material

The concept of instructional material is used in various ways, such as 'teaching tools, teaching aids, instructional tools or learning materials. It can also be defined in different ways. Chacha (2018) viewed instructional materials as the devices that are designed to assist the teachers in the support of the learning process in transmitting structured knowledge, talents, and approaches to the learners within an instructional condition. Instructional resources are the teachers' available tools, they are used for instructional purposes, which may also be obtained online, or from supplemental textbooks, activity books, and from the materials that are obtained from other sources or those that are provided by the teachers (Edenfield, 2010). Thus, either the resources can be soft copies or hard copies and the teachers can utilise the materials to promote the

conducive teaching and learning of Life Sciences in the classroom. This study defines instructional material as the tools that are used by the educators to facilitate the learners' understanding of Life Sciences for effective teaching and learning.

Sengai and Mokhele (2021) affirm that instructional materials play an indispensable part in the teaching and learning process as their proper use improves the learners' memory level. Similarly, Kochhar (2012) reveals that the teaching tools were important in teaching as well as in learning and the teachers should find crucial resources for teaching to complement the information found on the textbooks to widen the concepts and stimulate the learners' curiosity in the subject. The teachers should not only depend on the textbooks as reference materials to teach Life Sciences, as there are many teaching tools they should consider engaging the learners. The different instructional materials may contribute positively towards the teaching and learning process, such as the sharing of resources between the educators and the learners, thereby stimulating the learners to engage in self-study without relying on the teacher to teach them and encourage the learners to participate in group activities and discussions.

It is fundamental to use an extensive range of instructional materials that are relevant as they yield positive results such that they assist learners to participate actively during the delivery of the lesson, making the lesson interesting and meaningful, assist learners for longer retention of acquired knowledge and the knowledge can be passed on among the learners (Sengai & Mokhele, 2021). In addition, Dhakal (2017) reveals that the various instructional materials should be utilised to advance the overall value of the learners' learning. Furthermore, Portana et al. (2021) underscored that instructional materials ignite and bring desirable changes in the learners learning such that they can easily understand the lesson, change attitude and behaviour in order for a meaningful learning to take place. In this regard, teachers may find orderly processes in understanding learners' different learning styles and how they make connection to prior knowledge and the content that the teacher is delivering during the contact session in class (Portana *et al*., 2021).

Research conducted by Berg *et al.* (2012) emphasised that it is essential for an educator to know the learners' individual differences and their academic backgrounds so that the teacher can effectively plan the teaching strategies to use in facilitating the

understanding of new content. Employing meaningful instruction is crucial, as the learners can connect new information with everyday experiences, using examples and items that can be used to in their classroom (King, 2018). Although teaching methods are critical in understanding of life science content, instructional materials also influence learners' understanding of science.

The instructional materials should positively influence the learners' understanding during teaching and learning as they consist of printed and non-printed objects such as textbooks, pictures, and video recordings because in most cases it is for learners to remember what they saw and hear (Effiong & Igiri, 2015). Likewise, Soetan et al. (2010) specify that the cartoon plans and drawings, posters and the graphics found in visual and audio-visual instructional materials would help the learners to deepen their understanding and ultimately communicate the scientific facts and ideas. The instructional materials can assist the teachers to deliver knowledge to the learners effectively which leads to proper teaching and learning processes (Koko, 2015). Moreover, the teaching tools assist the teachers in creating the ideal teaching and learning environment. Okobia (2011) echoed that one of the key purposes of instructional materials was to support the educational efficacy by assisting the effective delivery of the content.

The resources should be made accessible and available in schools. The Life Sciences teachers should utilise these resources when teaching to reinforce teaching and learning. Syengo et al. (2016) reveal that the utilisation of teaching tools is a skill that is required for the teachers in choosing effectively, obtaining, and using instructional resources to successfully achieve and improve the learning goals. The utilisation of these resources is therefore one of the best strategies that the teachers can use to involve the learners in the teaching and learning of Life Sciences. The materials can further encourage the learners in heuristic learning, thereby minimising the ostensive teaching method among the Life Science teachers. Ordinarily, appropriate teaching and learning is accomplished through the utilisation of instructional resources and the teachers should have the proficiency to ascertain the value and the relevancy of using the materials (Portana et al., 2021). This study will assist Life Sciences teachers to select the suitable instructional materials for a particular content to assist the learners to understand the Life Sciences.

2.3 Types of instructional materials

There are different types of instructional materials that the teachers can use to teach effectively in their classrooms. Idris et al. (2018) proclaim that the instructional materials emerge in different resources and tools, which can be utilised to enhance the teachers' hard work in ensuring the conducive learning of learners. This study focuses on the three types of instructional materials which are; audio, visual and audio-visual that the teachers can engage to successfully deliver Life Sciences content in secondary schools. Sengai and Mokhele (2021) indicate that the three types of instructional materials are audio, visual and audio-visual and they can help during the teaching and learning procedure by making theoretical concepts and ideas concrete. Furthermore, the integration of the distinct types of instructional materials (visual, audio and audio-visual) can be used as a vehicle to promote the effective teaching and learning of Life Sciences in secondary schools.

In Tanzania, a study by Manjale and Abel (2017) indicated that the utilisation of different teaching materials makes the learning process conducive as it creates better understanding, as well as encourages support and retention to the subject that is included in the teaching and learning procedure, thereby resulting in the increased academic achievement of the learners. Correspondingly, Achola et al. (2016) in their study revealed that teaching by using diverse teaching resources enhanced the learners' achievement in different learning activities, which included the capacity to write what is spoken in words.

2.3.1 Audio instructional material

This teaching aid involves the sense of hearing. It deals with sound only, as the learners can listen. It promotes and improves communication and the learners' listening skills. Consequently, the teachers who are using audio instructional materials assist auditory learners to comprehend the lesson that is taught in the classroom. The utilisation of audio also affords the learners the opportunity to relax and increase their interest in participating actively in Life Sciences lessons. The examples of audio include but are not limited to Compact Discs (CDs), radios, gramophones, record players, and cassettes, which support the delivery of content through the sense of hearing (Olawale, 2013). Amosa and Ogunlade (2015) in their study investigated the differences in the achievements of the learners that are taught without audio

instructional material and the learners that are taught with audio instructional tools. Their findings disclosed that the learners that were exposed to audio materials achieved better marks than the learners who were taught without audio instructional material.

According to Maniruzzaman and Rahman (2008), the use of audio instructional resources works as teaching tools and a learning facilitator as it motivates the learners to pay attention during the instructional process. It also assists in minimising the traditional approach of 'chalk and talk' teaching style where the teachers spend too much time talking and writing on the chalkboards when they are delivering the Life Sciences content to the learners. Sarwinda et al. (2020) contend that the learners are passively involved in the learning procedure, and they achieve less meaningful learning experiences if the teachers continue to be teacher-centred and textbook-oriented when they are managing the teaching and learning process.

The teachers must use audio materials to avoid the traditional way of delivering the content to ensure exciting teaching and to support the learners' understanding of the content. The teachers could make a recording during their delivery of the lessons or they could make the recording prior to the commencement of the lesson; hence, the learners would be able to access and listen to the recording (audio) at any time to assist their understanding of the lessons. In other words, the learners can listen to the recordings repeatedly until they clearly understand what was taught. Krčelić and Matijević (2015) attest that the learners use technology outside the classroom and allowing them to use it inside their classroom would have a positive impact on their motivation and they could attain better academic results. Conversely, the utilisation of audios can improve the learners' listening skills and it would improve their memory (Amosa and Ogunlade, 2015). Effective teaching and learning may take place even if the teacher is not available at school, as he or she may send audios to learners so that they can engage in learning activities without depending on the teachers to be present to inform them about the activities they have to complete.

2.3.2 Visual instructional material

Visual instructional material is a teaching aid that involves the sense of sight. It deals with what one sees. Raiyn (2016) defines visual learning as the integration of information from visual presentations. A visual aid can promote observation skills amongst learners, as it is stated in the Life Sciences Curriculum and Assessment Policy statement (CAPS) document that the learners should investigate phenomena in Life Sciences by obtaining an in-depth understanding of science so that they can use their knowledge in unfamiliar contexts (DBE, 2012). Visual aids comprise of but are not restricted to posters, diagrams, maps, pictures, specimens, and blackboards. King (2018) expounds on this by describing the visual aid as any resource that is utilised to demonstrate or afford a visual demonstration of information. Therefore, these resources are indispensable in the teaching and learning process. Shabiralyani et al. (2015) further accentuate that these aids inspire the learners' learning process and make it interesting and simpler to comprehend the material. They further highlight that the visual aids are useful for knowledge dissemination, and they are valuable for conducive teaching and learning. In the same vein, a study conducted in Afghanistan by Baser (2013) articulated that the visual tools are useful materials in the teaching field since they make the lesson easier to understand and the teachers can easily teach the content to the learners during the teaching and learning sessions in their classroom. Using visual tools, the learners are actively engaged in the lesson, and they pay attention as they observe what is displayed to them by the teacher; hence, they find the lesson more interesting and their curiosity to learn and explore is stimulated.

In Stellenbosch in South Africa, a study by King (2018) entitled *"Exploring the use of visual aids as tool to understanding subject specific terminology in Life Sciences"* alluded to the essentials of using the visual instructional material to teach Life Sciences. The study findings revealed that using visual tools in teaching and learning assisted the learners who were struggling academically and who were taught without using their 'home language' to understand the Life Sciences and the terminology. In addition, it can be said that the visual instructional material in the educational contexts could become an indispensable educational tool for the teacher to reinforce the learners' understanding of the complicated terminology (King, 2018). The literature by Ferreira (2011) asserts that the learners found it difficult to understand Life Sciences

if they encountered terminology that was difficult to understand and master. Hence, the teachers can use charts, pictures, or posters as visual material to expound the Life Sciences terminology and the concepts that are challenging the learners to understand. Thus, the learners would be able to visualise those concepts and their memory would be triggered to understand the Life Sciences better.

According to Soetan et al. (2010), the visual materials help to strengthen the learners' level of understanding and they can obviously connect the facts and the ideas. Additionally, the learners can visualise the concepts that are taught and their correlation to other concepts (Portana et al., 2021). The learners sometimes tend to forget the learned concepts, so through the appropriate utilisation of visual tools they can develop the ability to remember those concepts and keep them in the long-term memory, which can assist them to make connections of concepts and strands of Life Sciences that form a continuum. This view is comparable to the literature from Raiyn (2016), who asserts that the visual information maintains human long-term memory and supports thought processes. The visual instructional materials can assist the teachers to use ample time to make learning permanent, as they provide a source of the learners' involvement in the lesson (Shabiralyani et al., 2015). Likewise, Pateşan et al. (2018) echo that the utilisation of visual materials in teaching holds enormous benefits, such as maintaining order to inspire the learners to be involved in a specific topic and assist them to retain information, and to make teaching and learning enjoyable as well as fascinating.

The visual instructional tools can be used as tools to diagnose the learners' challenges during teaching and learning to provide them with a scaffolding to better understand the learning area (Pateşan et al., 2018). They have positive effects on the learners' understanding of the content, thereby assisting them to defeat the learning barriers and the teachers can help the learners to learn through monitoring and evaluating their performance (Halwani, 2017). This notion is also supplements findings by Kaswa (2015), who states that the visual materials are effective for teaching as they have a positive effect in facilitating learning and lead to outstanding performance of the learners. Thus, it is crucial to use visual tools, as it would stimulate the learners positively and enrich their learning experience (Halwani, 2017). The learning technique can be assisted through the utilisation of the resources and the learners would find it

easier to comprehend visual materials such as but not limited to charts and textbooks in their classrooms (Kaswa, 2015).

The teachers should comprehend that the various examples of visual instructional materials serve different purposes Life Sciences concepts. For example, the charts, posters, or the pictures can be used to introduce or summarise the lesson to draw the learners' attention so that they participate actively and further understand the concepts (Kaswa, 2015). The textbooks, the PowerPoint presentations, or the handouts, on the other hand, may be used to explain the lesson in detail since they contain huge amounts of information (Halwani, 2017). Contrary to that, the different visual materials can be used to teach and assess the different skills among the learners (King, 2018). A textbook may be used to diagnose the learners' reading and understanding skills, while the charts may be used to diagnose the learners' observation skills.

Teaching by using visual tools helps the learners to learn visually. Consequently, the visual learning approach increases the learners' analytical thinking skills, and the teachers monitor the learning process productively to progress the learners' higher-order thinking skills (Raiyn, 2016). As such, when the learners see the information that is displayed in the classroom, a better comprehension is attained. The teaching and learning method using visual instructional materials should not be emphasised only in Life Sciences, but in all the science learning areas to encourage engaging the learners and helping them to understand the complex phenomena in science.

2.3.3 Audio-visual instructional material

Audio-visual material is a teaching aid, which includes both the senses of hearing and sight. Abubakar et al. (2021) opine that the audio-visuals are well-documented resources that assist the teachers to convey knowledge in all sectors of education as they make teaching and learning effective and interesting. The materials are very helpful as they are multisensory and they stimulate many senses of the learners, which could assist them to control the content and the flow of information (Idris et al. 2018). It is one of the advanced instructional materials used in the sector of education for effective teaching and learning and if it is used properly, educational efficacy may be achieved. Thus, the audio-visual materials accommodate both the visual and the auditory means of understanding the Life Sciences content better, because the learners are able to visualise (see) and listen to what is being taught (Idris et al. 2018).

The audio-visual instructional materials consist of but are not restricted to smartboards, Edu-boards, laptops, smartphones, televisions, and projectors. Rahul, Bakhsh, and Barolo (2011) view audio-visual resources as tools that are utilised to inspire the teaching and learning procedure in lessons by making it simple and mesmerising. Additionally, they state that the materials are crucial in the education sector, and they are appropriate for knowledge distribution.

Kinder (2015) specifies that the audio-visual resources are the tools that the teachers can use in the teaching and learning technique to make learning more active, realistic effective and dynamic. An in-depth teaching and understanding of Life Sciences can be attained through the utilisation of the tools. Additionally, the educators have to play a key part in making sure that they drive the learners to acknowledge the importance of audio-visuals in the teaching and learning environment. In their study, Idris et al. (2018) revealed that the availability of audio-visual tools alone does not yield credible results in the schools, but that the teachers should be involved so that the learners can take advantage of the possible benefits of the materials on their own. The authors further outline that the educators should be equipped on how to utilise the materials to enable them to participate actively in the use of the teaching tools to improve the learners' intellectual capacities and creativeness. In the same vein, Abubakar et al. (2021) affirm that the utilisation of audio-visual materials in the teaching and learning process assisted the teachers to teach and the learners to acquire knowledge easily.

The utilisation of audio-visual materials improves the learners' motivation to learn and increases their critical thinking skills since the learners become more zealous, attracted, and contented in attending the lesson (Sarwinda et al., 2020). Thompson (2011) stipulates that, "An individual who possesses the critical thinking skills will realize the potential obstacles and difficulties and, therefore, he or she will always be ready to identify the approach that should be taken in solving the given problems systematically". If the learners are motivated to learn and they think critically, their academic performance could increase, since they would be able to apply their expertise in answering higher order questions and they are able to relate facts, as the DBE annual diagnostic reports always reveal that most learners are struggling to answer higher order questions (DBE, 2021). Consequently, they perform poorly. In Sudan, a study by Arbab (2020) found that the secondary school learners were

motivated with audio-visuals, and they achieved a better performance in language. When the teachers use audio-visual materials effectively to teach the learners in secondary schools, they improve and increase the pace of learning, which gives teachers time to embark on other activities such as compiling lesson notes (Abubakar et al., 2021).

One of the challenges the educators face in the delivery of Life Sciences concepts with audio-visual materials is that they are expensive and some of the devices are unavailable in secondary schools, even more so in the remote areas. Although some of the tools are not available, that should not stop the teachers from improvising. Although some devices may not be available, teachers should use the available devices to teach the learners. For example, a Television (TV) is an audio-visual material that can be used in schools to accommodate all the learners in the classroom during the lesson. There is a learning channel 'Learn Xtra Mindset Learn' that is supported by the DBE free of charge. There are live lessons from the Learn Xtra Mindset Learn that are provided by some of the best Life Sciences teachers in the country; hence, the teachers can allow their learners to watch those lessons in schools and they could be given opportunities to ask questions during the presentation by calling or asking questions on Facebook during the show.

Secondly, we are living in a digital world and most learners have smartphones and can communicate with their teachers on WhatsApp groups. Thus, the teachers can simply download the lesson presentations and share them on the learners WhatsApp group. The learners can watch those lessons several times until they clearly understand the content. Consequently, the learners might even be encouraged to download the lessons and share them with their classmates. In this way, they would enjoy learning Life Sciences and understand it better.

Most if not all the audio-visual, instructional resources are Information and Communication Technology (ICT) devices. Hassan and Mirza (2021) point out that ICT is essential in the education sector and the teachers should be competent in facilitating the use of the devices as they are viewed as promoters towards the development of learning and improving the value of education. The access to ICT tools improves the value of education efficacy and its implementation also assists the learners to become competent thus, reaching conducive learning by allowing learners to access more

information on the internet that would increase the learners' learning within the curriculum (Bariu, 2020). The teachers should not do away with these teaching tools and the learners' academic achievement could be improved, provided they are used profitably. Lowder and Regmi (2020) stress that it is valuable at all levels in the field of education to have ICT for quality teaching and learning.

All three types of instructional materials were considered in the study with the intention of catering for the different schools in the District and for the sake of avoiding bias. The resources are assets in effective teaching and learning, not only in Life Sciences, but also in all the learning areas that are offered in the schools.

2.4 The impact of instructional materials on the learners' academic performance

Utilising instructional resources is pivotal among the teachers and the learners in the teaching and learning of Life Sciences. The utilisation of instructional materials can encourage both the teachers and the learners to share resources. It can also minimise the level of misconception amongst the learners regarding certain concepts in Life Sciences. Okobia (2011) asserts that the instructional materials promote educational efficacy by promoting quality teaching and learning. It encourages collaborative work between the teachers and the learners; and cooperative learning activities among the learners. For example, audio-visual instructional materials such as smartboard can assist teachers to present a topic effective in an overcrowded classroom.

Dhakal (2017) reveal that teachers should use instructional materials for teaching and learning activities to be effective and purposeful. Thus, the importance of using instructional materials during teaching and learning should not be underestimated (Sengai & Mokhele, 2021). The use of instructional materials can also assist teachers to convey knowledge which may help the learners to acquire and develop learning skills. Arum (2015) pointed out that such resources provided the diversity of the learners learning skills as well as the amalgamation to attain distinct learning and teaching capabilities, as it inspires the learners with skills by paying attention during the lesson and energising learners curiosity to learn. This is even more reason why the teachers should use instructional materials to teach Life Sciences so that the learners can be engaged in the learning method, thereby becoming active participants, rather than being passive. In addition to this, Tuimur and Chemwei (2015) state that

the resources stimulated the learners to learn and brought life to learning. They further revealed that the implementation of instructional resources by teachers in the classroom held the possibility to assist them in explicating the new concepts more effectively. This could help the learners to better understand the concepts and the subject matter.

There are numerous issues contributing to the poor academic achievement in Life Sciences among the learners including teaching strategies or the methods the teachers use when teaching Life Sciences (Effiong and Igiri, 2015). However, findings of several studies showed that the utilisation of teaching resources in teaching resulted in high academic achievement and in improved learners' performance (Njuguna, 2018; Omariba, Ongâ & Ondigi, 2017; Danjuma & Adeleye, 2015; Ifeoma, 2013).

A study by Omariba et al. (2017) titled, *"Extent of use of biology instructional resources and effect on students' academic performance in secondary schools in Siaya County Kenya"* asserted that the use of teaching materials in the teaching of Life Sciences was essential for the learners to obtain quality results This indicates that the utilisation of resources played a significant role in the learners' academic achievement. Adalikwu and Iorkpilgh (2013) agreed that the learners who were exposed and taught using instructional materials showed improved performance than the learners who were taught without instructional resources. Thus, there is a direct relationship between the utilisation of teaching aids and the learners' academic achievement.

Furthermore, Oladejo et al. (2011) revealed that the learners who were taught by using instructional material obtained higher marks in a physics achievement test when compared to the learners who were taught by using the traditional method and insufficient instructional material. According to Popoola (1980), the performance in the schools with enough resources was better than the performance in the schools with insufficient instructional resources. Once again, this proves that the Life Sciences teachers should utilise adequate materials and the schools should provide the educators with teaching aids to encourage an active teaching and learning environment to increase the learners' academic achievement in Life Sciences and the other learning areas that are taught in the schools.

Typically, the use of teaching resources in teaching and learning would help the learners to understand the abstract nature of Life Sciences. As a result, their academic achievement could improve. In Sudan, a study by Arbab (2020) on the consequence of using instructional resources such as audio-visual in the students' language reported that the students were inspired in the teaching and learning procedure; hence, they performed better in language. Another study conducted in South Africa by King (2018) revealed that the learners, who were taught by using instructional materials in other languages rather than their home language, were given valuable support in the Life Sciences classroom. The learners therefore better understood the difficult terminology in Life Sciences and its content, resulting in better achievement (King, 2018). This proved that if there are language barriers, the learners could not understand the subject and their academic achievements might be hampered or compromised.

Through the utilisation of various instructional materials, the learners who are taught in a language other than their home language could better understand the concepts and this would advance their performance in Life Sciences. The use of teaching tools inspires the learners to track the presentation of the lessons and trigger them for active participation and conducive learning for better achievements (Canning-Wilson, 2001). Furthermore, the utilisation of teaching resources makes teaching and learning real, and it helps the learners to remember, thereby providing them with the advantage of achieving quality results (Manjale & Abel, 2017).

Effective communication and the delivery of information can be achieved through the implementation of the different sources of teaching aids (Idris et al., 2018). The materials also cause teaching and learning to be fascinating, and it builds a better relationship between the teachers and the learners in the teaching environment, which encourages better communication among the teachers and the learners (Abubakar et al., 2021). Contrastingly, the inappropriate use of instructional materials may create turbulence among the teachers and the learners in communication and in the delivery of the lesson. The learners may not understand the lesson and they may become demotivated, which would result in poor academic achievement. Bukoye (2019) notes the high incidence of underachieving in the learners' external assessments is because several schools and the teachers were not using instructional materials accurately.

