



**Grade 11 Learners' Life Sciences Self-concept: A Case Study in Amajuba
District**

By

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Submitted in fulfilment of academic requirements for the degree of Master of
Education in the School of Education, College of Humanities,

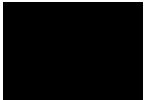
University of KwaZulu-Natal

2023

Declaration

I **Bhekumuzi Innocent Zondi** declare that:

- i. The research entitled, “*Grade 11 Learners’ Life Sciences Self-concept: A Case Study in Amajuba District*”, except where indicated is my original work.
- ii. The thesis has not been submitted for any degree or examination at any other University.
- iii. This thesis does not contain another person’s writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then;
 - a) Their words have been re-written but the general information attributed to them has been referenced;
 - b) Where their exact words have been used, their writing has been placed inside quotation marks and referenced.
- iv. The work described in this thesis was carried out in the School of Education, University of KwaZulu-Natal from March 2021 to June 2023 under the supervision of Dr T Chirikure and co-supervision of Dr D Sibanda.
- v. Ethical clearance No HSSREC/00003971/2022 was granted prior to undertaking the research.

Signed Date: 18/11/2023

As the candidate’s supervisor I, **Dr Tamirofoa Chirikure**, agreed/do not agree to the submission of this thesis.

Signed.....Date: 20/11/2023

As the candidate's co-supervisor I, **Dr Doras Sibanda**, agreed/do not agree to the submission of this thesis.

Signed

A solid black rectangular box used to redact the signature of the co-supervisor.

Date: 20/11/2023

Acknowledgements

This study could only be completed with the assistance of others, and I would like to convey my gratitude to the following people:

- Dr T Chirikure and Dr D Sibanda, my supervisor and co-supervisor respectively, for your advice, guidance, insight, and continuous support throughout this study.
- UKZN Cohort supervisors for their critical reviews, consistent support, and constructive criticism.
- KwaZulu-Natal Department of Education for approving the gathering of data.
- School headmasters and educators of respective schools for consenting me to conduct study at their schools and for all their assistance.
- To all the participants, without your help, this study would not have been possible.
- My family, a word of encouragement and moral support, without which I might have given up this project.
- My niece, Siyanda, thank you for your moral support and words of encouragement. My gratitude cannot be sufficiently expressed either in words or writing.
- Finally, the greatest expression of gratitude goes to the Almighty Lord, who has guided and protected me through all hardships.

Dedication

This work is dedicated to my late grandmother, MaGumede, and my late brother, Sibusiso, who would have been very proud of me.

List of Abbreviations

ASC:	Academic Self-concept
GI/EFMR:	Generalised Internal/External Frame of Reference Model
I/EM:	Internal/External Model
KZN:	KwaZulu-Natal
KZNDoe:	KwaZulu-Natal Department of Education
LS:	Life Sciences
REM:	Reciprocal Effect Model
SC:	Self-concept
SDQ:	Self-Description Questionnaire
SPSS:	Statistical Package for the Social Sciences
STEM:	Science, Technology, Engineering and Mathematics
UKZN:	University of KwaZulu-Natal

Abstract

The purpose of this mixed methods sequential explanatory study was to explore the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in KwaZulu-Natal Province. Life Sciences self-concept refers to self-perceptions learners have about their capabilities in Life Sciences. The current study was guided by revisited Reciprocal Effect Model (REM) and Generalised Internal/External Frame of Reference Model (GI/EFRM). Data were generated through a Self-Description Questionnaire, Grade 11 learners' term marks, and semi-structured interviews. SPSS was used to analyse quantitative data. Content analysis was used to analyse qualitative data. The findings of the study showed that 94.7% of Grade 11 learners had a positive Life Sciences self-concept ($M = 45.86$). Female learners ($M = 47.21$) demonstrated a more positive Life Sciences self-concept than male learners ($M = 43.30$). The findings also showed a strong positive correlation between the learners' Life Sciences self-concept and their academic achievement ($r = .491, p < .01$). Hence, it was recommended that relevant stakeholders and educators should help learners build a positive Life Sciences self-concept.

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Chapter 1

Introduction

1.1 Introduction

The current study aimed to investigate the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in KwaZulu-Natal Province. To study the phenomenon, an explanatory sequential mixed methods was used. Chapter 1 included a discussion of the background, significance of the study and purpose statement. The aims, objectives and key research questions, as well as research design and methodology then followed. Finally, the chapter ended by presenting a summary of how the thesis is structured from chapter to chapter.

1.2 Background of the Study

The concept of self as a multi-dimensional model has gained enormous attention in social sciences research through the work of Shavelson and colleagues (Marsh & Craven, 2006). Since then, research on self-concept has captured the attention of scholars from diverse fields. The multi-dimensional model states that one of the key areas of self that contribute to a