Among the Filipino learners in Philippine, the achievement rate was very low because of the inadequate materials of the science education and in addition to lack of quality facilities (Jalmasco, 2014).

Nyagosia (2011) argues that the introduction of functional teaching and learning strategies and instructional tools as well as the positive reinforcement of the learners for good performances would function as an inspiring factor when the learners achieve low grades. The teaching tools that the teachers can use should not only be the expensive ones; even the cheaper tools such as posters could be used when teaching to improve learners' performance. Azhar, Niwaz and Khan (2017) assert that even the inexpensive instructional materials are effective tools for increasing learning, and they would help the teachers to increase the zest of the learners to learn, thereby giving teachers more time to interact with the learners for effective teaching and learning process. The literature by Azhar, Niwaz and Khan (2017) further shows that using inexpensive instructional resources assisted the learners who were having diverse abilities, to improve their performance in science subjects. Life Sciences teachers in the Ehlanzeni District can also share inexpensive instructional materials such as handouts, power point presentations and posters when teaching to improve learners' performance.

2.5 Gender and preferences of teachers' utilisation of instructional materials

Teachers play an important role in explaining the use and implementation of instructional materials in schools to achieve the desired learning outcomes (Adu, 2018). Instructional materials are indispensable in the teaching and learning process as they are basic apparatus in the academic performance of learners (John, 2021). Teachers should not only be encouraged to use instructional materials but they should be capacitated and be guided to choose instructional materials that are effective and relevant for a particular topic to achieve effective teaching and learning in schools (Adu and Duku, 2021). Teachers' preferences and use of instructional materials can be influenced by many factors which include but not limited to availability of the resources, skills and gender.

Gebhardt, et al. (2019) revealed that gender can influence the teachers use of instructional materials more especially audio visuals which included ICT devices. Gebhardt, et al. (2019) findings showed that male teachers were using ICT materials

more than female teachers as they had skills on how to use the instructional materials compared to the female teachers. Manyilizu and Gilbert (2015) in their study in Tanzania disclose that there is a gender imbalance in the utilisation of audio-visual (ICT) materials and applications in the teaching and learning such that male teachers seem to use ICT tools more than females. Majority of male teachers attended ICT courses compared to female teachers as such male teachers were capable of using audio-visual instructional materials more than females for teaching and learning (Manyilizu and Gilbert, 2015). Similarly, a study conducted in Turkey by Sutcu and Bayir (2007) showed that male teachers prefer to use visual and audio-visual materials more frequently compared to female teachers for teaching and learning.

2.6 Barriers in providing and utilising instructional materials

The utilisation and improvisation of instructional materials supports the teachers to successfully deliver the Life Sciences concepts as learners easily understand what is being taught and they learn more. Research has revealed that sometimes the teachers do not utilise these materials to teach Life Sciences, even if the materials are available. In his work, Ogoma (1987) pointed out that many teachers in Nairobi did not use the available resources for teaching. On the other hand, Komen (1991) observed that the teachers were not sufficiently equipped to utilise the materials and they often used inadequate instructional materials. Teaching in under-resourced schools where the materials were not available made it impossible for the teachers to access such instructional materials to deliver content to the learners. Mthiyane et al. (2014) reported that in KwaZulu-Natal, the inadequate supply of the teaching aids by the Department of Basic Education also affects the utilisation of these materials. The lack of funding, either from the government or from the DBE also affects the utilisation and improvisation of the materials.

There are many barriers to the utilisation and improvisation of the materials in schools. A study conducted by Ema (2010) divided these barriers into two main categories, namely extrinsic barriers, which include services, time, support, access, materials and preparation, and intrinsic barriers, which are related to resistance, practices, beliefs, and attitudes. The impact of the barriers is one way or the other, based on the level and frequency of utilisation of teaching resources in the classroom (Ema, 2010). Furthermore, the insufficient or inadequate levels of understanding instructional

resources may result in the rejection and the discontinuance of their use because of frustration, the stress and the strain faced by teachers (Ema, 2010). It is thus suggested that booklets or flyers should accompany the instructional materials serving as guides to offer information dealing with how to use the resources in teaching and learning. The teacher controls all the material or the technology used in the classroom, therefore the teacher's level of creativeness and critical skills would determine the level of failure or success of the activities.

Some of the barriers in using instructional materials include the inadequate training of teachers on how to use the materials, the teachers' lack of planning and preparation, the unavailability of the instructional materials in schools and the learners' barriers to learning (Ema, 2010).

2.6.1 Inadequate teacher training on how to use the materials

Some teachers are incapable of using some of the instructional materials, especially the audio-visual resources such as the smart boards, the laptops, and the projectors (Gulbahar and Guven 2008). These resources fall under ICT devices, and it is known that some of the teachers who were born before technology are struggling to utilise them as compared to the teachers who were born after technology (source). Gulbahar and Guven (2008) assert that lack the expertise of using ICT materials by teachers even when they are eager to utilise them is due to inadequate in-service training of the teachers. The ICT materials help the teachers to effectively deliver the content to the learners and allows them to share the resources. The teachers who lack skills in using teaching resources usually ignore the use of those resources, as they do not know what to do and where to start (Jones, 2004). In the same vein, Lawal, Rumah and Amadi (2020) emphasise the importance of using instructional materials, yet the teachers depend only on the traditional method of teaching.

The teachers should not be spectators in the teaching and learning process, but they should actively participate through using all the necessary tools for the betterment of the learners. Naidoo (2013) points out that the lack of knowledge among the teachers on the use of teaching tools negatively affects the learners. To enable the teachers to improve the thinking capacity and creativity of the learners, they should be trained in using teaching resources in their classroom and the learners might be inspired to take responsibility of their studies (Idris, et al., 2018). Supporting the teachers through

ongoing courses and in conducting workshops encourages them to effectively deliver the lesson by using different resources, such as laptops, in the classroom (Naidoo, 2013). The researcher is of the view that teachers should also initiate personal skills development rather than relying on the Department of Education for a training so that they can be in a position to use the different types of instructional materials in order to be productive when they are teaching in their classroom.

2.6.2 The teachers' lack of planning and preparation

Planning and preparation are key aspects that bring about educational efficacy and effective utilisation of instructional resources in the schools. The failure of the teacher to plan and prepare for the lesson compromises the use and the implementation of different teaching materials. Preparation and planning are essential in the development of the teachers' content knowledge, instructional strategies, and the strategies for managing the classroom (Meador, 2019). The teachers who plan know exactly which type of materials would be useful for conducting an activity prior to the arrival of the learners in the classroom. In addition, the teacher will be aware of the instructional material that would be useful for a particular Life Sciences concept, rather than using ineffective instructional material. The teachers' use of inadequate instructional tools and the lack of lesson preparation affect the quality of teaching and learning (Nguyen, Warren & Fehring, 2014).

Life Sciences deals with some of the concepts that are challenging to comprehend if there is no proper planning. King (2018) asserts that some of the Life Sciences terminology is difficult for the learners to understand, especially those who are taught in a language that they cannot comprehend clearly. The lack of preparation and planning among the teachers hinders the effective use of instructional materials (Nguyen, Warren & Fehring, 2014). For instance, if an educator wants to teach a practical activity and there are no apparatus or resources for that activity, the teacher might end up not engaging the learners in that activity because of the lack of planning and preparation (Drokow *et a*l., 2020). The researcher agrees that the lack of preparation and planning among the teachers hinders the effective use of instructional materials. In order to deal with this problem, the researcher investigates the extent of using instructional materials in the teaching and learning of Life Sciences in the Ehlanzeni District. For instance, if a teacher has planned and prepared properly even

if there are no laboratory apparatus to engage learners in practical work, the teacher might use audio-visual simulations to engage the learners.

2.6.3 Utilisation of the instructional materials in schools

A conducive teaching and learning environment is important as it advances the learners to acquire knowledge and promotes effective teaching and learning. To enable the teachers to be effective in the school environment, the instructional materials should be available and must be used at all costs during teaching and learning. The effectiveness of the educators to teach depends on the access and the availability of instructional materials to assist the learners in understanding the concepts (Sengai & Mokhele, 2021). One of the factors that acts as a barrier in using instructional materials is the unavailability of the resources in schools, which negatively affects the learners' academic performances. A study by Seth (2009) in Ghana proved that the shortage of teaching resources in secondary schools compromised the quality of teaching and learning and it resulted in the low achievement of the learners. The inadequate supply of instructional resources in schools is also exacerbated by the lack of financial support (Sengai & Mokhele, 2021). Irrespective of the contribution of teaching materials in teaching and learning, the deficiency and the poor usage of these tools prevent the effectiveness of delivery of the lesson in the classroom (Lawal, Rumah & Amadi, 2020).

The lack of financial support prevents the teachers from using some of the valuable instructional materials especially the audio-visual ones, which form part of ICT devices. Lloyd (2020) asserts that the use of ICT infrastructure in Africa is lagging behind, as many African countries are still struggling to incorporate ICT in the education sector. Despite the rich policies of using ICT in the education system, most African countries, have limited use and application of ICT (Bariu, 2020). The teachers cannot use resources that are not available in their schools. If the instructional resources and the kits for teaching and learning in schools are lacking, the provision of quality education is negatively impacted (Bariu, 2020). Hence, a better-quality education can be achieved if the teachers are provided with all the necessary quality-teaching tools, and they are utilised in a proper way. Dhakal (2017) reveals that the teachers should utilise suitable instructional materials to make teaching and learning activities conducive. Ghazali et al. (2009) point out that the insufficient provision of instructional resources

in secondary schools demotivates the learners. This literature is important to this study as it focus on finding out the types of instructional materials that are available in the teaching and learning of Life Sciences. It will also assist the researcher to find out whether the materials help teachers to teach effectively in their classroom.

2.6.4 The level of accessing instructional materials in Schools

The main aim of introducing and using instructional resources by Life Sciences teachers is to enrich the teaching and learning process and to improve the teachers' competence to make learning and teaching relevant. The teachers who lack knowledge and skills cannot access and use these materials to teach Life Sciences. Kwasu (2015) stated that the teachers cannot access and use instructional resources if they have inadequate knowledge of how, when, which, why and what instructional resources they should to use when they are teaching certain Life Sciences concepts.

Kwasu (2015) further observes that the teachers who continue to use the conventional method to teach Life Sciences do that because they lack the knowledge, and they have very limited exposure to the resources and how to apply them to teaching. Okobia (2011) supports this view when findings showed that teachers were depending on the chalkboards and textbooks; yet there were appropriate instructional resources such as audios and audio-visual aids that were rarely used. The Life Sciences teachers are thus more likely to use instructional materials that are easily accessible to them, such as the textbooks and the chalkboards and it is easy to use these materials. The implication is that the teachers continue with the traditional approach of "chalk and talk" and do not utilise other types of instructional materials for teaching. According to Effiong and Igiri (2015), the non-availability and the lack of the use of teaching tools in secondary schools is one of the reasons why the learners find it challenging to comprehend what the teachers are teaching.

The teachers have the tendency of saying they do not have enough materials for teaching and learning or the school does not provide them with the required materials for teaching and learning. Therefore, they do not bother to go an extra mile in accessing the resources that are available online. A good teacher should access and improvise the resources for the learners, no matter what the circumstances are. Dawidi (2020) found that the teachers with more experience in teaching have negative attitudes concerning the instructional materials that were inadequately accessible in

their schools and they were not willing to access or improvise. On the contrary, the teachers with less teaching experience had a positive attitude towards the utilisation of teaching materials in secondary schools (Dawadi, 2020).

The scarcity, the inappropriate use, and the inaccessibility of instructional materials by the teachers in the Niger State schools resulted in the non-utilisation of the resources when teaching and consequently a high rate of failure among the learners in the external examinations (Bukoye, 2019). The teachers can use the internet as a source of materials to access resources for teaching and learning. The utilisation of the internet as a way of accessing materials can easily allow the teachers to access different educational information, which can assist in increasing the learners' knowledge (Mutia, Gimin & Mahdum, 2020). The teachers can also use internet blogs to access instructional materials so that the learners can have inexhaustible resources for learning which may be reinforced by videos, sounds or images (Mutia, Gimin a& Mahdum, 2020). The teachers should intrinsically be motivated to access instructional materials on their own without depending heavily on the school or education department to provide them. In doing so, they will expose the learners to various teaching tools which will enable the learners to understand Life Sciences and increase their academic achievement.

2.6.5 Learners' barriers to learning

The National Policy Pertaining to the Programme and Promotion Requirements (NPPPR) stipulates that learners have different barriers to learning, which may hinder the effective use of certain instructional materials and affect the assessment (DBE, 2012). For example, the NPPPR clearly states that some of the learners may be short-sighted or far-sighted, or deaf, and some may struggle to read, write and spell (dyslexia). If a learner has dyslexia, as a teacher cannot just give the learner handouts and expect them to understand what is written (DBE, 2012). The same applies to the learners who are deaf; the use of audio-instructional materials is not effective for them. The researcher suggests that teachers should know when to use certain instructional materials to cater for learners' different barriers to learning. The DBE should also be responsible in making sure that learners are supplied with relevant instructional materials that will cater their needs.

2.7 Theoretical framework

The Reigeluth Instructional Design Theory (IDT) supports the study. According to Reigeluth (1999), the theory is focused on the goal, as it explains the approaches of teaching and the conditions where the approaches should be used. Hence, the approaches should be divided into easy components so that the learners can understand the concepts. In addition to, Wiley (2000) states that the IDT application should play a major part in applying the learning outcomes and the advances in facilitating learning so that learners can understand the concepts.

Reigeluth (1999), further states that the theory is important because it features the methods that are not universal, but are situational, in the sense that only a particular technique would work best in an ideal condition, while another would also work best in various other conditions. The methods are divided into two, the instructional conditions and the desired instructional outcomes. The instructional conditions focus on the nature of the learner and the content to be learned, the learning environment and the instructional improvement constraints. The desired instructional outcomes focus on the level of effectiveness of the instruction.

The instructional design theory was used to help the teachers to plan and organise the instructional process to achieve the instructions that would advance the efficacious of teaching and learning of Life Sciences. This study used desired outcomes to explore the impact of using instructional materials in the teaching and learning of Life Sciences in secondary schools. Reigeluth desired outcomes include three levels namely effectiveness, efficiency and appeal. The researcher used the level of effectiveness and efficiency to check whether using instructional materials is effective in the teaching and learning of Life Sciences by checking the teachers views on the impact of using instructional materials when teaching. Lastly, the level of appeal assisted the researcher to explore the extent that teachers use instructional materials to teach Life Sciences. The three level of desired outcomes also assisted the researcher to collect and analyse quantitative. In order to ensure that effective teaching and learning takes place, the education stakeholders that include teacher components should play a role in organising instructional materials that will assist towards the achievements of the learners. The instruction in this case is referred to as the teaching strategies and the learning activities that are used to organise learning.

Gustafson (1996) indicates that the instructional design theory helped in the following: It examines the concepts that are taught and learnt, organises how the concepts are taught and learnt, and organises the revision and assessment for the learners. Thus, it enhances the teachers to know which concepts to teach in the classroom, how to teach the concepts, which instructional material would be suitable for teaching a particular concept. Lastly, it indicates how to use the instructional material to teach and how to evaluate and assess whether effective teaching and learning took place.

The theory was chosen because it deals with how teaching resources should be made relevant in a teaching and learning environment. The theory also establishes the connection between making use of teaching tools and its impact in the teaching and learning of Life Sciences in secondary schools.

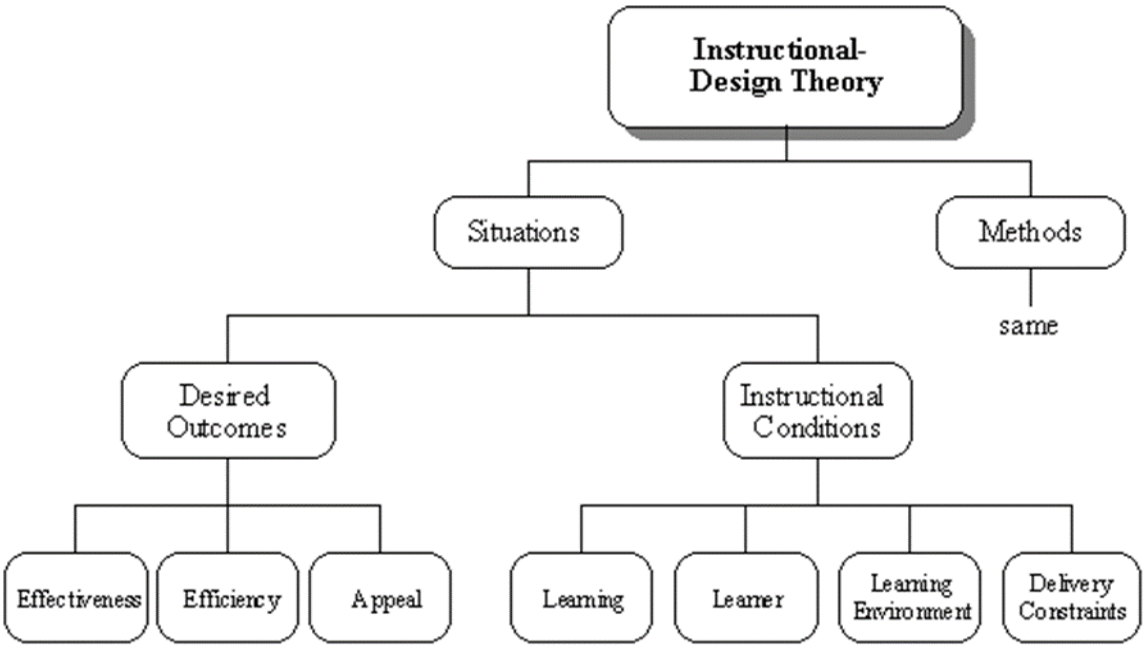

Figure 2.1: The components of the instructional design theory

2.8 Conclusion

The utilisation of instructional materials to teach Life Sciences sometimes seems simple, whereas in reality there are many challenges that are faced by Life Sciences teachers to effectively deliver the content to the learners. The insufficient supply of instructional materials hinders the teachers to use the resources. Apart from that, the educators who lack knowledge and who are inadequately trained on how to use some

of the resources also contribute towards the barriers in utilising the resources. Although these challenges are known, the teachers should not do away with the instructional materials, as they are indispensable in the Life Sciences teaching and learning space.

The literature from this study concurred that the instructional repertoires play a prominent part in improving the learners' achievements as well as in promoting effective teaching and learning. Hence, the repertoires which include audio, visual and audio-visual materials can be used to motivate the learners to obtain quality results and to eradicate the notion that Life Sciences is difficult. Therefore, to achieve productive and an ideal teaching and learning, the instructional tools should be utilised in the teaching and learning environment.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter is aimed at unfolding the study's research method. Sileyew (2019) made the statement that research methodology involves the pathway whereby the researchers need to conduct their study or research. The chapter explicates the research design, the population, the sampling techniques, data collection and the data analysis tools that were utilised during the conduction of the research. The study adopted a quantitative research method as it focused on collecting numerical data and the SPSS tool was utilised to analyse the data. The opportunity of choosing a quantitative research method was guided by Kumatongo and Muzata (2021), who asserted that a quantitative research method is aimed at finding facts, testing theories, and representing the associations between the variables and predicting the results.

The quantitative research method emphasises objectivity in describing and measuring phenomena (McMillan & Schumacher, 2014). According to Babbie (2010), the quantitative method emphasises the statistical analysis and objective measurements of data collection though surveys and by handling data using calculation. Additionally, Khusainova, Shilova and Curteva (2016) emphasise that it is essential to choose the best research method that is appropriate for a study to produce credible results.

3.2 Research design

A research design is the strategy that describes the procedures and the conditions for selecting participants, as well as for accumulating and analysing data (McMillan & Schumacher, 2014; Creswell & Poth, 2017). This study used a survey design. Avedian (2014) views a survey as an orderly technique that is used to obtain data from a sample of groups with the aim of creating computable descriptors of the characteristics of the bigger population, which consists of members of the group. The survey design gives a quantifiable or computable explanation of trends, approaches, or ideas of a population by engaging a sample of that population (Creswell, 2017); hence, inferences are drawn from the sample results. Check and Schutt (2012) applauded the research design as it deals with the data collection of individuals from a sample through the replies to the questions.

Sukamolson (2007) explicated that the design makes use of scientific sampling, and the questionnaires were designed in such a way that they measure the features of a population using numerical accuracy. Cohen, Manion and Morrison (2002) likewise explicated that in a survey, a sample is chosen from the members of the population that have the same characteristics of interest. Hence, in this study, only the Life Sciences teachers in secondary schools were chosen as they met the characteristics of the study interest. The findings from the sample of the Life Sciences educators were used to reach generalisations on the availability, the utilisation of instructional resources and the impact this had in the teaching and learning of Life Sciences in the secondary schools. The generalisations of the findings from the study were guided by Kraemer (1991), who affirmed that in a survey, the research findings could be utilised to make generalisations of the whole population, based on the selected part of the population.

The study subscribed to a positivist paradigm, as it employed a quantitative method, and this would assist the researcher to succinctly understand and address the problem that is revealed in the problem statement in Chapter one. According to Perera (2018), the research paradigms are shared beliefs, that is, the principles that the researchers share to understand and address the problems. Schwandt (2001) views a paradigm as a common worldview in a discipline that exemplifies the values, as well as the

beliefs and shows how the problems are solved. A positivist paradigm was selected, as truth is based on accurate observations and measurements that are verifiable and tested, hence it views the nature of knowledge as objective (Chilisa & Kawulich, 2012).

Positivism is therefore interpreted from an objective point of view as an approach of gauging reality (Kumatongo & Muzata, 2021). In the same vein, Selvan (2017) ascertained that the positivists embrace a prospect that truth is a unit belief system, as it can be retrieved by systematic approaches. The positivist paradigm assisted the researcher in formulating the closed-ended questionnaire for collecting the data and for using descriptive as well as inferential statistics to analyse the data to make some inferences. Secondly, a paradigm supported the researcher in finding the level of available resources. This was aimed at determining the impact of using instructional materials in the teaching and learning of Life Sciences in advancing educational efficacy.

In the study, the researcher therefore used a highly structured closed-ended questionnaire to collect data, which helped to ascertain the availability, the use, and the impact of instructional resources in the teaching and learning of Life Sciences. Furthermore, it exposed the teachers to the different types of instructional materials, which may be engaged during the delivery of a lesson by enabling teachers to integrate the different types of instructional materials when they are teaching in the classroom. Thus, the Life Sciences teachers subsequently were offered a chance to express their opinions on the instructional materials used, and how they assisted them in lessons. Conversely, it permitted the researcher to make use of descriptive statistics to analyse the data where graphs, percentages, and frequency counts were presented. However, inferential statistics were applied, where the Chi-square test, the Kruskal-Wallis H test and the Mann-Whitney U test were presented to make inferences based on the descriptive statistics.

3.3 Study site

This study was conducted in the Mpumalanga Province at Ehlanzeni District. The Mpumalanga Department of Education has four school districts, which are Ehlanzeni, Nkangala, Gert Sibande and Bohlabela. The area of focus of the study was the Ehlanzeni School District, which comprises of two municipalities, the Nkomanzi Local Municipality, and the City of Mbombela. The Ehlanzeni School District consists of 15

school circuits, which are controlled by the Circuit Managers. According to (DBE, 2013), “education circuit is the second- level administrative sub-division of a Provincial Education Department”. Only the secondary schools and the Life Sciences teachers were targeted. A teacher in each of the five schools per circuit out of the 15 circuits was randomly selected. The most dominant language used in the district is SiSwati; therefore, most of the people that are found in the area are Swazis.

3.4 Population

McMillan and Schumacher (2010) define a population as an event or a collection of individuals that is drawn from a sample and the results obtained from the sample can be generalised. Likewise, Neuman (2014) views the population as a group of individuals that is obtained from a sample by a researcher through reaching generalisations about the findings from the sample. In this study, the researcher viewed the population as a collection of Life Sciences teachers that bear the same features, such that the generalisations might be made from the findings that are gathered from the sample of the population.

The population may comprise of the teachers, the school districts, the municipalities, the learners, and the ethnic groups. In this study, the Life Sciences teachers from the various circuits in the Ehlanzeni School District were chosen as the target population. Only the secondary schools were selected from the district as the Life Sciences subject is offered in secondary schools starting from Grade 10 to Grade 12. The five schools in each circuit were randomly selected. It was difficult for the researcher to account for the number of Life Sciences teachers per school in the District, as the number of the teachers are determined by the number of learners (enrolment) per school. Thus, the number of Life Sciences teachers in schools differs according to the number of learners in each school. For example, in some of the schools that the researcher has visited, there were three Life Sciences teachers in a school, while other schools have five and more Life Sciences teachers. The number of learners determine the number of teachers per school. The higher the number of learners the more the District allocate Life Sciences teachers to the school. Conversely, the lower the enrolment the lesser the number of teachers will be found in that particular school.

3.5 Sampling

A sample is the subgroup that represents the population, and it is utilised to draw conclusions concerning the entire population (Avedian, 2014). In this study, a sample refers to the individual Life Sciences teachers that were chosen by the researcher from a large population with the intention of participating actively in a study and to reach generalisations of the entire population. Sampling is categorised into two groups, which are non-probability and probability sampling. In probability sampling, an individual from the population has an equivalent opportunity to be involved in the sample. However, in non-probability sampling the possibility of choosing an individual from a population is guaranteed (McMillan & Schumacher, 2014).

The researcher in this study adopted a probability sampling method, wherein the simple random sampling was utilised to sample the Life Sciences teachers and schools from the 15 circuits in the Ehlanzeni District. Firstly, the researcher obtained database of the 15 circuits in the district together with the list and names of the secondary schools in each circuit with the help of Life Sciences subject advisor. Then five schools per circuit were randomly selected. The schools and the Life Sciences teachers in the various circuits thus had an equal opportunity of being chosen and this was an added advantage for the study, because a sample was taken from the large population. Taherdoost (2016) attested that everyone from a population is more likely to form part of the sample in probability sampling.

3.6 Data collection

Data collection is the method of collecting and assessing information to allow a researcher to respond to the research questions, test the hypotheses and to assess the results (Muhammad & Kabir, 2016). Ajayi (2017) opined that data collection has a significant role in statistical analysis. However, there are two categories a researcher can use as a way of gathering information, which are primary and secondary data (Douglas, 2015). The researcher collects primary data at the introductory stage of the research while secondary data is the existing data that had already been collected by other researchers and sources (Ajayi, 2017).

In this study, primary data was collected, as it is highly recommended for researcher to produce accurate results. Ajayi (2017) eloquently revealed that primary data is

accurate and original, as the collected data also addresses the problems that are at hand. The logic of using primary data was to have an insight of first-hand information concerning the availability, the use, and the impact of applying instructional materials in the teaching and learning of Life Sciences and to make some recommendations. A closed-ended questionnaire was adopted to gather primary data for this study. Reja, Manfreda, Hlebec & Vehovar (2003) state that the responses to the closed-ended questionnaires have the tendency of limiting the respondents, as they offer a set of alternatives. However, Neuman (2014) expressed the view that in a closed-ended questionnaire, it would be more likely that the respondents would give responses concerning sensitive topics.

The researcher made arrangements with the participating Life Sciences teachers before they were given the questionnaire. The questionnaire was structured in such a way that it was not confusing to the participants to give their responses as the closed-ended questions were straightforward and easy to understand. The researcher personally distributed the questionnaire to the educators. Some of the questionnaires were sent via e-mail to the teachers. Some of the questionnaires were delivered with the help of cluster leaders and Life Sciences subject advisor. Out of the 75 questionnaires that were distributed, 28 were sent via e-mail and 47 were physically given to the participants. In a large sample, a closed-ended questionnaire is useful because it can generate frequencies of responses that can be used in statistical treatment and analysis (Neuman, 2014). A closed-ended questionnaire allows the respondents enough time to properly think about the questions and they are free from an interviewer's bias (Kothari, 2004). The data was collected for a period of seven weeks.

The questionnaire was divided into three sections. Section A, represented the demographic information of the participants which included, gender; race; age group; academic qualifications and teaching experience. Section B included the types of instructional materials that are available and the extent of using instructional materials. Section C consisted of teachers' views on the impact of teaching using instructional materials. The questionnaire was considered reliable as the reliability test generated a Cronbach Alpha of 0.778. The questionnaire was designed in such a way that it included a Likert scale, a checklist (as question 6 of the questionnaire required the

participants to indicate by yes or no whether the types of instructional materials listed on the questionnaire were available or not available), and a rating scale. For the question “Which types of instructional materials are available in secondary schools in the Ehlanzeni District?”, a checklist was used to check the types of instructional resources that are obtainable in the schools. Whitcomb and Merrell (2012) state that using a checklist gives the respondents the freedom of choosing multiple responses that apply, as the questions are designed to provide a list of multiple responses.

On the other hand, the questionnaire had a rating scale, which consisted of a five-point measure of agreement (always, three times a week, twice a week, once a week and never), and it was used in the question “To what extent do teachers use instructional materials to teach Life Sciences?” This was done to gain an insight of the level at which the teachers use the different types of instructional materials in a week. A Likert scale was used to check the impact of instructional materials in the teaching and learning of Life Sciences, and to determine whether the use of teaching resources promoted efficacious teaching and learning. In this study, a Likert scale consisted of five-point symmetrical responses starting from 1=strongly disagree, 2=disagree, 3=neutral, 4= agree, and 5=strongly agree.

3.7 Data analysis

Calzon (2021) described data analysis as a technique of displaying the collected data and analysing it to gain insight that would assist in decision-making. Data analysis involves an inductive technique in which data is organised into groups, classification of trends and associations between the groups (McMillan & Schumacher, 2010). Since the study adopted a quantitative approach, a statistical package (SPSS software, version 27) was employed to analyse data statistically. Descriptive statistics was employed where graphs, percentages and frequency counts were presented. The numerical data was also presented in a table. Marczyk, DeMatteo & Festinger (2005), corroborated that in a quantitative study, the descriptive statistics are used to analyse the collected data to accurately characterise the variables under observation within a specific sample. In this study, large data therefore was reduced and organised into manageable data to present it in a summary of tables, graphs, percentages, and frequency counts. After the descriptive statistics had been applied, the inferential statistics was used to make inferences and generalisations of the findings.

3.7.1 Descriptive statistics

Descriptive statistics is a statistical analysis method that is utilised to abridge data, arrange, and lessen enormous numbers of observations (McMillan & Schumacher, 2010). It also helps the researchers to make a summary of the variables from the data (Sarka, 2021). Descriptive analysis was used to analyse the demographic information of the participants, which included but was not limited to gender, age groups, cross-tabulation of academic qualifications and teaching experience. It was also used to check the accessibility of instructional materials in the secondary schools in the Ehlanzeni District, as well as the extent to which the teachers use the available instructional materials. The analysis was used where graphs, charts, frequency counts and percentages were presented.

3.7.2 Inferential statistics

In inferential statistics, the researchers can compile reports concerning the population with regard to the knowledge about the samples (Wooditch, Johnson, Solymosi, Ariza & Langton, 2021). Thus, the researchers can also make inferences concerning the entire population through the data obtained from the samples (Wooditch et al., 2021). After the descriptive statistics had been applied, the inferential statistics was used to make inferences and generalisations of the findings. A Pearson correlation was computed to determine whether there is a correlation between the age groups and teaching experience of the teachers. The Chi-square test was used to check whether the utilisation of instructional materials depend on the availability of instructional materials. A Kruskal-Wallis H test was used to check if there was any relationship between the teachers teaching experience and the extent of using instructional materials for teaching and learning of Life Sciences. All inferential statistics tests were calculated at a $p < 0.05$ level of confidence.

3.8 Validity and reliability

It is significant to make sure that the validity and reliability of the research instrument are taken into consideration to minimise errors and to increase the accuracy of the research findings. Validity and reliability assist the researchers in their studies to attain credible and reliable results. Kumar (2005) outlined validity as the point to which the researchers measured what they wanted to measure. According to Heale and

Twycross (2015), validity in quantitative research is the extent of measuring precision in a model. To guarantee the validity of this study, the researcher consulted the experts before handing the research instrument (a closed-ended questionnaire) to the participants. The questionnaire was pre-tested with ten participants from the targeted population. Adjustments and improvements were made to ensure the validity of the questionnaire.

Reliability is the measure that provides reliable outcomes with equivalent values (Blumberg, Cooper & Schindler, 2005). Neuman (2014) viewed reliability as the measure of dependability. For the sake of ascertaining the reliability of the results, the data from the participants was thoroughly checked before it was captured in the statistical package SPSS version 27 to minimise errors before analysing the data. Cronbach Alpha was used to check the reliability of the questionnaire.

Table 3.1: The coefficient of reliability of the questionnaire

	Reliability Statistics		
	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
Types of instructional materials that are available in the Ehlanzeni District	.813	.798	22
Extent of using instructional materials	.802	.812	23
The impact of using instructional materials to promote effective teaching and learning	.824	.825	8

Cronbach Alpha (α) was used in order to determine the reliability of the questionnaire. The reliability test showed .813 for the types of instructional materials that are available in the Ehlanzeni District, .802 for the extent of using instructional materials in a week to promote effective teaching and learning of Life Sciences and .824 for the impact of using instructional materials to promote effective teaching and learning. The questionnaire of the study was reliable. Amirrudin et al. (2021) underscored that Cronbach Alpha value of .70 and above shows that the questionnaire is considered reliable.

3.9 Ethical considerations

Ethics is one of the significant aspects of research, thus the researchers should apply ethics to guard the rights of the partakers and to maintain privacy. In this study, the following ethical issues were addressed.

3.9.1 Informed consent

Tai (2012) confirmed that informed consent was a necessity in research ethics as it is the most essential aspect of research. The participants were given consent forms prior to the gathering of data where they agreed or confirmed their involvement in the study. The teachers were advised that they should volunteer to partake in this study. The researcher acquainted the participants with the fact that if they wished to withdraw, they were free to do so at any stage and there would be no penalties or consequences.

3.9.2 Privacy, confidentiality, and anonymity

Ethical issues such as privacy, anonymity and confidentiality were explained to all the stakeholders involved in the research. Confidentiality was considered by ensuring that the results gathered in the study would be kept confidential. Anonymity was taken care of by ensuring that pseudonyms were used where there was a necessity.

Marczyk, et al. (2005) stipulated that it was the responsibility of the researcher to keep information secure in terms of the law and any information that might affect the confidentiality and dignity of the study participants. The participants' personal information was not disclosed to anyone. It would remain in the hands of the researcher and would be kept private.

3.9.3 Permission to conduct research

The ethical clearance to carry out this study was requested from the University of Limpopo, Turfloop Research and Ethics Committee (TREC) and permission was granted. The researcher also requested approval from the Mpumalanga Department of Education (MDE) to carry out the study. After obtaining the approval from the MDE, the other stakeholders, including the District Director, and the Circuit were provided with the proof of approval from the MDE before commencing with the study.

3.9.4 Protection from harm

To prevent harm, it is necessary to apply pertinent ethical principles. The safeguarding of participants in a research study is crucial (Orb, Eisenhauer & Wynaden 2001). The confidential data that was gathered from the participants was not revealed and the participants were not identified. The researcher protected the participants at all costs, therefore, the participants' names and the names of the schools were not revealed, and the information will remain in the hands of the researcher. Pseudonyms were used where necessary, instead of the schools and the teachers' names.

3.9.5 Prevention of deception

It is unethical to use deception in research, and as suggested by Tai (2012), a high moral standard is required in research. When researchers use deception, they do not enlighten the participants in detail about the aim of the study (McMillan & Schumacher, 2010). The researchers should prevent deception whenever they conduct studies to prevent harm to the participants. In the study, the researcher prevented deception by giving the participants the requisite information regarding the project before the commencement of this study. The participants had ample time to make informed decisions about study participation. The results that were obtained from the study were truly representative of the participants' contributions as there were no alterations made to the collected data.

3.10 Conclusion

The chapter presented the study's approach, and it was clarified in detail to display its relevancy to the study. Moreover, the study design, the sampling technique, the gathering of data and analysis were also discussed in detail. Furthermore, the validity of the research instrument and the reliability of the results also outlined the relevancy of the study's methodology. Ethical consideration was highly articulated in this chapter.

The following chapter (Chapter 4) represents the analysed data. The results findings are discussed below.

CHAPTER 4: DATA PRESENTATION, ANALYSIS, AND INTERPRETATION OF FINDINGS

4.1 Introduction

The chapter is aimed at presenting the data, as well as analysing, and interpreting the findings. It also represents the demographic information of the participants. The results of the study are interpreted and discussed, based on the research objectives and the research questions that are found in Chapter one of the study. A descriptive statistics technique was employed to represent the data. An SPSS package was used to represent the data in tables, graphs, charts, frequency counts and percentages. Inferential statistics was also employed to make some inferences where a paired samples test, an independent samples test, a Mann-Whitney U test and a Kruskal-Wallis H were presented.

4.2 Response rate

The size of the sample consisted of 75 Life Sciences teachers. The response rate was very good. All the teachers that were given the questionnaire returned them via e-mail or WhatsApp and some of the questionnaires were collected by the researcher. Although in some of the questionnaires there were questions that were not answered by the participants, these were very few as compared to the questions that were answered. The researcher handled the questions that were not answered by allocating zero (0) when capturing the data in the SPSS software. Not all the questions that were not answered in the questionnaire formed part of the results. This shows that the teachers were willing to participate, and they were not forced to do so, as they left some of the questions unanswered.

4.3 Demographic information of the participants

Figure 4.1 shows that out of the 75 partakers, there were 52% males and 48% females. Thus, there were 39 males and 36 females. In terms of gender, the participants were equally distributed to avoid bias in terms of gender in the study.

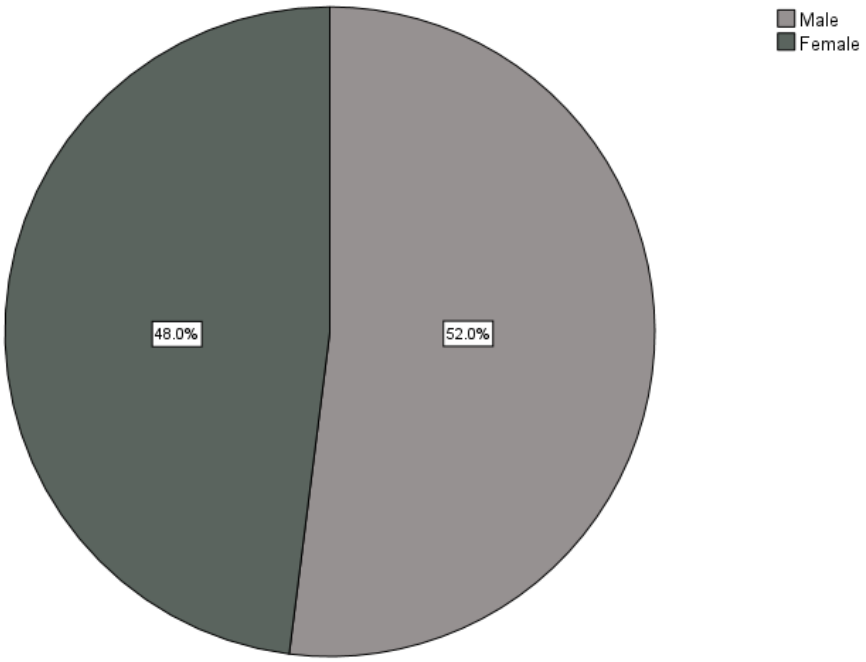

Figure 4.1: Gender of the participants in percentages

Table 0.1: Race and academic qualification of participants

		Race			
		African Count	**White Count**	**Coloured Count**	**Indian Count**
Academic qualification	PhD	0	0	0	0
	Masters	1	0	0	0
	Honours	19	0	0	0
	Degree	45	0	0	0
	Diploma	4	0	0	0
	ACE	6	0	0	0

Table 4.1 revealed that all the participants were African. This implied that African teachers dominate the Ehlanzeni District and most of the schools are located in remote areas. Only one of the participants has a master's degree while none of the participants has a PhD. Most of the participants have Bachelor's Degrees, 19 out of 75 have Honours Degrees, a few have Diplomas and Advanced Certificates in Education

(ACE). The results from the table above shown that all the participants are qualified to teach Life Sciences; hence, they are also knowledgeable about the subject content.

Table 0.2: Age group of participants

Age Group	Frequency	Percent (%)	Cumulative Percent (%)
20-30 years	35	46.7	46.7
31-40 years	14	18.7	65.3
41-50 years	14	18.7	84.0
51-60 years	10	13.3	97.3
60+ years	2	2.7	100.0
Total (n=75)	75	100.0	

Table 4.2 discloses that 46.7% of the participants were between 20 and 30 years of age, which is a sign that the majority of the educators who participated in this study consisted of young people, and they were eager to serve the Department of Basic Education. There was a low percentage (18.7%) of middle-aged participants between 31 and 40 years of age from the table above, 18.7% of the respondents were between 41 and 50 years of age and they had been in the system for quite some time. The participants who were between 51 and 60 years and above 60 years consisted of 13.3% and 2.7% respectively. All the different age groups of the teachers were included in this study. This is proof that the researcher was not biased in terms of choosing the age groups of the participants although most of the participants were middle-aged, as shown in table 4.2. The age groups ranged from 20 years to more than 60 years.

Table 0.3: Cross-tabulation of academic qualification and teaching experience of Life Sciences teachers

			Teaching experience							Total
			0-5 Years	6-10 Years	11-15 Years	16-20 Years	21-25 Years	26-30 Years	31-35 Years	
Academic qualification	**Honours and Masters**	Count	5	1	8	4	1	1	0	20
		% of Total	6.7	1.3	10.7	5.3	1.3	1.3	0.0	26.6
	Bachelor's Degree	Count	29	6	4	4	0	1	1	45
		% of Total	38.7	8.0	5.3	5.3	0.0	1.3	1.3	60.0
	ACE and Diploma	Count	1	3	3	0	2	1	0	10
		% of Total	1.3	4.0	4.0	0.0	2.7	1.3	0.0	13.3
Total		Count	35	10	15	8	3	3	1	75
		% of Total	46.7	13.3	20.0	10.7	4.0	4.0	1.3	100.0

Table 4.3 reveals that a total of 26.6% of the partakers had Honours and master's degree. Out of the 26.6% participants with Honours and master's degree, at least 10.7% had a teaching experience that ranged from 11 to 15 years which was a higher proportion amongst all the ranges of teaching experience. Only 1.3% had a teaching experience of more than 20 years, this showed that there is a shortage of Life Sciences teachers with Honours and master's degrees who have a lot of teaching experience in the field. Most of the Life Sciences teachers have Bachelor's degrees as 60% of all the participants in this study obtained Bachelor's degrees. However, most of the participants with Bachelor's degrees do not have many years of teaching experiences as 38.7% have a teaching experience that ranged from zero to 5 years. There were few participants with Diplomas and Advanced Certificates in Education, as they constituted a total of 13.3%, which is below 15% when combined, respectively. The results in Table 4.3 also expounded that the educators who were less experienced were more qualified, while the teachers with more teaching experience were less qualified. For example, only 5.3% of the participants with a teaching experience that ranged from 16 to 20 years had Bachelor's degrees while 6.7% of the participants with a teaching experience of between 0 to 5 years had Honours and Masters degrees.

A cross-tabulation was used to identify whether teaching experience of teachers is influenced by the age group. The findings are revealed in the table below.

Table 0.4: Cross-tabulation of age group and teaching experience of Life Sciences teachers

		Teaching experience							Total
		0-5 Years	6-10 Years	11-15 Years	16-20 Years	21-25 Years	26-30 Years	31-35 Years	
Age group	20-40 years	35	9	5	0	0	0	0	49
	41-60 years	0	1	9	8	3	3	0	24
	60+ years	0	0	1	0	0	0	1	2
Total		35	10	15	8	3	3	1	75

Table 4.4 shows that 35 out of the 75 teachers between the ages of 20 to 40 years had teaching experience that ranges from 0- 5 years. On the other hand, most teachers who were 40 years and above had a teaching experience of more than ten years. The findings underscore that teaching experience of the teachers is affected by their age. The educators who are older had more teaching experience as compared to educators who are of younger and middle aged. Some of the participants from this study had a lot of teaching experience as table 4.4 reveals that 7 participants had a teaching experience of more than 20 years.

Table 0.5: Pearson correlation between the age group and teaching experience of the teachers

Correlations

		Age group	Teaching experience
Age group	Pearson Correlation	1	.866**
	Sig. (2-tailed)		<.001
	N	75	75
Teaching experience	Pearson Correlation	.866**	1
	Sig. (2-tailed)	<.001	
	N	75	75

**. Correlation is significant at the 0.01 level (2-tailed).

A Pearson correlation was computed to determine the relationship between the age group and teaching experience of the teachers. Table 4.5 Shows a positive correlation between the age group and teaching experience of the teachers, r (75) = .87, p<.01.

4.4 Analysis and interpretation of findings

Which types of instructional materials are available in secondary schools in the Ehlanzeni District?

It was revealed in Chapter two from the literature that there are three types of instructional materials that can be utilised for teaching and learning Life Sciences in secondary schools, which are visual, audio and audio-visual. The data was only collected in schools in the Ehlanzeni District to find out the types of instructional materials that are available in the Ehlanzeni District. Secondly, to check whether the teachers were using the accessible instructional materials deliver the Life Sciences concepts and to scrutinise whether the use of instructional tools promoted effective teaching and learning. Table 4.6 displays that the majority of the participants' responses revealed that there were more visual resources available in the schools in the Ehlanzeni District. The most available visual instructional materials comprised of textbooks (98.7%), chalkboards (90.7%) and charts, which constituted of 84.0%. Thus, many secondary schools have sufficient visual instructional materials even though some were not available. However, there was inadequate availability of some of the visual instructional materials, which included the foldscope, as only 14.7% available and 29.3% specimens were available.

Table 0.6: Availability of instructional materials

Type of instructional material	Instructional Materials	Number of instructional materials available	Percentage of instructional material that are available (%)	Percentage of instructional material that are not available (%)
Visual	Textbooks	74	98.7	1.3
	Pictures	59	78.7	21.3
	White boards	43	57.3	41.3
	Chalk boards	68	90.7	6.7
	Microscope	31	41.3	58.7
	Specimens	22	29.3	70.7
	Foldscope	11	14.7	85.3
	Pamphlets	59	78.7	21.3
	Charts	63	84.0	13.3
	Projectors	56	74.7	25.3
	Models	46	61.3	34.7
Audio	Compact Disc (CD)	31	41.3	58.7
	Radio	13	17.3	81.3
	Tape recorder	6	8.0	92.0
	Record player	3	4.0	96.0
	Audio cassettes	7	9.3	90.7
Audio-visual	Laptops/Computers	62	82.7	16.0
	Smartboards	33	44.0	56.0
	Edu boards	16	21.3	77.3
	Television	29	38.7	61.3
	Video recorders	14	18.7	81.3
	Multimedia	24	32.0	66.7
	Smart phones/ tablets	38	50.7	49.3
Total		**808**	**1077.3**	**1305.3**

Table 4.6 shows that laptops or computers (82.7%) were the most available audio-visual instructional materials. There was an average availability of tablets (50.7%) in schools in the Ehlanzeni District for the teaching and learning of Life Sciences. The results also pointed out that some audio-visual tools were adequately available, which included smartboards (44.0%), television (38.7%) and multimedia (32.0%). The findings pointed out that some of the audio-visual instructional material for the teaching of Life Sciences was inadequately available such, as Edu boards (21.3%) and video recorders (18.7%).

The majority of the schools in the in the Ehlanzeni District lacked audio instructional materials, as indicated in the table above. The findings disclosed that only 4.0% had record players, 8.0% had tape recorders and the availability of audio cassettes was merely 9.3%. Even radios, which play a crucial part in the teaching and learning

through the various educational radio programmes supported by the Department of Basic Education and the South African Broadcasting Corporation (SABC), were inadequately available in the secondary schools. Hence, the findings revealed that only 17.3% radio audio material was available. This proved that approximately (90%) audio instructional materials were not available in the schools.

Similarly, most of the audio-visual instructional materials were not available. There were few audio-visual instructional materials that were available for teaching Life Sciences. These included but not limited to multimedia (32.0%) and video recorders (18.7%) that were available. In addition, the findings showed that many schools are currently inadequately supplied with audio and audio-visual instructional resources, as the level of availability was very low. On the other hand, there were few visual teaching tools that were not available for teaching and learning in the Ehlanzeni District secondary schools, for instance 1.3% textbooks, 6.7% chalkboards and 13.3% charts were not available.

To what extent do the teachers use instructional materials to teach Life Sciences?

One of the crucial aspects that makes the teaching and learning of Life Sciences in secondary schools meaningful is the utilisation of the different teaching tools to cater for the learners' preferences or choices. Table 4.7 is aimed at revealing the teachers' extent of the utilisation of teaching tools to check whether the teachers are incorporating the different types of instructional materials when teaching Life Sciences.

Table 4.7 highlights that chalk boards (91.9%), textbooks (83.8%), pictures (30.1%) and charts (27.0%) are the most used visual instructional materials to teach and learn Life Sciences in secondary schools as the teachers are always using the resources every day in their classroom. Hence, it is commonly known that the teachers rely on the textbook and chalkboard to teach and the findings from this study confirmed the assertion. In the same vein, the level of using visuals as an instructional material is very high among the Life Sciences teachers.

Table 0.7: Life Sciences teachers' utilisation of instructional materials in a week

	Always		Three times a week		Twice a week		Once a week		Never	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Textbooks	62	83.8	6	8.1	5	6.8	1	1.4	0	0.0
Pictures	22	30.1	11	15.1	11	15.1	17	23.3	12	16.4
White boards	17	22.7	8	10.7	7	9.3	6	8.0	37	49.3
Chalk boards	68	91.9	2	2.7	1	1.4	1	1.4	2	2.7
Microscope	2	2.7	4	5.4	2	2.7	16	21.6	50	67.6
Specimens	0	0.0	2	2.8	2	2.8	15	20.8	53	73.6
Foldscope	0	0.0	1	1.4	1	1.4	4	5.4	68	91.9
Pamphlets	25	33.8	10	13.5	10	13.5	14	18.9	15	20.3
Charts	20	27.0	10	13.5	16	21.6	14	18.9	14	18.9
Projectors	7	9.3	4	5.3	13	17.3	25	33.3	26	34.7
Models	5	6.7	4	5.3	15	20.0	18	24.0	33	44.0
Compact Disc (CD)	1	1.3	1	1.3	3	4.0	12	16.0	58	77.3
Radio	2	2.7	0	0.0	3	4.0	7	9.3	63	84.0
Tape recorder	1	1.3	0	0.0	3	4.0	2	2.7	69	92.0
Gramophone/ podcast	0	0.0	0	0.0	1	1.4	0	0.0	73	98.6
Record player	1	1.4	0	0.0	0	0.0	1	1.4	72	97.3
Audio cassettes	0	0.0	1	1.4	1	1.4	6	8.1	66	89.2
Laptops/Computers	17	22.7	10	13.3	14	18.7	12	16.0	22	29.3
Smartboards	4	5.3	7	9.3	3	4.0	19	25.3	42	56.0
Edu boards	3	4.1	3	4.1	2	2.7	6	8.2	59	80.8
Television	0	0.0	0	0.0	2	2.7	16	21.6	56	75.7
Video recorders	3	4.1	0	0.0	0	0.0	10	13.5	61	82.4
Multimedia	4	5.4	4	5.4	3	4.1	11	14.9	52	70.3
Smart phones/ tablets	15	20.0	1	1.3	9	12.0	13	17.3	37	49.3

The level of using instructional materials is also affected by the availability of the resources. The results pointed out that the visual instructional materials for conducting practical activities in Life Sciences are not utilised by the teachers as (67.6%) microscopes, (73.6%) specimens and (91.9%) foldscopes are not utilised by the teachers in a week.

Although most teachers use visual instructional materials, it is shocking to find out that most of them do not use audio instructional resources when teaching Life Sciences. Only the 1.4% record players, 16.0% compact discs and (2.7%) tape recorders

teachers use once a week, whereas merely 1.4% podcasts are used twice a week. The level of disuse of audio materials for the teaching and learning of Life Sciences in a week is too high, as 92.0% tape recorders, 97.3% record players and 98.6% the teachers do not use gramophones at all in a week.

The findings in Table 4.7 alluded to the point that the majority of educators use laptops, smartphones and smartboards when teaching in their classroom and the resources are part of the audio-instructional materials. It is also shown in the table that 22.7% laptops and 20.0% smartphones are always utilised by the teachers when they are teaching. Teachers use only 25.3% smartboards at least once a week to teach their learners. However, the teachers rarely use some of the audio-visual resources to teach. It is shocking that many teachers are not using some of the resources at all, as 82.4% video recorders, 80.8% Edu boards and 75.7% televisions are not utilised by the teachers at all in a week. There is therefore a correlation between the available and the utilisation of instructional materials in the teaching and learning of Life Sciences. Teachers frequently use tools that are available in schools for teaching as well as learning and the findings of the study pointed to the fact that 98.7% textbooks are available in schools; hence, Table 4.8 revealed that the teachers on a daily basis during teaching and learning always use 83.8% textbooks.

Table 0.8 Chi-square test for the availability and utilisation of instructional materials for teaching and learning.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	38.865[a]	4	<.001
Likelihood Ratio	36.834	4	<.001
Linear-by-Linear Association	20.899	1	<.001
N of Valid Cases	74		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is 2.16.

A Chi-square test was carried out in order to check whether the utilisation of instructional materials by teachers depend on the availability of the instructional

materials. It was discovered from the Chi-square test that the utilisation of instructional materials by teachers to teach Life Sciences depend on the availability of the instructional materials as table 4.8 findings shows that, $x^2(4) = 38.865$, $p = <.001$. Thus, the researcher was of the view that the level of availability influences the teachers use instructional materials. The more the instructional materials are available, the more teachers use the instructional materials to teach Life Sciences in secondary schools. Contrastingly, there were instructional materials that were available which included video recorders, Edu boards and Smartboards but teachers barely use the resources.

Table 0.9: Cross-tabulation of gender and extend of using smartphones as instructional materials in a week

			Instructional material					
			Smartphones					
			Always	Three times a week	Twice a week	Once a week	Never	Total
Gender	Male	Count	19	0	5	8	7	39
		% of Total	25.3	0.0%	6.7%	10.7%	9.3%	52.0%
	Female	Count	8	1	4	5	18	36
		% of Total	10.7%	1.3%	5.3%	6.7%	24.0%	48.0%
Total		Count	15	1	9	13	37	75
		% of Total	20.0%	1.3%	12.0%	17.3%	49.3%	100.0%

A cross-tabulation was used to check whether the use of smartphones instructional materials to teach Life Sciences depend upon gender. Table 4.9 reveals that males used smartphones to teach Life Sciences more than females in a week as, 25.3% males always use their smartphones to teach, while 10.7% females always use smartphones to teach. The results in table 4.9 also shows that 24.0% of the females do not use smartphones at all to teach Life Sciences while, 9.3% males do not use smartphones at all to teach Life Sciences in a week. Thus, the researcher is of the view that there are instructional materials that males prefer to use to females when teaching Life Sciences and it applies to females.

Table 0.10: Chi-square test for the availability of audio, visual and audio-visual instructional materials and the level of usage

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.083[a]	3	.781
Likelihood ratio	1.065	3	.785
Linear-by-linear association	.003	1	.957
N of valid cases	72		

a. 4 cells (50,0%) have expected count less than 5. The minimum expected count is 2,89.

A Chi-square test was conducted to check whether the level of utilisation of the three types of instructional materials in schools is influenced by the availability of the instructional materials. The findings in table 4.10 illustrates that there was no statistical significance between the availability of the three types of instructional materials and the level of utilization, as $x^2(3) = 1.083$, $p > .05$. Most of the teachers were, however, unable to utilise the audio and the audio-visual instructional materials because of the scarcity of skills to utilise some of those resources. In addition, most of the audio and audio-visual materials were not available in the schools, which acted as a barrier to prevent the teachers from utilising the resources in order to promote effective teaching and learning of Life Sciences in secondary schools.

Table 0.11: Chi-square test for gender and the teachers' preferences for using audio-visual materials

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.394[a]	4	.249
Likelihood ratio	6.939	4	.139
Linear-by-linear association	2.051	1	.152
N of valid cases	75		

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is 1.92.

A chi-square test was done to express whether the males preferred to use audio- visual materials more frequently as compared to the females. The results showed $x^2(4) = 5.394$, $p=.249$. This shows that there was no statistically significant difference as to whether gender affected the preference for using the audio-visual materials to teach Life Sciences. Thus, both males and females either agreed or strongly agreed that

they preferred to use audio-visual materials to promote the effective teaching and learning of Life Sciences.

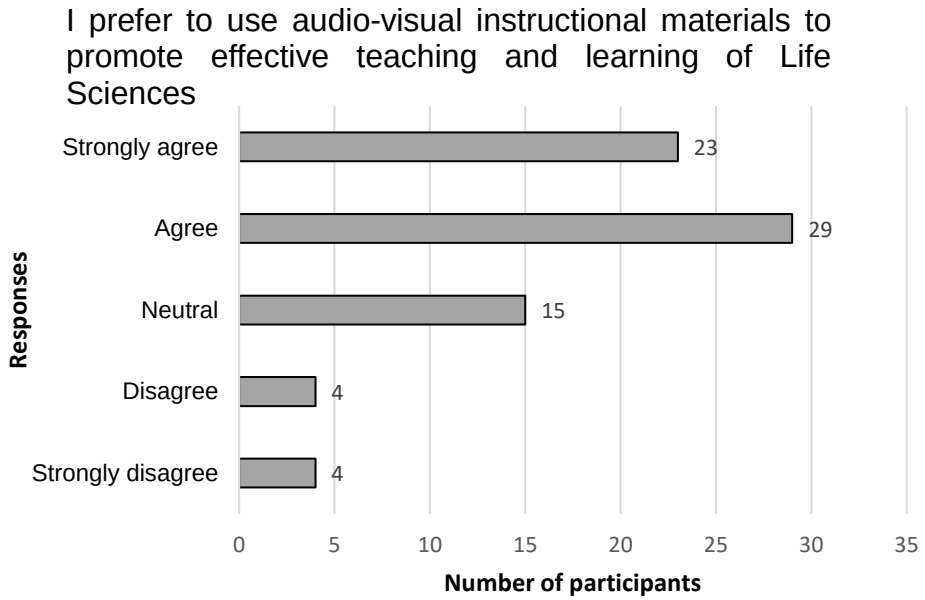

Figure 4.2: Audio-visual instructional resources

Many respondents preferred to use audio-visual instructional resources to promote the effective teaching and learning of Life Sciences. Figure 4.2 shows that most teachers either (29) agreed or 23 strongly agreed that they preferred to use audio-visual resources to teach to progress the productive teaching and learning of Life Sciences. A small number of the respondents did not like to utilise audio-visual materials for teaching and learning, as there were only eight participants out of the 75 participants, as revealed in Figure 4.5. Considering the results in figure 4.5, the use of audio-visual resources can assist the secondary schools in promoting the conductive teaching and learning of Life Sciences.

Although the majority of the participants believe that audio-visual resources promote conductive teaching and learning, conversely 15 out of the 75 teachers were neutral concerning their preferences of using audio-visual instructional materials to promote effective teaching and learning. The researcher is of the view that the percentage of those who were neutral is much bigger, as some of the audio-visual resources were inadequately obtainable in the schools and the results revealed that some of the teachers seldom utilised those teaching tools.

Table 0.12: Kruskal-Wallis H test for teaching experience and mean rank of utilisation of instructional materials

	Teaching experience	N	Mean Rank
Promote effective teaching and learning of Life Sciences	0-5 Years	34	35.37
	6-10 Years	10	34.95
	11-15 Years	15	33.97
	16-20 Years	8	38.50
	21-25 Years	3	38.50
	Total	70	

Table 0.13: A Kruskal-Wallis H test for teaching experience and the utilisation of instructional materials

Test Statistics[a,b]	
	Promote effective teaching and learning of Life Sciences
Kruskal-Wallis H	1.414
Df	4
Asymp. Sig.	.842

a. Kruskal Wallis Test

b. Grouping Variable: Teaching experience

ANOVA was not suitable for this analysis since, the questionnaire about the use of instructional materials to promote effective teaching and learning of Life Sciences consisted of a 5- point Likert scale, (1= strongly disagree, 2= disagree, 3= neutral, 4=agree and 5= strongly agree) which is an ordinal data. A Kruskal-Wallis H test was used to determine whether the utilisation of instructional materials to promote effective teaching and learning was dependent upon the teaching experience of the teachers. Table 4.13 displays the scenario that there was no statistical difference between the utilisation of instructional tools and the teaching experience of the participants to promote the operational teaching and learning of Life Sciences, $\chi 2\ (4) = 1.414$, $p = .842$. The mean rank of teaching experience was 35.37 for 0 to 5 years, 34.95 for 6 to 10 years, 33.97 for 11 to 15 years, 38.50 for 16 to 20 years and 38.50 for 21 to 25 years as shown in from table 4.12. Thus, teachers teaching experience does not affect the use of instructional materials to promote effective teaching and learning of Life Sciences. In contrast, one could not say that an experienced teacher uses instructional materials more frequently than inexperienced teacher does.

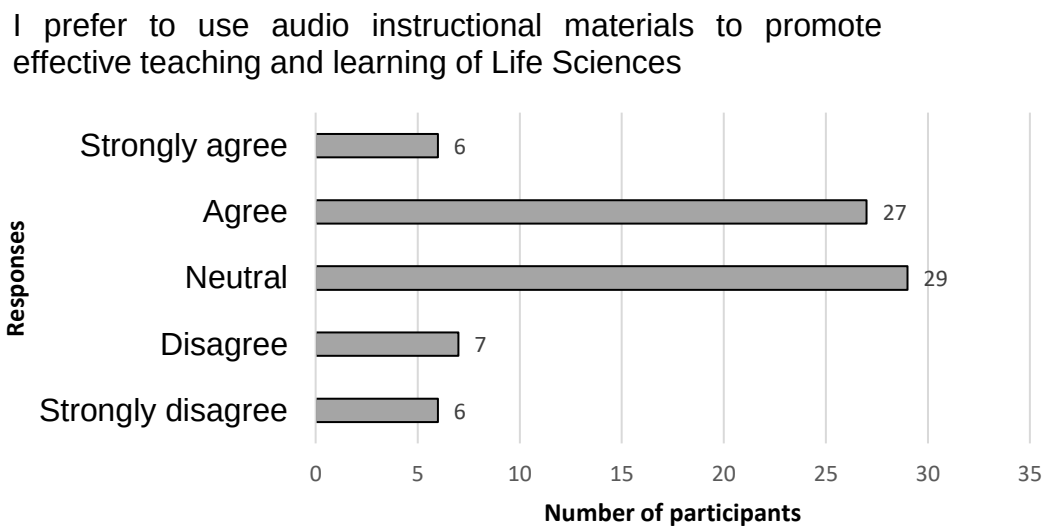

Figure 4.3: Audio instructional materials

Figure 4.3 shows teachers' level of preference of utilising audio instructional materials in order to promote effective teaching and learning. The results in Figure 4.3 display that of the 75 teachers, 27 agreed and six strongly agreed that they preferred to use audio-instructional materials to promote the effective teaching and learning of Life Sciences. Looking at the results, 29 were neutral or not sure, seven disagreed and six strongly disagreed. A conclusion may therefore be drawn that the majority of educators in the Ehlanzeni District do not choose to use audio instructional materials to teach Life Sciences. The results in Table 4.6 revealed that there are insufficient audio-instructional materials in the Ehlanzeni District; thus, the teachers are deprived of the opportunities of using the tools to support the ideal teaching and learning of Life Sciences, as they are unavailable in most of the secondary schools. In addition, it is easy to utilise the visual teaching aids for teaching and learning as no training or skills are required for the utilisation of the resources.

Table 0.14: Kruskal-Wallis H test for teaching experience and mean rank of utilisation of audio instructional materials

Ranks

	Age group	N	Mean Rank
Use audio instructional materials	20-30 years	35	31.47
	31-40 years	14	38.25
	41-50 years	14	46.96
	51-60 years	10	42.70
	60+ years	2	64.25
	Total	75	

Table 0.15: Kruskal-Wallis H test for different age group of teachers and their preference of using audio resources

Test Statistics[a,b]

	Use audio instructional materials
Kruskal-Wallis H	9.931
df	4
Asymp. Sig.	.042

a. Kruskal Wallis Test
b. Grouping Variable: Age group

A Kruskal-Wallis H test was conducted to determine whether teachers' preference of using audio instructional materials was dependent upon the age groups and experience of the teachers. The results in table 4.15 shows that the age groups of teachers influence their preferences of using audio instructional to promote effective teaching and learning of Life Sciences as $\chi 2$ (4) = 9.931, p= .042. The mean rank age group was 31.47 for 20 to 30 years, 38.25 31 to 40 years, 46.96 for 41 to 50 years, 42.70 for 51 to 60 years and 64.25 for 60 and above years as shown in table 4.14.

Younger teachers prefer to use audio materials more frequently as compared to the educators who have been in the education system for a long period.

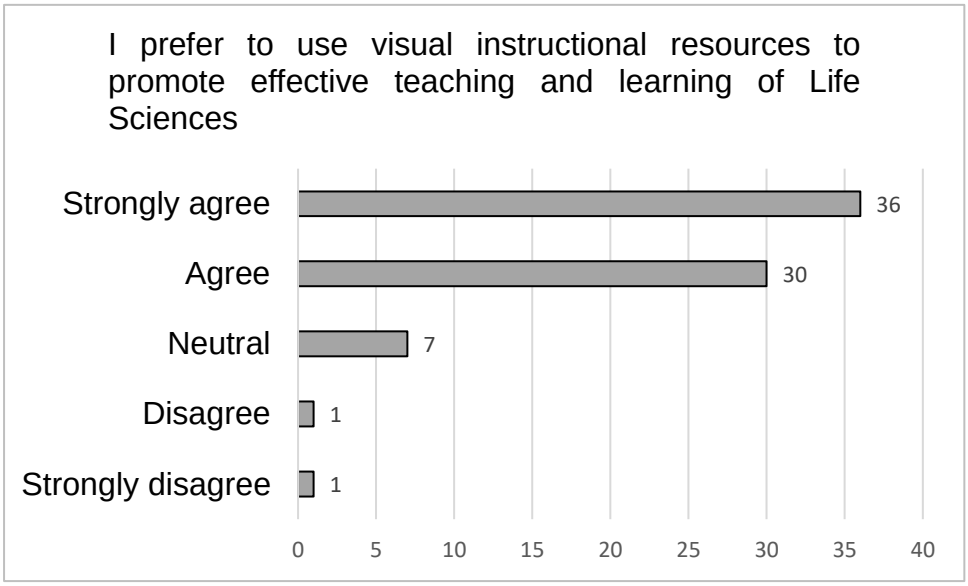

Figure 4.4: Visual instructional materials

Figure 4.4 flagged that most of the participants preferred to use visual instructional materials to teach Life Sciences, as the findings illustrated that 30 agreed and 36 strongly agreed that they chose to utilise the visual instructional materials to promote the effective teaching and learning of Life Sciences. However, Figure 4.4 further shows that only two participants of the 75 participants do like to utilise visual tools in the teaching and learning of Life Sciences. On the contrary, seven of the 75 participants were neutral. One of the contributing factors that triggered the seven participants to be neutral was that some of the visual resources were used for practical work in schools and the results in Table 4.6 outlined that most of them were unavailable in schools as 85.3% foldscopes and 70.7% specimens were unavailable.

Generally, the teachers use visual instructional materials when teaching rather than the other instructional resources. The main motive why the teachers rely on visual instructional tools for teaching and learning is that the tools are sufficiently available in the Ehlanzeni District secondary schools.

In addition, it is easy to utilise the visual teaching aids for teaching and learning as no training or skills are required for the utilisation of the resources.

The researcher was of the view that the teachers' preferences of using visual instructional materials depended upon gender. A Mann-Whitney U test was carried out to find out whether the use of visual instructional materials depend upon the gander.

Table 0.16: Gender Mean rank of the use of visual instructional materials

Ranks				
	Gender	N	Mean Rank	Sum of Ranks
Use visual instructional materials	Male	39	39.15	1527.00
	Female	36	36.75	1323.00
	Total	75		

Table 0.17: Mann-Whitney U test summary of gender and preference for the utilisation of visual instructional materials

Test Statistics[a]	
	Use visual instructional materials
Mann-Whitney U	657.000
Wilcoxon W	1323.000
Z	-.525
Asymp. Sig. (2-tailed)	.599
a. Grouping Variable: Gender	

The findings from this study underscore that the teachers' preferences for the utilisation of visual instructional materials does not rely on gender. Table 4.16 shows that male (N= 39) has a larger mean rank (39.15) than female (N=36) with a mean rank (36.75). There was no significant difference in the teachers' preferences for utilising visual instructional materials between the males and the females as table 4.17 reveals that (U= 657.000, p >.05).

Table 0.18: Kruskal-Wallis H test for teaching experience of teachers and their preference of using audio-visual resources

Test Statistics[a,b]	
	Use audio-visual instructional materials
Kruskal-Wallis H	1.234
Df	6
Asymp. Sig.	.975
a. Kruskal Wallis Test b. Grouping Variable: Teaching experience	

The researcher was of the view that the teachers who are still new in the education system preferred to use audio-visual instructional materials more frequently as compared to the teachers who had been in the system for quite some time (more experienced teachers). A Kruskal-Wallis H test was conducted to determine whether there was a statistically significant difference between the teachers' teaching experience and their preference for using audio-visual instructional materials. The results showed no significance, $\chi 2(6) = 1.234$, $p > .05$. Therefore, the teachers' teaching experience does not influence their preferences of using the audio-visual instructional resources to support the operative teaching and learning of Life Sciences.

Table 0.19: Competency level of teachers in accessing and utilising instructional materials in Life Sciences

	Very low	Low	Average	High	Very high
	Row Valid N %	Row Valid N %	Row Valid N %	Row Valid N %	Row Valid N %
Utilise audio-visual materials	12.0	16.0	52.0	10.7	9.3
Utilise ICT devices to promote effective teaching and learning	5.3	16.0	48.0	21.3	9.3
Make models and charts for teaching	6.7	12.0	45.3	20.0	16.0
Improvise real objects for learners for teaching and learning	1.4	11.0	37.0	32.9	17.8
Access information on the internet and share it with learners	1.4	2.7	25.7	29.7	40.5
Using laboratory apparatus and equipment for teaching	6.7	8.0	40.0	25.3	20.0
Integrate animations to promote effective teaching and learning	1.3	12.0	44.0	24.0	18.7

Organise field trips for the learners	10.7	17.3	21.3	29.3	21.3

There is an average (52.0%) level of competency in utilising audio-visual instructional materials by a majority of teachers. A small number of teachers are capable of using the audio-visual materials, as Table 4.19 shows that only 10.7% displayed a high level of competency and 9.3% a very high competency level for using audio-visual teaching tools among the participants. Likewise, the majority of the teachers can averagely use ICT devices to promote the conducive effective teaching and learning of Life Sciences, as there is a 48.0% average competency level of utilising ICT resources. The findings also point out that on average, many teachers can make models and charts for teaching, and they can use laboratory apparatus and equipment for teaching and integrating animations to promote effective teaching and learning. Their competency levels are 45.3%, 40.0% and 44.0% respectively.

The findings shown that the majority of the teachers are capable of accessing information on the internet and share it with their learners as the 29.7% level of competency is high and the 40.5% level of competency is very high. Several teachers can organise field trips for the learners to expose them to different fields related to Life Sciences as a way of motivating their learners. The teachers have the expertise in the improvisation of real objects for teaching learners since 32.9% showed a high level of competency and a 17.8% level of competency among teachers is too high. However, the findings in Table 4.19 also reveal that most teachers' competency levels in accessing and utilising teaching and learning materials in Life Sciences is average. The teachers should be competent and must be able to access and utilise all the various tools that can play a major role in promoting educational efficacy in Life Sciences to improve the learners' academic performance.

Table 0.20: Independent samples test for the level of competency of ICT devices and gender

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Utilise ICT devices to promote effective teaching and learning	Equal variances assumed	.980	.325	.660	73	.512	.14957	.22673	-.30229	.60144
	Equal variances not assumed			.664	72.463	.509	.14957	.22520	-.29931	.59846

An independent samples test was carried out to identify or check whether the level of competency of the teachers in accessing and in the utilisation of ICT devices to promote effective teaching and learning of Life Sciences depended on gender. The findings displayed no significant difference among the males and the females' level of competency of using ICT devices as M=.14957, t (73) = .660, p >.05. As a result, the competency level of teachers and the utilisation of teaching materials for the ideal teaching and learning of Life Sciences is not influenced by gender.

Table 0.21: Chi-square test for the teachers' academic qualification and their competency level in accessing and utilisation of information

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.447[a]	16	.422
Likelihood ratio	17.473	16	.356
Linear-by-linear Association	.002	1	.968
N of valid cases	74		

a. 20 cells (80.0%) have expected count less than 5. The minimum expected count is .01.

The researcher's view is that the teachers who are more qualified are also competent to access information on the internet and share it with the learners compared to teachers who are less qualified. Table 4.21 illustrates that there was no statistical significance between the teachers' academic qualifications and their competency level

in accessing information on the internet and sharing it with their learners in the classroom. The data show that $x^2(16) = 16.447$, $p > .05$. Most of the teachers' competency levels in terms of accessing information on the internet and sharing it with their learners was either high or very high, irrespective of their academic qualifications.

It is crucial for the teachers to have skills of using the different teaching tools so that they will know which type of teaching tool is suitable for a particular concept in Life Sciences and when to use it. Out of the three types of instructional materials, the participants were required to show which type of instructional material they rarely used because of the barriers that included the lack of skills or the unavailability of the resource in the schools. The results are shown in figure 4.5.

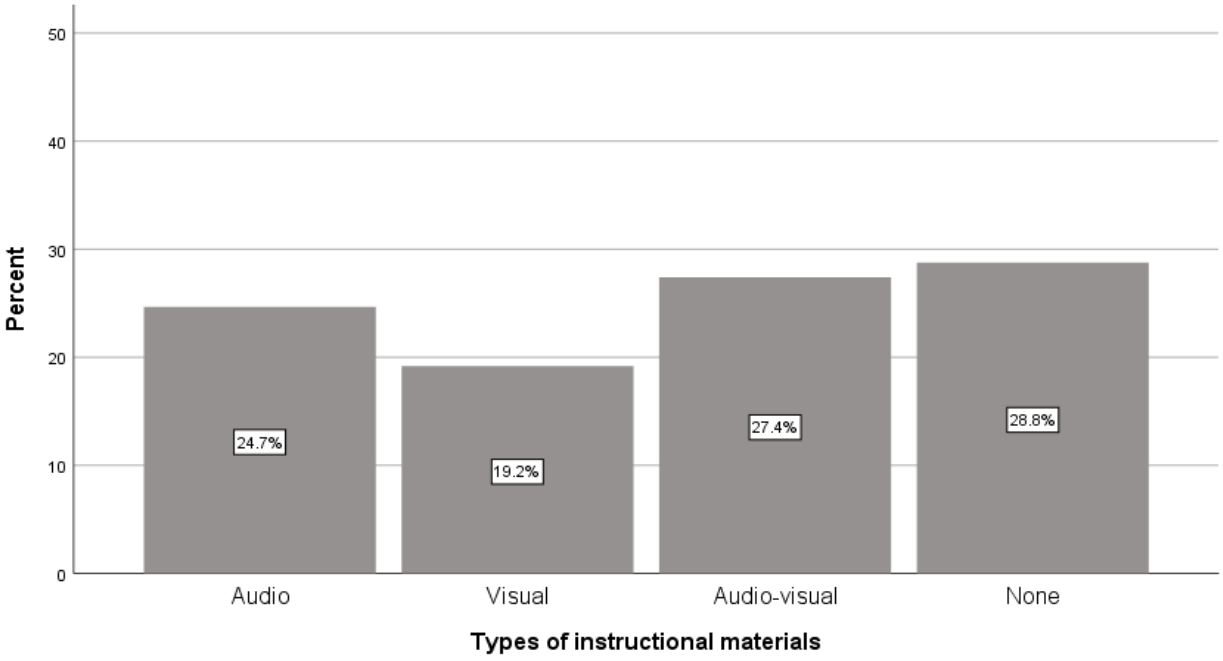

Figure 0.5: Percentage of instructional materials that are rarely used

Seemingly, Figure 4.5 elucidates that 27.4% of the respondents rarely use audio-visual materials, 19.2% barely use visuals and 24.7% rarely use audio instructional materials. However, 28.8% of the respondents indicated that they did not experience challenges in utilising all the three types of instructional materials for teaching and learning to promote educational efficacy in Life Sciences. A high percentage of teachers seldom use audio and audio-visual instructional materials as compared to visual instructional material. One of the contributing factors is the unavailability of the instructional

materials in schools which lead to teachers being deprived of opportunities to use the instructional materials. On the other hand, teachers lack skills in using the instructional materials especially audio and audio-visual can cause teachers not to use the resources even if the instructional materials are available in schools.

How does the use of instructional materials affect the teaching and learning of Life Sciences?

Table 0.22: Views of teachers on the impact of using instructional materials in the teaching and learning of Life Sciences.

	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	Frequency	%	Count	%	Count	%	Count	%	Count	%
Promotes effective teaching and learning of Life Sciences	5	6.8	0	0.0	2	2.7	0	0.0	67	90.5
Creates a conducive environment for teaching and learning	4	5.3	3	4.0	4	5.3	0	0.0	64	85.3
Allows teachers to teach heuristically	1	1.4	3	4.1	15	20.3	0	0.0	55	74.3
Teachers share resources	4	5.3	0	0.0	4	5.3	0	0.0	67	89.3
Improves the learners' academic performance in Life Sciences	4	5.3	3	4.0	5	6.7	0	0.0	63	84.0
Minimises the learners' misconceptions	4	5.3	3	4.0	13	17.3	0	0.0	55	73.3
Helps the learners to get rid of the notion that science is difficult	3	4.1	4	5.4	9	12.2	0	0.0	58	78.4
Maintains order in class	3	4.0	8	10.0	15	20.0	0	0.0	49	65.3
Makes learning more meaningful	4	5.3	4	5.3	2	2.7	0	0.0	65	86.7
Renders delivery of the lesson more interesting in class	3	4.0	2	2.7	3	4.0	0	0.0	67	89.3
Promotes retention	3	4.1	3	4.1	20	27.0	0	0.0	48	64.9
Accessing resources	3	4.0	1	1.3	7	9.3	0	0.0	64	85.3
Promotes educational efficacy in Life Sciences	2	2.7	1	1.3	6	8.0	0	0.0	66	88.0

The main aim of Table 4.22 was to check "the impact of the utilisation of instructional materials in the teaching and learning of Life Sciences". A five-point Likert scale was employed to display the results in a form of a table. The findings underscored that

teachers were of the views that using the teaching materials had a positive impact in the teaching and learning of Life Sciences as shown in Table 4.22. The results revealed that out of the 75 participants, 90.5% strongly agreed that the use of instructional materials promoted the effective teaching and learning of Life Sciences. Contrastingly, fewer participants (6.8%) strongly disagreed that the utilisation of instructional materials promoted the effective teaching and learning of Life Sciences. Thus, it can be asserted that the instructional materials do promote the effective teaching and learning of Life Sciences in the classroom.

Furthermore, 85.3% of the participants strongly agreed that the use of instructional resources creates a conducive environment to ensure conductive teaching and learning. Adalikwu and Lorkpilgh (2013) assert that the utilisation of instructional materials improved the learners' performance. In the same vein, the results from this study further revealed that 84.0% teachers were of the view that the use of instructional resources enhanced the learners' academic performance in Life Sciences. The results portray that more teachers (89.3%) strongly agreed that the instructional resources made the delivery of the lesson more interesting and allowed the teachers to share resources.

The majority of the teachers strongly agreed (88.0%) that the educational efficacy in the Life Sciences may be promoted by the utilisation of instructional resources. The findings in Table 4.22 outline that of the 75 respondents, more than 80.0% strongly agreed with the assertions concerning the use and the impact of instructional materials in the teaching and learning of Life Sciences. The percentage of teachers who strongly disagreed or disagreed was less than those who strongly agreed or agreed with the assertions in the table. In conclusion, the utilisation of instructional resources should be emphasised in secondary schools as the resources have a positive impact in the teaching and learning of Life Sciences.

The results also show the percentages of teachers who strongly agree with the views on the impact of using instructional materials in the teaching and learning of Life Sciences. The results illustrate that the utilisation of instructional materials yields a positive impact in the teaching and learning of Life Sciences in the teachers and the learners. The results revealed that many of the participants' responses (more than 60%) strongly agreed with the statements regarding the utilisation of instructional

materials in ensuring the effective teaching and learning of Life Sciences to improve educational efficacy. Various studies have ascertained that the learners have the notion that science is difficult because of the fact that the teachers use the traditional approach for teaching and learning. However, the results in the study showed that 78,4% of the participants strongly agreed that by using the different types of instructional materials, the learners would be helped to get rid of the notion that science is difficult, and they can improve their academic performance.

4.5 Conclusion

The chapter presented and interpreted the findings from the respondents by means of closed-ended questionnaires. Based on the demographic information of the participants, all of the participants were black. The study showed that most participants had Bachelor's degrees although an average number of them had Honours degrees. The findings outlined that the competency level of teachers and the utilisation of teaching materials for the ideal teaching and learning of Life Sciences is not influenced by gender. There was, however, a significant difference between the age group and the teaching experience of the teachers. Those who have been in the system for a prolonged period of time are more experienced as compared to the teachers who are still new in the system, although more teachers were between 20 to 30 years of age.

The findings were analysed as based on the data that emerged from the Life Sciences teachers in the Ehlanzeni District. The data was related to the availability, the use, and the impact of instructional materials in the teaching and learning of Life Sciences in secondary schools. The results can be summarised as follows:

- With regard to the question of the availability of instructional materials, the results revealed that there are more visual teaching and learning materials available in schools for teaching Life Sciences as compared to audio and audio-visual instructional materials.
- Teachers tend to regularly use instructional materials that are available to teach, as it is indicated in the results that they use visual teaching tools more frequently

as compared to audio and audio-visual instructional materials. The researcher discovered that the utilisation of instructional materials by teachers to teach Life Sciences depend on the availability of the instructional materials as table 4.8 findings from the Chi-square test shows that, $x^2(4) = 38.865$, $p = <. 001$. However, there were other instructional materials such as laptops, smartboards and projectors that were available, but teachers did not frequently use them.

- The responses also showed that a majority of the teachers agree or strongly agree that using all the three types of instructional materials, a conducive teaching and learning environment can be created to assist the learners to advance their academic performances in Life Sciences.

  Therefore, it appears as if the utilisation of all the instructional resources has positive impacts on the teaching and learning of Life Sciences in secondary schools. The views of teachers on the impact of using instructional materials in the teaching and learning of Life Sciences in table 4.22 attested that 84% teachers strongly agreed that instructional materials improves learners' academic performance. The teachers are encouraged at all times to improvise and utilise all these teaching and learning materials to foster heuristic learning among learners.

The following chapter presents a discussion of the findings based on this chapter and relates them to the studies that were undertaken in the past to make suggestions and reach a conclusion.

CHAPTER 5: DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

The teaching and learning of Life Sciences does not occur through osmosis. The teachers should use teaching tools to advance a conducive teaching and learning environment for Life Sciences to improve the learners' academic achievement as was indicated in the purpose of the study in Chapter one. It was also attested by studies that the use of the resources improves the learners' performance (Njuguna, 2018; Adeleye, 2015). Although these resources have positive impacts on the teaching and learning of Life Sciences such as but not restricted to improving learners' academic performance; help teachers in maintaining order in class and promote educational efficacy in Life Sciences. There are barriers that prevent educators to access and utilise instructional materials. It is a fact that most of the African countries are poor, and they lack suitable infrastructure and resources in the education sector for teaching and learning (Lloyd, 2020).

This also has a negative impact on the education sector where the schools have insufficient materials for teaching and learning. A study conducted by Nsama, Masaiti and Akakandelwa (2020) pointed out that most schools in Zambia have challenges in infrastructure, even though some of the schools have facilities, the educators and the learners are unauthorised to access the facilities. In the same vein, Mathevula and Uwizeyimana (2014) in their study conducted in the Limpopo Province in South Africa attested to a lack of availability of Information and Communication Technology resources in schools for ICT incorporation. Their findings reveal that the teaching and curriculum administration were negatively affected due to the shortage of ICT resources in their schools. Effective teaching and learning can be compromised. However, the teachers seem to be encouraged in the utilisation of diverse teaching and learning tools to strengthen active teaching and learning in their classroom as the results in figure 4.5 indicate that 27.4% of the teachers rarely use audio-visual materials, 19.2% barely use visuals and 24.7% rarely use audio instructional materials. This shows that majority of teachers can integrate the different types of instructional materials in the teaching and learning of Life Sciences.

Using various teaching and learning materials, the learners can also be inspired to take possession of the learning process rather than depending on the teachers. By doing so, they can become lively partakers in the teaching and learning process than being inactive participants. This study has investigated the topic of “the availability, use and impact of instructional materials in the teaching and learning of life sciences in secondary schools” based on creating an ideal situation for teaching and learning to promote educational efficacy in Life Sciences.

A summary of these study findings was disclosed in Chapter 4. Conclusions are to be drawn and the recommendations will be made to defeat the negative impacts that prevent the teachers from accessing and utilising some of the instructional resources that are scarcely obtainable in schools. This will be done to enable the teachers to teach heuristically and create an ideal environment for the effective teaching and learning of Life Sciences to take place in secondary schools.

5.2 Summary of research design and method

The study was quantitative and utilised a survey design. The population consisted of qualified Life Sciences teachers who are also teaching Life Sciences in secondary schools and some of them are only teaching Natural Sciences, either in primary schools or in the Further Education and Training band. Simple random sampling under probability sampling was selected in the study. A total number of 75 Life Sciences teachers in secondary schools were randomly selected from the 15 circuits in the Ehlanzeni District. A total of five secondary schools in each circuit were randomly chosen and one educator was chosen from each school. The respondents were given a closed-ended questionnaire by the researcher. Some of the questionnaires were sent to the respondents via e-mails. Some of the questionnaires were personally delivered with the help of cluster leaders and Life Sciences subject advisor.

An SPSS software, Version 27 was utilised to capture the data and run the analysis. Descriptive statistics were utilised to analyse the data, which was presented in a summary of tables, graphs, percentages, and frequency counts. For example, tables were used to represent the types of instructional materials that were available in schools and the extent of the utilisation of the materials for teaching and learning. Furthermore, the inferential statistics were carried out to make inferences from the

descriptive statistics. The Chi-square test was used to check whether the utilisation of instructional materials depend on the availability of instructional materials. A Kruskal-Wallis H test was used to check if there was any relationship between the teachers teaching experience and the extent of using instructional materials for teaching and learning of Life Sciences. All inferential statistics tests were calculated at a $p < 0.05$ level of confidence

5.3 Summary of the study

It is the duty of the instructors to make sure that the teaching and learning of Life Sciences takes place in a conducive environment to support effective teaching and learning. The study explores *"the availability, use and impact of instructional materials in teaching and learning of Life Sciences in secondary schools in the Ehlanzeni District, Mpumalanga"*. The scholars alluded to the fact that instructional materials should be utilised in schools to ensure ideal teaching and learning and to encourage the learners' academic achievements (Dahar & Faize, 2011; Adeniran, 2006; Kadzela, 2006). To achieve this, the teachers should use various instructions and learning resources so that the learners can acquire knowledge and the understanding of the Life Sciences concepts. The Life Sciences curriculum and assessment policy statements highlight that in the process of acquisition knowledge, the learners should access information from different teaching and learning materials (DBE, 2011).

The schools in South Africa, especially those in the remote areas, face many challenges in the creation of an ideal setting for active teaching and learning to take place to produce quality results among the learners in Life Sciences. The challenges include the scarcity of instructional materials, and in some of the schools, they are completely unavailable. This may result in the learners' poor academic performance. In Limpopo, Mathevula and Uwizeyimana (2014) found out that schools did not enough ICT instructional materials for teaching and learning. In KZN, inadequate achievement in Life Sciences was influenced by the lack of instructional materials (Majozi, 2013). Likewise, Adalikwu and Lorkpilgh (2013) attest that one of the factors that contribute to the poor academic performance in learners is the unavailability of teaching tools.

Although it is alluded to in Chapter 2 that there are barriers that prevent teachers from utilising the different instructional materials, the educators should come up with plans

to combat the problems to teach effectively in their classes. The teachers should improvise on the teaching tools to allow heuristic learning to take place. Even though most teachers depend on the textbook to teach, there are a number of materials that are on the internet that the teachers may access and share with the learners to advance effective teaching and learning. As Kwasu (2015) found, some of the teachers cannot access teaching aids on the internet, and one is of the view that those teachers can outsource teaching aids from the educators who can access the resources from the internet. They can also borrow from the neighbouring schools that have plenty of teaching aids for the teaching and learning of Life Sciences.

5.4 Summary and interpretation of the research findings

The data analysed in Chapter four will be used to provide a precise snapshot of the summary and the analysis of the results findings. The outcomes from this study are in line with the aim of this study, which was to determine the availability, the use, and the impact of instructional materials in the teaching and learning of Life Sciences. The summary of research findings is based on the data that was gathered regarding the three research questions and the demographic information of the participants.

The results from the study revealed that 52% of the participants were male and 48% of the participants were female. The outcomes portrayed that there are more male teachers who teach maths and science compared to female educators. These findings are similar to those of Apondi (2015) who found that 75% of the participants in her study were male teachers who taught mathematics and the remaining 25% were female teachers. The findings further underscore that a majority (60%) of the participants have Bachelor's degrees, 25% have Honours degrees, 5% have Diplomas, 8% were ACE holders and 1% held a Master's degree. Therefore, it is evident that all the participants were qualified teachers with the capacity of teaching Life Sciences. However, the results show that we cannot conclude that the males are more qualified than the females, or vice versa.

The findings show that all the age groups of the participants were also presented in the study. The majority 46.7% were between 20 to 30 years, 18.7% were between 31 to 40 years and 41 to 50 years respectively, and 13.3% were between 51 to 60 years. A few (2.7%) participants were over 60 years of age. The teaching experience of the

educators were between 0 to 35 years. The findings reveal that there was a significant difference between the age group and the teaching experience of the teachers as $p < 0.05$. In synopsis, the teachers who have been teaching for a prolonged time are more experienced when compared to the teachers who are newly absorbed in the system.

The subsequent summary and the interpretations of the study findings originate from the results of the three research questions and the discoveries derived from the closed-ended questionnaire. Hence, the summary and the interpretations of the findings were also driven by the research questions. The discoveries point out how the results regarding the research questions were accomplished from this study by providing a snapshot summary of the outcomes.

Research question 1: Which types of instructional materials are available in secondary schools in the Ehlanzeni District?

The teachers can use different resources to teach, as Obianwu and Azubike (1994) outlined that instructional materials can be grouped into three groups, namely audio, visual and audio-visual. The findings from this study in Table 4.6 revealed that the visual materials were the most commonly available instructional materials found in the Ehlanzeni District secondary schools. The findings illustrate that the most adequately available visual materials were textbooks, which comprised of 98.7%; chalkboards represented approximately 90.7% and charts were found to comprise 84.0% in terms of availability. These findings are comparable to the results from Abubakar et al. (2021), Adebule and Ayoola (2015), Aina (2013) and Okobia (2011), who found that secondary schools have adequately available visual instructional materials for teaching and learning, such as charts, chalkboards, printed materials, and textbooks. In contrary, findings from a study done by Nugba (2020) revealed that secondary schools in Ghana in the Central Region have insufficient science textbooks. Although visual materials were the mostly available resource, the results in Table 4.6 show that the visual instructional materials that are utilised for conducting practical activities were inadequately available in secondary schools, which included (58.7%) microscopes, (70.7%) specimens and (85.3%) foldscopes, were not available. This means that teachers were unable to engage learners on practical activities since the instructional materials were not available.

The analysis also demonstrated that the audio-visual instructional resources were averagely available for the delivery of the Life Sciences lessons. The results in Table 4.6 showed that the schools were at least provided with laptops or computers (82.7%), smartboards (44%), Edu boards (21.3%) and tablets (50.7%). In the same vein, Nsama, Masaiti and Akakandelwa (2020) in their study findings attested that the secondary schools in Zambia have adequate desktop computers (77.2%) and computer laboratories (63.9%). Thomson et al.(2011) found that most audio-visual materials which included laptops were widely available in Australian schools. Adu (2018) also revealed that many schools that are found in Pretoria and Johannesburg in South Africa are enjoying modern ICT facilities, which means that those schools have audio-visual instructional materials. These findings differ from the findings of Effiong and Igiri (2015), Aina (2013), Okobia (2011) and Kadzera (2006) who found that the secondary schools lacked the audio-visual instructional tools for teaching and learning. The provision of teachers with these resources can help them to teach effectively as they save time instead of writing on the chalkboard. The supply of audio-visual materials to the teachers yields a positive collaboration between the instructors and the learners. The resources in the classroom attract the learners and they pay attention, which promotes better understanding and learning (Arbab, 2020).

The outcomes in Table 4.6 pointed out that the majority of the schools in the Ehlanzeni District have insufficient audio-instructional materials, as the level of availability was very low. Only 4% for example had a record player and 8% tape recorders were available in those schools. Schools that are situated in rural areas lack audio and audio-visual instructional materials. For instance, the Ehlanzeni District is located in rural areas many schools in the District lacked audio and audio-visual instructional materials. These findings are comparable to Adu and Duku (2021) who revealed that most schools in remote areas in South Africa do not have audio-visual instructional materials compared to schools that are in urban areas. The results from a study done in Nigeria by Effiong and Igiri (2015) revealed that the secondary schools had inadequate audio materials to teach Biology (Life Sciences). Their study findings indicated that in only 17% of the secondary schools there were tape recorders. Inferences from the study of Aina (2013) specified that at 10% of the schools, there were audio tapes that were available and at 20%, radios were available for teaching and this concurs with the results from Effiong and Igiri (2015) and this study, proving

that indeed the secondary schools have insufficient audio teaching tools for teaching Life Sciences. However, the findings illustrated that most secondary schools have visual instructional materials compared to audio and audio-visual materials. Thus, teachers and learners are deprived the opportunities of accessing audio and audio-visual materials for the teaching and learning of Life Sciences.

In summary, the schools and the education sector should provide the teachers with all the necessary instructional materials they require to achieve effective teaching and learning. The Department of Basic Education should also increase the budget for schools so that they can buy the resources that are not available to promote educational efficacy in Life Sciences.

Research question 2: To what extent do teachers use instructional materials to teach Life Sciences?

The findings in Table 4.7 presented a summary of the results, which explained how often the teachers utilise the available different types of instructional resources in a week. The results showed that the visual instructional materials are the most commonly utilised by the teachers to teach Life Sciences. The findings demonstrate that a majority of the teachers always use pamphlets, textbooks and chalkboards when teaching in their classroom. Sutcu and Bayir (2007) found that teachers frequently used visual instructional materials for teaching and learning which included textbooks and pamphlets. These findings concur with Abubakar et al. (2021) who found that 100% of the teachers' use textbooks, chalkboards and charts every day to teach mathematics. Likewise, the findings by Njuguna (2018) attested that 75% of the teachers frequently use visual materials and 25% always use those including textbooks. The textbooks and the chalkboards are the most dominantly used visual materials in the classroom. In another study conducted by Okobia (2011), similar results were found where teachers frequently used textbooks and chalkboards to teach in their classrooms.

It may therefore be argued that the teachers do not want to do away with textbooks for teaching and learning as they use them more frequently in their lesson delivery. Thus, they depend more on textbooks and the teaching and learning becomes textbook-oriented. The findings correspond with the findings in a study by Mupa and Chinooneka

(2019) who eloquently found that the teachers are used to textbooks as instructional materials, and they are unable to use multiple materials for teaching and learning. Consequently, educators' sporadically use of the other instructional tools deprive the learners of the opportunities of being exposed to different teaching and learning resources to cater for the learners' different necessities for effective teaching and learning to occur. The learners learn differently. Some learners prefer visual learning, while others are auditory reliant, and some are both visual and auditory oriented. The teachers should make sure that they expose their learners to all types of instructional materials to teach effectively and to promote educational efficacy in Life Sciences. Adeniran (2006) emphasises that exposing the learners to different teaching tools helps them to become active participants during the delivery of the lesson in a science classroom.

The results in Table 4.7 prove that it is obvious that in most instances the teachers' utilisation of instructional materials depends on the availability of the resources. For instance, results in table 4.6 revealed that 58.7% CDs and 92% tape recorders were not available in schools. The teachers hardly use audio-instructional materials as 1.3% always use CDs and 2.7% use tape recorders once a week. Part of the reason for this is that audio resources were inadequately available in the schools. Okobia (2011) also alludes to the fact that video recorders and projectors were not utilised for teaching and learning, as they were inadequately accessible in schools. However, the findings from the study demonstrate that the teachers averagely utilised audio-visual instructional resources in schools. For instance, 22.7% and 20.0% of the teachers always utilise laptops and smartphones respectively for the teaching and learning of Life Sciences every week. Thomson et al., (2011) found that most audio-visual materials which included laptops were frequently used by teachers to teach in Australian schools and teachers. Adu (2018) also revealed that teachers that are teaching in Pretoria and Johannesburg frequently use audio-visual (ICT) instructional materials for teaching and learning.

Contrastingly, other research findings found an infrequent use of audio-visual resources by the teachers, such as computers, overhead projectors and videos for teaching and learning (Dahar & Faize, 2011; Kadzera, 2006). In another study carried out in Zambia by Nsama, et al. (2020) on the "availability and use of ICT (audio-visual)

materials in secondary schools" it was pointed out that some of the resources were available, but they were not working. There are challenges that the teachers encounter in secondary schools in the Ehlanzeni District where the resources are available, but teachers are not capable of using the resources; more especially the audio and the audio-visual materials that are also part of the ICT devices that are required by the schools for teaching and learning. For instance, figure 4.5 shows that 27.4% teachers were unable to use audio-visual materials and 24.7% were unable to use audio instructional materials to teach Life Sciences. Thus, teachers' inability to use the instructional materials might also affect the integration of using the different types of instructional materials during and after the delivery of the lessons for effective teaching and learning to take place.

This study also used a Chi-square test in order to check whether the utilisation of instructional materials by teachers depend on the availability of the instructional materials. The results in table 4.8 revealed that the more the instructional materials are available, the more they are used by teachers to teach Life Sciences in secondary schools as $x2(4) = 38.865$, $p = <.001$. The findings further revealed that teaching experience does not influence the level of using instructional materials to promote effective teaching and learning of Life Sciences. The results have shown that Males use prefer to use smartphones as instructional materials more than females to teach Life Sciences in a week as 25.3% males always use smartphones and 10.7% females always use smartphones to teach in a week.

The teachers' competency level in accessing and using instructional materials for teaching and learning of Life Sciences

The teachers are required to be competent to utilise the different types of instructional resources to create a conducive teaching and learning environment to advance effective teaching and learning. In doing so, the educational efficacy in Life Sciences can be achieved. The findings in Table 4.19 show that a larger number of the teachers' (52.0%) competency level in using audio-visual material is average. The results also reveal that 48.0% of the sampled teachers' level of using ICT devices to promote the effective teaching and learning of Life Sciences is also average. This suggests that many educators were not adequately trained on the utilisation of ICT devices for

teaching and learning in their classroom. This finding also reflects on Al-Sharef (2018), who provided the insight that the inadequate teacher training on utilising ICT resources resulted in the incompetence in the utilisation of the tools for teaching and learning. Similarly, a study carried out in India revealed that less than 10% of the teachers were competent as they were trained to use ICT resources for teaching, whereas 80% of them were not competent enough to utilise the ICT resources for effective teaching and learning to take place and only a few (15%) were competence enough to use ICT resources such as PowerPoint presentations and smartboards for teaching and learning (Hassan & Mirza, 2021).

Conversely, the teachers are capable of accessing and utilising visual materials for teaching and learning. The results reflected that many of them could make models and charts for the teaching and learning of Life Sciences. The finding also provides the insight that the teachers are capable of searching relevant information from the internet and sharing it with their learners, as 29.7% and 40.5% of the teachers' level of competency is high and very high respectively. However, a different insight was provided by the findings of Hassan and Mirza (2021), who pointed that 50% of the teachers were unable to access information from the internet and approximately 60-70% were unable to distinguish between the relevant and the irrelevant sources of information.

Chi-square test for the teachers' competency level in accessing and utilisation of materials is not influenced by their academic qualification. Findings from Chi square illustrates that there was no statistical significance between the teachers' academic qualifications and their competency level in accessing information on the internet and sharing it with their learners in the classroom as $x^2(16) = 16.447$, $p > .05$. The results also illustrated that there was no significant difference in the teachers' preferences for utilising visual instructional materials between the males and the females as ($U = 657.000$, $p > .05$). However, the Mann-Whitney U test results findings from Nsama, et al. (2020) revealed that the females utilised the ICT resources more frequently, as compared to the males to promote effective teaching and learning ($U = 13572.5000$, $df = 1$, $P = 0.034$). On the other hand, Manyilizu and Gilbert (2015) revealed a significant difference in the use of ICT tools between male and females in the teaching and

learning, with $X^2(1, N=229) = 9.81$, $p=.002$. Hence, male teachers (55.1%) were using ICT tools during teaching and learning more than female teachers (35.1%).

The results presented in Figure 4.5 displayed the level of the teachers' infrequent use of teaching resources because of the barriers, which include the unavailability of the resources and the lack of skills in utilising the resources. The findings reveal that only a few (19.2%) of the teachers were unable to utilise the visual resources while 24.7% of the teachers were unable to use audios and 27.4% of the teachers were unable to use the audio-visual resources, as a result of the barriers that were also revealed in the literature review in Chapter four of the study.

Research question 3: How does the use of instructional materials impact the teaching and learning of Life Sciences?

The research findings were based on the teachers' views on the impact of using instructional materials in the teaching and learning of Life Sciences in table 4.22. The findings based on the teachers' views show that the use of instructional positively impact the teaching and learning of Life Sciences such that the utilisation of the resources assist teachers to create a conducive environment for teaching and learning as 85.3% of the teachers strongly agreed with the statement. The results in table 4.22 illustrated that 88.0% of the teachers strongly agreed that the use of instructional materials promotes educational efficacy in Life Sciences. These findings correspond with those of Okobia (2011) who found that the utilisation of instructional materials promoted educational efficacy by promoting quality teaching and learning. The resources also offer different methods to make the teaching and learning procedure easier and assists the learners to grasp what is taught, and the learners relate to the subjects (Portana et al., 2021). This shows that the instructional resources are required in the teaching and learning procedure. For instance, Arbab (2020) also articulated that the usage of audio-visual resources by the teachers could contribute to effective lesson delivery in the classroom.

The study results analysis outlined that the utilisation of the resources, can help the educators to deliver lessons more interestingly and assist the learners to get rid of the notion that science is difficult as shown in table 4.22 that 78.4% teachers also strongly agreed with the view. This is in comparable with the findings from King (2018) who

states that the utilisation of visual aid resources assisted the learners in high school to master scientific skills to understand Life Sciences by stimulating curiosity and creating interest in science. Conversely, 84.0% of the teachers strongly agreed that the use of instructional tools improves the learners' academic success in Life Sciences. The findings from the study are consistent with the findings of Portana, et al. (2021); Njuguna (2018); as well as Omariba, Ongâ, and Ondigi (2017) who found that instructional materials positively influence teaching and learning as they increase the learners' academic achievement. In the same way, a report from the study by Adalikwu and Lorkpilgh (2013) accentuated that the utilisation of instructional resources for teaching and learning in secondary schools assisted the learners by improving their academic achievement in chemistry. Moreover, the findings also show that the inadequate and inappropriate usage of the materials results in a non-conducive teaching and learning environment, which negatively affects the learners' learning and academic achievement in Life Sciences. In Botswana, a study by Jotia and Matlale (2011) confirmed that the educators' inadequate use of teaching resources resulted in the learners' poor attainment in their school-final external certificate examination.

The results from Figure 4.3 outline the fact that a majority of the teachers do not prefer to utilise audio materials to promote the productive teaching and learning of Life Sciences, as of 75 participants 29 were neutral, seven disagreed and six strongly disagreed. Hence, it is evidence that many secondary schools in the Ehlanzeni District do not have audio-instructional materials. Although there are many reasons that teachers may not prefer to use audio instructional materials. In the Ehlanzeni District the scarcity of audio instructional materials and teachers lack skills in the utilisation of audio instructional materials might be the contributing factors that teachers may not prefer to use the instructional materials as shown in figure 4.5 and table 4.7 from the results. The results of the study display that, ordinarily, the teachers use tools that are accessible for teaching and learning, whereas those that are inadequately available are consequently not utilised for the teaching and learning of Life Sciences. Teachers have to strive towards productive teaching to promote conducive teaching and learning during lesson delivery.

The outcomes in Figure 4.4 also underscored that indeed the use of instructional materials yield positive impact such that the resources advance the efficacious

teaching and learning of Life Sciences, since 40.0% and 48.0% of the teachers agreed and strongly agreed, respectively with the view. These findings are similar to another study by Abubakar, et al. (2021) who found that several teachers were using visual materials which included textbooks, chalkboards and charts for the efficacious “teaching and learning of mathematics in secondary schools”. The researcher is of the opinion that most secondary schools have visual instructional materials thus the teachers prefer to use visual materials to promote conducive teaching and learning in their diverse subjects or learning areas.

The majority of the teachers prefer to utilise audio-visual materials in their classroom to promote the effective teaching and learning of Life Sciences. The findings reveal that 38.7% and 30.7% of the teachers respectively agreed and strongly agreed that that they prefer to use audio-visual resources to teach to promote the effective teaching and learning of Life Sciences. These findings correspond with those of Arbab (2020), who revealed that the teachers prefer to use audio-visual materials, as 74.2% of the teachers strongly agreed and 24.2% agreed that they utilise audio-visual resources to effectively deliver the lessons; thus, promoting effective teaching and learning. Contrastingly, the results outcomes from Abubakar et al. (2021) pointed out that 100% of the educators strongly agree that the use of audio-visual resources assists the teachers to increase the learners’ level of focus so that they can participate actively; thus, saving time for teaching and learning.

The audio-visual materials also form part of the ICT devices that can be used in schools to stimulate real teaching and learning. Bariu (2020) explained that the ICT materials are important for supporting productive teaching and learning in schools, even though majorities of the schools are inadequately equipped with them. Contrastingly, Butler et al. (2018) lambasted the teachers because they do not utilise the ICT materials to create an ideal environment for effective teaching and learning. Thus, the educators should use the materials in schools to assist the learners to be curious so that they can comprehend the content much better.

5.5 Conclusion

It appears that the educational efficacy in Life Sciences depends on the types and the availability of instructional resources that are used for teaching and learning. Many aspects can hamper the educational value of Life Sciences, such as the availability and the utilisation of instructional materials. For instance, in the Ehlanzeni District most visual instructional materials were available which included textbooks (98.7%), chalkboards (90.7%), pamphlets (78.7%), and charts (84.0%). Furthermore, audio-visual materials which included laptops (82.7%), tablets (50.7%) and smartboards (44.0%), were also available. However, audio instructional materials such as compact disc (41.3%), radio (17.3%), tape recorder (8.0%), record player (4.0%) and audio cassettes (9.3%) were inadequately available in secondary schools in the Ehlanzeni District.

The availability of instructional materials also influences the extent that teachers use the instructional materials to teach Life Sciences in secondary schools. The more the resources are available the more they are utilised by teachers to teach. Majority of teachers were always using visual instructional materials such as chalk boards (91.9%), textbooks (83.8%), pictures (30.1%) and charts (27.0%) when teaching Life Sciences every day in their classroom. Moreover, audio-visual instructional materials were averagely used by teachers for teaching and learning as 22.7% laptops and 20.0% smartphones were always utilised by the teachers, while only 25.3% teachers used smartboard once a week. Teachers hardly use audio instructional materials to teach as (16.0%) compact disc, (9.3%) radio and (2.7%) tape recorder were only used once a week by teachers when teaching Life Sciences.

The use of instructional materials yield fruitful impact in the teaching and learning of Life Sciences. Hence, all the stakeholders involved in the education system should be involved to strive for quality education for the learners. Based on the teachers views on the impact of using instructional materials in the teaching and learning of Life Sciences in table 4.22 underscored that indeed the use of instructional materials have positive impact in the teaching and learning of Life Sciences such as better academic achievements of learners; the sharing of resources among the teachers and the learners; encouraging heuristic learning among learners; as well as more meaningful teaching and learning. Thus, there is a crucial need for improvising and using different

Life Sciences instructional materials for teaching and learning in secondary schools to promote educational efficacy

5.6 Recommendations

The recommendations made are aligned with the study findings:

- The results findings indicated that it is common among the schools in the Ehlanzeni District that they have insufficient audio and audio-visual materials. Hence, the study recommends that the Department of Basic Education support the schools by improvising on the audio and audio-visual instructional materials that are adequate for teaching and learning. The DBE should also place an emphasis on the fact that it is mandatory for the teachers to utilise the various teaching and learning materials to accommodate the learners' different learning needs to promote educational efficacy in schools.
- The schools should also fundraise and ask for donations from various stakeholders to buy all the necessary resources for teaching and learning to improve the quality of teaching and for the betterment of the learners rather than relying on the DBE as it takes time for DBE to hear the voice of the schools and other stakeholders involve in the education sector
- The findings outlined that most of the teachers are using visual instructional resources, especially textbooks, chalkboards, and charts, even though they have audio and audio-visuals. It is recommended that the teachers should use all the assets that are accessible in their respective schools.
- Secondly, the study also recommends that the Mpumalanga Department of Education should arrange professional development workshops specifically for the teachers who need training on the use of different instructional resources. The results in figure 4.5 elucidates that 27.4% teachers were unable to use audio-visual instructional materials, 19.2% were unable to use visual instructional materials and 24.7% were unable to use audio instructional materials as they lack skills in using the resources for effective teaching and learning. The workshops can help in capacitating the teachers on the effective use of the resources, more especially on audio and audio-visuals such as smartboards, Edu boards and laptops as some of the teachers lack skills on utilising the materials.

- The results on table 4.22 based on teachers views on the impact of using instructional materials in the teaching and learning of Life Sciences also show that the use of instructional materials have positive impact on the teaching and learning of Life Sciences such as promoting educational efficacy in Life Sciences. The teachers should be encouraged to utilise the different resources for teaching and learning.

Recommendations for further research

Despite the role that the utilisation of instructional resources plays in teaching and learning, based on these study results, it appears that most schools have insufficient audio and audio-visuals for teaching and learning. Although some of the schools have audio and audio-visual materials, some of the teachers barely utilise the resources. In addition, the lack of capacities is one of the contributing aspects that contribute to the non-utilisation of the instructional materials. It is proposed that further study should be conducted in the following areas:

- The factors that inhibit the improvisation of audio and audio-visual instructional materials in the teaching and learning of Life Sciences in secondary schools.
- The factors that inhibit the teachers from using audio and audio-visual materials in the teaching and learning of Life Sciences in secondary schools.
- The impact of using instructional resources in the teaching and learning of Life Sciences in secondary schools in Mpumalanga Province.
- The impact of insufficient teaching resources in the teaching and learning of Life Sciences or other learning areas.

5.7 Contributions of the study

The studies undertaken in the past indicated a need of the utilisation of various instructional materials for teaching and learning in schools, to advance the learners' academic achievement. Although the studies emphasised the use of instructional materials in various learning areas, there is limited knowledge on "the availability, the use, and the impact of using instructional tools on the teaching and learning of Life

Sciences". This study was aimed at contributing literature towards "the availability, the use and the impact of instructional in the teaching and Learning of Life Sciences". In addition, it also emphasises that the educators should use instructional materials to create an ideal situation for productive teaching and learning to occur. Hence, in doing so, the learners can be encouraged to learn heuristically by sharing resources among teachers; thereby improving their academic performance, not only in Life Sciences, but in all the learning areas in both primary and secondary schools.

The study result findings also contributed immensely towards the factors that inhibit the teachers, more especially in secondary schools, to utilise instructional materials for productive teaching and learning to occur. Secondly, the findings will also assist all the educational stakeholders to plan effectively on how the schools may best be assisted to have all the different instructional materials and to help the teachers to utilise the materials effectively during their lesson delivery to promote educational efficacy.

The findings of this study afford a direction for the DBE to develop a policy that binds the teachers to efficiently implement the use of the various instructional materials in the schools to accommodate the learners' differences. The findings will also assist the DBE to work hand in hand with the universities in training student teachers (pre-service teachers). Thus, the pre-service teachers can be capacitated to have skills on how to use instructional materials effectively, more specifically the audio-visual (ICT) resources for teaching and learning. Hence, the pre-service teachers will also be in line with the Fourth Industrial Revolution (4IR) since we are now living in the digital world. The findings also seek to assist teachers who are already working but lack the skills of using the various instructional materials to register for short courses to capacitate themselves with the necessary skills. In conclusion, the research findings and the recommendations are expected to benefit all the stakeholders in the education sector to pay attention to the aspects that hinder the utilisation of instructional resources to create a conducive teaching and learning environment to strive for educational efficacy.

5.8 Limitations of the study

The study was only conducted in one of the school districts in the Mpumalanga Province due to insufficient resources (financial constraints) and the time was limited. There were a few schools that were selected and most of them were in remote areas. Since most of the schools found in the Ehlanzeni District were in remote areas, the schools were also under-resourced in terms of teaching and learning materials. The schools also lack ICT resources, which are part of audio and audio-visual materials. If the study had been conducted in all the school districts, it would have been more advantageous, as more data would supposedly be collected. Full insights of the identified challenges would therefore also possibly be represented rather than giving a snapshot view of the challenges. Generalisations were made, based on the sample size, which consisted of only African teachers, rather than including all the different races (Indians, Coloured and Whites). This would also assist the study to compare whether the availability and the utilisation of instructional resources for teaching and learning in schools were influenced or dependent upon race. However, a probability sampling method was used, where simple random sampling was utilised to achieve the aim of the study.

5.9 Concluding remarks

Although teaching and learning may appear to be easy when the educators and the learners are interacting in the classroom, the teaching and learning of Life Sciences is incomplete without the utilisation of relevant instructional resources. The teachers should incorporate the different types of instructional materials during the teaching and learning procedure. The availability and utilisation of instructional materials have a positive impact on the teaching and learning of Life Sciences. The tools for instance create an ideal environment for conducive teaching and learning to advance the learners' achievements (Omariba et al., 2017). The effective utilisation of instructional materials promotes educational efficacy in Life Sciences.

The findings from the study also outlined the fact that the use of instructional resources is of paramount importance, even though there are barriers that prevent the teachers from using the resources. The teachers and all the educational stakeholders should play an indispensable role in improvisation and in the use of these resources to

transform the education system in South Africa to strive for the learners' academic excellence. The teaching and learning should accommodate the learners' different learning techniques. Thus, a paradigm shift can be achieved where the learners can move from ostensive learning to heuristic learning.

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APPENDICES

APPENDIX A: Faculty approval of proposal

University of Limpopo
Faculty of Humanities
Executive Dean
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 4895, Fax: (015) 268 3425, Email:Satsope.maoto@ul.ac.za

DATE: 3 February 2020

NAME OF STUDENT:	**MATHABA, SR**
STUDENT NUMBER:	**[201303887]**
DEPARTMENT:	**MEd – Science Education**
SCHOOL:	**Education**

Dear Student

FACULTY APPROVAL OF PROPOSAL (PROPOSAL NO. FHDC2019/10/21)

I have pleasure in informing you that your MEd proposal served at the Faculty Higher Degrees Meeting on 23 October 2019 and your title was approved as follows:

TITLE: THE AVAILABILITY, USE AND IMPACT OF INSTRUCTIONAL MATERIALS IN THE TEACHING AND LEARNING OF LIFE SCIENCES IN SECONDARY SCHOOLS AT EHLANZENI DISTRICT, MPUMALANGA

Note the following:

Ethical Clearance	Tick One
In principle the study requires no ethical clearance, but will need a TREC permission letter before proceeding with the study	
Requires ethical clearance (Human) (TREC) (apply online) Proceed with the study only after receipt of ethical clearance certificate	√
Requires ethical clearance (Animal) (AREC) Proceed with the study only after receipt of ethical clearance certificate	

Yours faithfully

Prof RS Maoto,
Executive Dean: Faculty of Humanities
Director: Prof MW Maruma
Supervisor: Prof MS Mtshali

APPENDIX B: Ethics clearance certificate

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING:	**05 March 2020**
PROJECT NUMBER:	**TREC/48/2020: PG**
PROJECT:	
Title:	The availability, use and impact of instructional materials in the teaching and learning of Life Sciences in Secondary Schools in the Ehlanzeni District, Mpumalanga
Researcher:	SR Mathaba
Supervisor:	Prof MS Mtshali
Co-Supervisor/s:	N/A
School:	Education
Degree:	Master of Education in Science Education

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:

i) **This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.**

ii) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.**

iii) **PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.**

Finding solutions for Africa

APPENDIX C: Approval letter

education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

Ikhamanga Building, Government Boulevard, Riverside Park, Mpumalanga Province
Private Bag X11341, Mbombela 1200.
Tel: 013 766 5552/5115, Toll Free Line: 0800 203 116

Litiko le Temfundvo Umnyango we Fundo   Departement van Onderwys   Ndzawulo ya Dyondzo

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Mr. Sunyboy Rowell Mathaba
University of Limpopo
Private Bag 1106
SOVENGA
0727

RE: APPLICATION TO CONDUCT RESEARCH: MR. SUNYBOY R. MATAHBA
(sunyboy.rowell@gmail.com)

Your application to conduct research study was received and is therefore acknowledged. The title of your study reads thus: **"The availability, use, and impact of instructional materials in teaching and learning of Life Sciences in Secondary Schools in the Ehlanzeni District of Mpumalanga."** Your request is approved subject to you observing the provisions of the departmental research policy which is available in the departmental website and available on request. You are also requested to adhere to your University's research ethics as spelt out in your research ethics document. We trust that the aims and the objectives of the study will benefit the department, especially the learners and the teaching staff and all officials in the department of education.

In terms of the research policy, data or any research activity can only be conducted after school hours as per appointment with affected participants. You are also requested to share your findings with the relevant sections of the department so that we may consider implementing your findings if that will be in the best interest of the department. To this effect, your final approved research report (both soft and hard copy) should be submitted to the department as soon as you complete your research project. You may be required to prepare a presentation and present at the department's annual research dialogue. For more information kindly liaise with the department's research unit @ 013 766 5476 or a.baloyi@education.mpu.gov.za.
The department wishes you well in this important project and pledges to give you the necessary support you may need.

MR. J.R. NKOSI
ACTING HEAD: EDUCATION
22/07/2020
DATE

MPUMALANGA

APPENDIX D: Consent form

Title of Project: "The availability, use and impact of instructional materials in the teaching and learning of Life Sciences in Secondary Schools in the Ehlanzeni District, Mpumalanga".

Name of Researcher: Mathaba S. R. (201303887)

I …… hereby agree to participate in this research project. The research project has been elucidated to me and I understand participation is voluntary.

I understand that:

a. My participation is voluntary and I am free to withdraw from the study at any stage without having to give reasons and without any penalties.
b. I can withdraw my data from the study at any time.
c. None of the confidential research data information collected in this study by means of the questionnaire will be disclosed and no information that identifies me will be made publicly available.
d. The risk of harm to participants will be minimised.
e. Data collected from the partakers will be used only in this research by the researcher.
f. The researcher will answer all the questions that participants might have concerning the study.

By signing this consent form, I come to an agreement to participate in this study.

_____	_____	_____
Name of participant	**Signature**	**Date**

APPENDIX E: Questionnaire
Closed-ended questionnaire

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information Please

tick in the appropriate box

(1) Gender:

Male ◯ Female ◯ Other specify ……..

(2) What is your race

◯ African ◯ White ◯ Coloured ◯ Indian Other specify ……

(3) Kindly indicate your age group

◯ 20-30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ 60+

(4) Please select your highest academic qualification

◯ PhD ◯ Masters ◯ Honours

◯ Degree ◯ Diploma ◯ Ace STD

(5) Indicate your teaching experience

◯ 0-5 years ◯ 6-10 years ◯ 11- 15years ◯ 16-20years

◯ 21-25 years ◯ 26- 30 years ◯ 31-45 years ◯ 46+years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks		
	(ii)	Pictures		
	(iii)	White boards		
	(iv)	Chalk boards		
	(v)	Microscope		
	(vi)	Specimens		
	(vii)	Foldscope		
	(viii)	Pamphlets		
	(ix)	Charts		
	(x)	Projectors		
	(xi)	Models		
AUDIO	(xii)	Compact disc (CD)		
	(xiii)	Radio		
	(xiv)	Tape recorder		
	(xv)	Gramophone/ podcast		
	(xvi)	Record player		
	(xvii)	Audio cassettes		
VISUAL AUDIO	(xviii)	Laptops/Computers		
	(xix)	Smartboards		
	(xx)	Edu boards		
	(xxi)	Television		
	(xxii)	Video recorders		
	(xxiii)	Multimedia		
	(xxiv)	Smart phones/ tablets		

(7) “To what extent do you use the instructional materials to teach in your class in a week”

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks					
(ii)	Pictures					
(iii)	White boards					
(iv)	Chalk boards					
(v)	Microscope					
(vi)	Specimens					
(vii)	Foldscope					
(viii)	Pamphlets					
(ix)	Charts					
(x)	Projectors					
(xi)	Models					
(xii)	Compact disc (CD)					
(xiii)	Radio					
(xiv)	Tape recorder					
(xv)	Gramophone/podcast					
(xvi)	Record players					
(xvii)	Audio cassettes					
(xviii)	Laptops/Computers					
(xix)	Smartboards					
(xx)	Edu boards					
(xxi)	Television					
(xxii)	Video recorders					
(xxiii)	Multimedia					
(xxiv)	Smart phones/tablets					

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials……	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences					
(ii)	assists teachers to create a conductive environment for teaching and learning					
(iii)	allows teachers to teach heuristically					
(iv)	helps teachers to share resources among themselves and learners					
(v)	improves learners academic performance in Life Sciences					
(vi)	minimises learners' misconceptions					
(vii)	helps learners to get rid of the notion that science is difficult					
(viii)	helps teachers to maintain order in class					
(ix)	encourages learners to make learning more meaningful					
(x)	assists in making the delivery of the lesson more interesting in class					
(xi)	promotes retention					
(xii)	helps teachers and learners to have access to resources					
(xiii)	promotes educational efficacy in Life Sciences					

(C) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5
(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences					
(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences					

(iii)	I prefer to use audio-visual instructional materials to promote effective teaching and learning of Life Sciences					

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audio-visual materials as an instructional material					
(ii)	I am able to utilise ICT devices to promote effective teaching and learning					
(iii)	I am able to make models and charts when teaching					
(iv)	I can improvise real objects for learners for teaching and learning					
(v)	I can access information on the internet and share it with learners					
(vi)	I am capable of using laboratory apparatus and equipment for teaching					
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences					
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school					

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

◯ Audio

◯ Visual

◯ Audio- visual

◯ None

APPENDIX F: Responses from participants

Participant 25

***Appendix C*: Closed-ended questionnaire**

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information Please

tick in the appropriate box

(1) Gender:

Male ✓ Female ◯ Other specify .....

(2) What is your race

◯ ✓ African ◯ White ◯ Coloured ◯ Indian Other specify .....

(3) Kindly indicate your age group

◯ ✓20-30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ 60+

(4) Please select your highest academic qualification

◯ PhD ◯ Masters ◯ ✓ Honours

◯ Degree ◯ Diploma ◯ Ace STD

(5) Indicate your teaching experience

◯ ✓ 0-5 years ◯ 6-10 years ◯ ss11- ◯ 15years 16- 20 years

◯ 21-25 years ◯ 26- 30 years ◯ 31-45 years ◯ 46+years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks	✓	
	(ii)	Pictures	✓	
	(iii)	White boards		✓
	(iv)	Chalk boards	✓	
	(v)	Microscope	✓	
	(vi)	Specimens	✓	
	(vii)	Foldscope	✓	
	(viii)	Pamphlets	✓	
	(ix)	Charts	✓	
	(x)	Projectors	✓	
	(xi)	Models	✓	
AUDIO	(xii)	Compact disc (CD)		✓
	(xiii)	Radio		✓
	(xiv)	Tape recorder		✓
	(xv)	Gramophone/ podcast		✓
	(xvi)	Record player		✓
	(xvii)	Audio cassettes	✓	
VISUAL	(xviii)	Laptops/Computers	✓	
	(xix)	Smartboards	✓	
	(xx)	Edu boards	✓	
AUDIO	(xxi)	Television	✓	
	(xxii)	Video recorders		✓
	(xxiii)	Multimedia	✓	
	(xxiv)	Smart phones/ tablets	✓	

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks	✓				
(ii)	Pictures	✓				
(iii)	White boards					✓
(iv)	Chalk boards	✓				
(v)	Microscope					✓
(vi)	Specimens				✓	
(vii)	Foldscope					✓
(viii)	Pamphlets	✓				
(ix)	Charts				✓	
(x)	Projectors					✓
(xi)	Models	✓				
(xii)	Compact disc (CD)					✓
(xiii)	Radio					✓
(xiv)	Tape recorder					✓
(xv)	Gramophone/podcast					✓
(xvi)	Record players					✓
(xvii)	Audio cassettes					✓
(xviii)	Laptops/Computers	✓				
(xix)	Smartboards					✓
(xx)	Edu boards					✓
(xxi)	Television					✓
(xxii)	Video recorders					✓
(xxiii)	Multimedia	✓				
(xxiv)	Smart phones/tablets	✓				

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials.....	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences					✓
(ii)	assists teachers to create a conducive environment for teaching and learning					✓
(iii)	allows teachers to teach heuristically					✓
(iv)	helps teachers to share resources among themselves and learners					✓
(v)	improves learners academic performance in Life Sciences					✓
(vi)	minimises learners' misconceptions					✓
(vii)	helps learners to get rid of the notion that science is difficult					✓
(viii)	helps teachers to maintain order in class				✓	
(ix)	encourages learners to make learning more meaningful					✓
(x)	assists in making the delivery of the lesson more interesting in class					✓
(xi)	promotes retention				✓	
(xii)	helps teachers and learners to have access to resources					✓
(xiii)	promotes educational efficacy in Life Sciences					✓

(C) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5

(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences			✓		
(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences					✓
(iii)	I prefer to use audiovisual instructional materials to promote effective teaching and learning of Life Sciences				✓	

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audiovisual materials as an instructional material			✓		
(ii)	I am able to utilise ICT devices to promote effective teaching and learning			✓		
(iii)	I am able to make models and charts when teaching				✓	
(iv)	I can improvise real objects for learners for teaching and learning					✓
(v)	I can access information on the internet and share it with learners					✓
(vi)	I am capable of using laboratory apparatus and equipment for teaching				✓	
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences				✓	
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school				✓	

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

- Audio
- Visual
- ✓ Audio- visual
- None

Participant 3

***Appendix C*: Closed-ended questionnaire**

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information

Please tick in the appropriate box

(1) Gender:

Male ◯ Female ⊗ Other specify .....

(2) What is your race

⊗ African ◯ White ◯ Coloured ◯ Indian Other specify .....

(3) Kindly indicate your age group

⊗ 20-30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ 60+

(4) Please select your highest academic qualification

◯ PhD ◯ Masters ◯ Honours

⊗ Degree ◯ Diploma ◯ Ace STD

(5) Indicate your teaching experience

⊗ 0-5 years ◯ 6-10 years ◯ 11- 15 years ◯ 16- 20 years

◯ 21-25 years ◯ 25- 30 years ◯ 26 – 30 years ◯ 31+ years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

1 | Page

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks	X	
	(ii)	Pictures	X	
	(iii)	White boards		X
	(iv)	Chalk boards		X
	(v)	Microscope		X
	(vi)	Specimens		X
	(vii)	Foldscope		X
	(viii)	Pamphlets	X	
	(ix)	Charts	X	
	(x)	Projectors		X
	(xi)	Models		X
AUDIO	(xii)	Compact disc (CD)		X
	(xiii)	Radio		X
	(xiv)	Tape recorder		X
	(xv)	Gramophone/ podcast		X
	(xvi)	Record player		X
	(xvii)	Audio cassettes		X
AUDIO VISUAL	(xviii)	Laptops/Computers		X
	(xix)	Smartboards		X
	(xx)	Edu boards		X
	(xxi)	Television		X
	(xxii)	Video recorders		X
	(xxiii)	Multimedia		X
	(xxiv)	Smart phones/ tablets		X

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks	X				
(ii)	Pictures				X	
(iii)	White boards					X
(iv)	Chalk boards	X				
(v)	Microscope					X
(vi)	Specimens					X
(vii)	Foldscope					X
(viii)	Pamphlets				X	
(ix)	Charts				X	
(x)	Projectors					X
(xi)	Models					X
(xii)	Compact disc (CD)					X
(xiii)	Radio					X
(xiv)	Tape recorder					X
(xv)	Gramophone/podcast					X
(xvi)	Record players					X
(xvii)	Audio cassettes					X
(xviii)	Laptops/Computers					X
(xix)	Smartboards					X
(xx)	Edu boards					X
(xxi)	Television					X
(xxii)	Video recorders					X
(xxiii)	Multimedia					X
(xxiv)	Smart phones/tablets					X

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials.....	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences				X	
(ii)	assists teachers to create a conducive environment for teaching and learning				X	
(iii)	allows teachers to teach heuristically				X	
(iv)	helps teachers to share resources among themselves and learners				X	
(v)	improves learners academic performance in Life Sciences				X	
(vi)	minimises learners' misconceptions					X
(vii)	helps learners to get rid of the notion that science is difficult					X
(viii)	helps teachers to maintain order in class				X	
(ix)	encourages learners to make learning more meaningful					X
(x)	assists in making the delivery of the lesson more interesting in class					X
(xi)	promotes retention				X	
(xii)	helps teachers and learners to have access to resources				X	
(xiii)	promotes educational efficacy in Life Sciences				X	

(C) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5
(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences			X		

(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences					X
(iii)	I prefer to use audiovisual instructional materials to promote effective teaching and learning of Life Sciences				X	

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audiovisual materials as an instructional material			X		
(ii)	I am able to utilise ICT devices to promote effective teaching and learning			X		
(iii)	I am able to make models and charts when teaching				X	
(iv)	I can improvise real objects for learners for teaching and learning				X	
(v)	I can access information on the internet and share it with learners				X	
(vi)	I am capable of using laboratory apparatus and equipment for teaching				X	
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences					X
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school					X

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

- ◯ Audio
- ◯ Visual
- ⊗ Audio- visual
- ◯ None

Participant 70

***Appendix C*: Closed-ended questionnaire**

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information

Please tick in the appropriate box

(1) Gender:

Male (✓) Female ( ) Other specify .....

(2) What is your race

(✓) African ( ) White ( ) Coloured ( ) Indian Other specify .....

(3) Kindly indicate your age group

( ) 20-30 ( ) 31-40 ( ) 41-50 (✓) 51-60 ( ) 60+

(4) Please select your highest academic qualification

( ) PhD ( ) Masters (✓) Honours

( ) Degree ( ) Diploma ( ) Ace STD

(5) Indicate your teaching experience

( ) 0-5 years ( ) 6-10 years (✓) 11- 15 years ( ) 16- 20 years

( ) 21-25 years ( ) 25- 30 years ( ) 26 – 30 years ( ) 31+ years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks	✓	
	(ii)	Pictures	✓	
	(iii)	White boards	✓	
	(iv)	Chalk boards	✓	
	(v)	Microscope	✓	
	(vi)	Specimens		✓
	(vii)	Foldscope	✓	
	(viii)	Pamphlets	✓	
	(ix)	Charts	✓	
	(x)	Projectors	✓	
	(xi)	Models		✓
AUDIO	(xii)	Compact disc (CD)	✓	
	(xiii)	Radio		✓
	(xiv)	Tape recorder	✓	
	(xv)	Gramophone/ podcast		✓
	(xvi)	Record player	✓	
	(xvii)	Audio cassettes		✓
VISUAL AUDIO	(xviii)	Laptops/Computers	✓	
	(xix)	Smartboards		✓
	(xx)	Edu boards	✓	
	(xxi)	Television	✓	
	(xxii)	Video recorders		✓
	(xxiii)	Multimedia	✓	
	(xxiv)	Smart phones/ tablets		✓

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks				✓	
(ii)	Pictures		✓			
(iii)	White boards			✓		
(iv)	Chalk boards			✓		
(v)	Microscope				✓	
(vi)	Specimens					✓
(vii)	Foldscope			✓		
(viii)	Pamphlets	✓				
(ix)	Charts			✓		
(x)	Projectors				✓	
(xi)	Models					✓
(xii)	Compact disc (CD)			✓		
(xiii)	Radio					✓
(xiv)	Tape recorder			✓		
(xv)	Gramophone/podcast					✓
(xvi)	Record players					
(xvii)	Audio cassettes			✓		
(xviii)	Laptops/Computers					✓
(xix)	Smartboards				✓	
(xx)	Edu boards				✓	
(xxi)	Television					
(xxii)	Video recorders					✓
(xxiii)	Multimedia			✓		
(xxiv)	Smart phones/tablets					✓

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials.....	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences				✓	
(ii)	assists teachers to create a conducive environment for teaching and learning		✓			
(iii)	allows teachers to teach heuristically				✓	
(iv)	helps teachers to share resources among themselves and learners				✓	
(v)	improves learners academic performance in Life Sciences	✓				
(vi)	minimises learners' misconceptions				✓	
(vii)	helps learners to get rid of the notion that science is difficult	✓				
(viii)	helps teachers to maintain order in class				✓	
(ix)	encourages learners to make learning more meaningful		✓			
(x)	assists in making the delivery of the lesson more interesting in class		✓		✓	
(xi)	promotes retention		✓		✓	
(xii)	helps teachers and learners to have access to resources			✓		
(xiii)	promotes educational efficacy in Life Sciences			✓		

(C) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5
(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences	✓				

(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences			✓		
(iii)	I prefer to use audiovisual instructional materials to promote effective teaching and learning of Life Sciences		✓			

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audiovisual materials as an instructional material	✓				
(ii)	I am able to utilise ICT devices to promote effective teaching and learning			✓		
(iii)	I am able to make models and charts when teaching	✓				
(iv)	I can improvise real objects for learners for teaching and learning				✓	
(v)	I can access information on the internet and share it with learners		✓			
(vi)	I am capable of using laboratory apparatus and equipment for teaching				✓	
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences		✓			
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school				✓	

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

- ✓ Audio
- ○ Visual
- ○ Audio- visual
- ○ None

Participant 28

***Appendix C*: Closed-ended questionnaire**

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information

Please tick in the appropriate box

(1) Gender:

Male ⊗ Female ○ Other specify .....

(2) What is your race

⊗ African ○ White ○ Coloured ○ Indian Other specify .....

(3) Kindly indicate your age group

⊗ 20-30 ○ 31-40 ○ 41-50 ○ 51-60 ○ 60+

(4) Please select your highest academic qualification

○ PhD ○ Masters ○ Honours

⊗ Degree ○ Diploma ○ Ace STD

(5) Indicate your teaching experience

⊗ 0-5 years ○ 6-10 years ○ 11- 15 years ○ 16- 20 years

○ 21-25 years ○ 25- 30 years ○ 26 – 30 years ○ 31+ years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks	✓	
	(ii)	Pictures		✓
	(iii)	White boards		✓
	(iv)	Chalk boards	✓	
	(v)	Microscope	✓	
	(vi)	Specimens		✓
	(vii)	Foldscope		✓
	(viii)	Pamphlets		✓
	(ix)	Charts		✓
	(x)	Projectors	✓	
	(xi)	Models	✓	
AUDIO	(xii)	Compact disc (CD)		✓
	(xiii)	Radio		✓
	(xiv)	Tape recorder		✓
	(xv)	Gramophone/ podcast		✓
	(xvi)	Record player		✓
	(xvii)	Audio cassettes		✓
VISUAL	(xviii)	Laptops/Computers	✓	
	(xix)	Smartboards		✓
	(xx)	Edu boards		✓
AUDIO	(xxi)	Television		✓
	(xxii)	Video recorders		✓
	(xxiii)	Multimedia		✓
	(xxiv)	Smart phones/ tablets		✓

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks	✓				
(ii)	Pictures					✓
(iii)	White boards					✓
(iv)	Chalk boards	✓				
(v)	Microscope	✓				
(vi)	Specimens					✓
(vii)	Foldscope					✓
(viii)	Pamphlets					✓
(ix)	Charts					✓
(x)	Projectors	✓				
(xi)	Models					✓
(xii)	Compact disc (CD)					✓
(xiii)	Radio					✓
(xiv)	Tape recorder					✓
(xv)	Gramophone/podcast					✓
(xvi)	Record players					✓
(xvii)	Audio cassettes					✓
(xviii)	Laptops/Computers			✓		
(xix)	Smartboards					✓
(xx)	Edu boards					✓
(xxi)	Television					✓
(xxii)	Video recorders					✓
(xxiii)	Multimedia					✓
(xxiv)	Smart phones/tablets					✓

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials.....	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences					✓
(ii)	assists teachers to create a conducive environment for teaching and learning					✓
(iii)	allows teachers to teach heuristically					✓
(iv)	helps teachers to share resources among themselves and learners					✓
(v)	improves learners academic performance in Life Sciences					✓
(vi)	minimises learners' misconceptions					✓
(vii)	helps learners to get rid of the notion that science is difficult					✓
(viii)	helps teachers to maintain order in class					✓
(ix)	encourages learners to make learning more meaningful					✓
(x)	assists in making the delivery of the lesson more interesting in class					✓
(xi)	promotes retention					✓
(xii)	helps teachers and learners to have access to resources					✓
(xiii)	promotes educational efficacy in Life Sciences					✓

(C) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5
(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences	✓				

(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences					✓
(iii)	I prefer to use audiovisual instructional materials to promote effective teaching and learning of Life Sciences					✓

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audiovisual materials as an instructional material			✓		
(ii)	I am able to utilise ICT devices to promote effective teaching and learning	✓				
(iii)	I am able to make models and charts when teaching			✓		
(iv)	I can improvise real objects for learners for teaching and learning					✓
(v)	I can access information on the internet and share it with learners			✓		
(vi)	I am capable of using laboratory apparatus and equipment for teaching			✓		
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences			✓		
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school	✓				

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

- ◯ Audio
- ◯ Visual
- ◯ Audio- visual
- ⊗ None

Participant 75

***Appendix C*: Closed-ended questionnaire**

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information

Please tick in the appropriate box

(1) Gender:

Male ◯ Female ✓ Other specify .....

(2) What is your race

✓ African ◯ White ◯ Coloured ◯ Indian Other specify .....

(3) Kindly indicate your age group

◯ 20-30 ✓ 31-40 ◯ 41-50 ◯ 51-60 ◯ 60+

(4) Please select your highest academic qualification

◯ PhD ◯ Masters ✓ Honours

◯ Degree ◯ Diploma ◯ Ace STD

(5) Indicate your teaching experience

◯ 0-5 years ◯ 6-10 years ✓ 11- 15 years ◯ 16- 20 years

◯ 21-25 years ◯ 25- 30 years ◯ 26 – 30 years ◯ 31+ years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks	✓	
	(ii)	Pictures		✓
	(iii)	White boards	✓	
	(iv)	Chalk boards	✓	
	(v)	Microscope		✓
	(vi)	Specimens		✓
	(vii)	Foldscope		✓
	(viii)	Pamphlets		✓
	(ix)	Charts		✓
	(x)	Projectors	✓	
	(xi)	Models		✓
AUDIO	(xii)	Compact disc (CD)		✓
	(xiii)	Radio		✓
	(xiv)	Tape recorder		✓
	(xv)	Gramophone/ podcast		✓
	(xvi)	Record player		✓
	(xvii)	Audio cassettes		✓
VISUAL	(xviii)	Laptops/Computers	✓	
	(xix)	Smartboards		✓
	(xx)	Edu boards		✓
AUDIO	(xxi)	Television	✓	
	(xxii)	Video recorders		✓
	(xxiii)	Multimedia		✓
	(xxiv)	Smart phones/ tablets		✓

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks	✓				
(ii)	Pictures					✓
(iii)	White boards				✓	
(iv)	Chalk boards	✓				
(v)	Microscope					✓
(vi)	Specimens					✓
(vii)	Foldscope					✓
(viii)	Pamphlets					✓
(ix)	Charts					✓
(x)	Projectors				✓	
(xi)	Models					✓
(xii)	Compact disc (CD)					✓
(xiii)	Radio					✓
(xiv)	Tape recorder					✓
(xv)	Gramophone/podcast					✓
(xvi)	Record players					✓
(xvii)	Audio cassettes					✓
(xviii)	Laptops/Computers		✓			
(xix)	Smartboards					✓
(xx)	Edu boards					✓
(xxi)	Television				✓	
(xxii)	Video recorders					✓
(xxiii)	Multimedia					✓
(xxiv)	Smart phones/tablets					✓

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks	✓				
(ii)	Pictures					✓
(iii)	White boards				✓	
(iv)	Chalk boards	✓				
(v)	Microscope					✓
(vi)	Specimens					✓
(vii)	Foldscope					✓
(viii)	Pamphlets					✓
(ix)	Charts					✓
(x)	Projectors				✓	
(xi)	Models					✓
(xii)	Compact disc (CD)					✓
(xiii)	Radio					✓
(xiv)	Tape recorder					✓
(xv)	Gramophone/podcast					✓
(xvi)	Record players					✓
(xvii)	Audio cassettes					✓
(xviii)	Laptops/Computers		✓			
(xix)	Smartboards					✓
(xx)	Edu boards					✓
(xxi)	Television				✓	
(xxii)	Video recorders					✓
(xxiii)	Multimedia					✓
(xxiv)	Smart phones/tablets					✓

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials.....	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences			✓		
(ii)	assists teachers to create a conducive environment for teaching and learning			✓		
(iii)	allows teachers to teach heuristically				✓	
(iv)	helps teachers to share resources among themselves and learners			✓		
(v)	improves learners academic performance in Life Sciences			✓		
(vi)	minimises learners' misconceptions				✓	
(vii)	helps learners to get rid of the notion that science is difficult				✓	
(viii)	helps teachers to maintain order in class				✓	
(ix)	encourages learners to make learning more meaningful					✓
(x)	assists in making the delivery of the lesson more interesting in class			✓		
(xi)	promotes retention			✓		
(xii)	helps teachers and learners to have access to resources				✓	
(xiii)	promotes educational efficacy in Life Sciences				✓	

(C) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5
(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences			✓		

(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences			✓		
(iii)	I prefer to use audiovisual instructional materials to promote effective teaching and learning of Life Sciences			✓		

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audiovisual materials as an instructional material		✓			
(ii)	I am able to utilise ICT devices to promote effective teaching and learning			✓		
(iii)	I am able to make models and charts when teaching	✓				
(iv)	I can improvise real objects for learners for teaching and learning			✓		
(v)	I can access information on the internet and share it with learners				✓	
(vi)	I am capable of using laboratory apparatus and equipment for teaching		✓			
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences		✓			
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school				✓	

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

- (✓) Audio
- ( ) Visual
- ( ) Audio- visual
- ( ) None

Participant 35

***Appendix C*: Closed-ended questionnaire**

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information

Please tick in the appropriate box

(1) Gender:

Male ◯ Female ✓ Other specify .....

(2) What is your race

✓ African ◯ White ◯ Coloured ◯ Indian Other specify .....

(3) Kindly indicate your age group

✓ 20-30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ 60+

(4) Please select your highest academic qualification

◯	PhD	◯	Masters	◯	Honours
✓	Degree	◯	Diploma	◯	Ace STD

(5) Indicate your teaching experience

✓ 0-5 years	◯ 6-10 years	◯ 11- 15 years	◯ 16- 20 years
◯ 21-25 years	◯ 25- 30 years	◯ 26 – 30 years	◯ 31+ years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks	✓	
	(ii)	Pictures	✓	
	(iii)	White boards	✓	
	(iv)	Chalk boards	✓	
	(v)	Microscope		✓
	(vi)	Specimens		✓
	(vii)	Foldscope	✓	
	(viii)	Pamphlets	✓	
	(ix)	Charts	✓	
	(x)	Projectors	✓	
	(xi)	Models		
AUDIO	(xii)	Compact disc (CD)	✓	
	(xiii)	Radio		✓
	(xiv)	Tape recorder		✓
	(xv)	Gramophone/ podcast		✓
	(xvi)	Record player		✓
	(xvii)	Audio cassettes		✓
VISUAL AUDIO	(xviii)	Laptops/Computers	✓	
	(xix)	Smartboards	✓	
	(xx)	Edu boards		✓
	(xxi)	Television	✓	
	(xxii)	Video recorders		✓
	(xxiii)	Multimedia	✓	
	(xxiv)	Smart phones/ tablets		✓

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks			✓		
(ii)	Pictures				✓	
(iii)	White boards			✓		
(iv)	Chalk boards	✓				
(v)	Microscope					✓
(vi)	Specimens					✓
(vii)	Foldscope					✓
(viii)	Pamphlets				✓	
(ix)	Charts				✓	
(x)	Projectors				✓	
(xi)	Models					✓
(xii)	Compact disc (CD)					✓
(xiii)	Radio					✓
(xiv)	Tape recorder					✓
(xv)	Gramophone/podcast					✓
(xvi)	Record players					✓
(xvii)	Audio cassettes					✓
(xviii)	Laptops/Computers					✓
(xix)	Smartboards				✓	
(xx)	Edu boards					✓
(xxi)	Television					✓
(xxii)	Video recorders					✓
(xxiii)	Multimedia					✓
(xxiv)	Smart phones/tablets					✓

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials.....	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences					✓
(ii)	assists teachers to create a conducive environment for teaching and learning					✓
(iii)	allows teachers to teach heuristically					✓
(iv)	helps teachers to share resources among themselves and learners					✓
(v)	improves learners academic performance in Life Sciences					✓
(vi)	minimises learners' misconceptions					✓
(vii)	helps learners to get rid of the notion that science is difficult					✓
(viii)	helps teachers to maintain order in class					✓
(ix)	encourages learners to make learning more meaningful				✓	
(x)	assists in making the delivery of the lesson more interesting in class					✓
(xi)	promotes retention					✓
(xii)	helps teachers and learners to have access to resources				✓	
(xiii)	promotes educational efficacy in Life Sciences				✓	

(C) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5
(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences	✓				

(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences					✓
(iii)	I prefer to use audiovisual instructional materials to promote effective teaching and learning of Life Sciences					✓

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audiovisual materials as an instructional material				✓	
(ii)	I am able to utilise ICT devices to promote effective teaching and learning				✓	
(iii)	I am able to make models and charts when teaching					✓
(iv)	I can improvise real objects for learners for teaching and learning			✓		
(v)	I can access information on the internet and share it with learners					✓
(vi)	I am capable of using laboratory apparatus and equipment for teaching					✓
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences			✓		
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school					✓

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

- ✓ Audio
- ○ Visual
- ○ Audio- visual
- ○ None

Participant 34

Appendix C: Closed-ended questionnaire

The questionnaire will be filled in by Life Sciences teachers in the Ehlanzeni District, Mpumalanga.

The information here provided will be treated with dignity and confidentiality. No names will be revealed in this study; only pseudonyms will be used if necessary.

(A) Demographic information

Please tick in the appropriate box

(1) Gender:

Male ◯ Female ✓ Other specify .....

(2) What is your race

✓ African ◯ White ◯ Coloured ◯ Indian Other specify .....

(3) Kindly indicate your age group

✓ 20-30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ 60+

(4) Please select your highest academic qualification

◯ PhD ◯ Masters ◯ Honours

✓ Degree ◯ Diploma ◯ Ace STD

(5) Indicate your teaching experience

✓ 0-5 years ◯ 6-10 years ◯ 11- 15 years ◯ 16- 20 years

◯ 21-25 years ◯ 25- 30 years ◯ 26 – 30 years ◯ 31+ years

(B) Types of instructional materials

On the following tables, tick in the space provided

(6) Indicate whether the following instructional materials are available or not available at your school

Types of instructional materials			Available	
			Yes	no
VISUAL	(i)	Textbooks	✓	
	(ii)	Pictures	✓	
	(iii)	White boards	✓	
	(iv)	Chalk boards	✓	
	(v)	Microscope		✓
	(vi)	Specimens	✓	
	(vii)	Foldscope		✓
	(viii)	Pamphlets	✓	
	(ix)	Charts	✓	
	(x)	Projectors	✓	
	(xi)	Models		✓
AUDIO	(xii)	Compact disc (CD)		✓
	(xiii)	Radio		✓
	(xiv)	Tape recorder		✓
	(xv)	Gramophone/ podcast		✓
	(xvi)	Record player		✓
	(xvii)	Audio cassettes		✓
VISUAL	(xviii)	Laptops/Computers	✓	
	(xix)	Smartboards		✓
	(xx)	Edu boards		✓
AUDIO	(xxi)	Television		✓
	(xxii)	Video recorders		✓
	(xxiii)	Multimedia		✓
	(xxiv)	Smart phones/ tablets	✓	

(7) To what extent do you use the instructional materials to teach in your class in a week

	Instructional materials	Always	Three times a week	Twice a week	Once a week	Never
(i)	Textbooks	✓				
(ii)	Pictures		✓			
(iii)	White boards	✓				
(iv)	Chalk boards	✓				
(v)	Microscope					✓
(vi)	Specimens				✓	
(vii)	Foldscope					✓
(viii)	Pamphlets				✓	
(ix)	Charts		✓			
(x)	Projectors				✓	
(xi)	Models					✓
(xii)	Compact disc (CD)					✓
(xiii)	Radio					✓
(xiv)	Tape recorder					✓
(xv)	Gramophone/podcast					✓
(xvi)	Record players					✓
(xvii)	Audio cassettes					✓
(xviii)	Laptops/Computers			✓		
(xix)	Smartboards					✓
(xx)	Edu boards					✓
(xxi)	Television					✓
(xxii)	Video recorders					✓
(xxiii)	Multimedia				✓	
(xxiv)	Smart phones/tablets			✓		

For question 8 – 10 use the following response Likert-scale and tick in the space provided.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

(8) How does the use of instructional materials impact the teaching and learning of Life Sciences?

	The use of instructional materials.....	1	2	3	4	5
(i)	promotes effective teaching and learning of Life Sciences	✓				
(ii)	assists teachers to create a conducive environment for teaching and learning	✓				
(iii)	allows teachers to teach heuristically		✓			
(iv)	helps teachers to share resources among themselves and learners	✓				
(v)	improves learners academic performance in Life Sciences		✓			
(vi)	minimises learners' misconceptions	✓				
(vii)	helps learners to get rid of the notion that science is difficult		✓			
(viii)	helps teachers to maintain order in class	✓				
(ix)	encourages learners to make learning more meaningful	✓				
(x)	assists in making the delivery of the lesson more interesting in class	✓				
(xi)	promotes retention	✓				
(xii)	helps teachers and learners to have access to resources	✓				
(xiii)	promotes educational efficacy in Life Sciences	✓				

(c) Types of instructional materials and the levels of importance in promoting effective teaching and learning of Life Sciences

(9) Below are a number of statements regarding the use of the types of instructional materials to promote effective teaching and learning of Life Sciences. Please read the statements and indicate to what extent you agree or disagree with each statement.

1 Strongly Disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly Agree

		1	2	3	4	5
(i)	I prefer to use audio instructional materials to promote effective teaching and learning of Life Sciences	✓				

(ii)	I prefer to use visual instructional materials to promote effective teaching and learning of Life Sciences	✓				
(iii)	I prefer to use audiovisual instructional materials to promote effective teaching and learning of Life Sciences		✓			

(10) Life Sciences teachers' level of accessing and utilisation of instructional materials

Please tick in the space provided

		Very low	Low	Average	High	Very high
(i)	I am able to utilise audiovisual materials as an instructional material		✓			
(ii)	I am able to utilise ICT devices to promote effective teaching and learning			✓		
(iii)	I am able to make models and charts when teaching		✓			
(iv)	I can improvise real objects for learners for teaching and learning		✓			
(v)	I can access information on the internet and share it with learners	✓				
(vi)	I am capable of using laboratory apparatus and equipment for teaching				✓	
(vii)	I can integrate animations to promote effective teaching and learning of Life Sciences				✓	
(viii)	I organise field trips for learners to expose them to some of the instructional materials that are not available at school		✓			

(11) Out of the three types of instructional materials, which one do you rarely use because of barriers (lack of skills) in utilising the instructional material? Please tick in the box.

- (✓) Audio
- ( ) Visual
- ( ) Audio- visual
- ( ) None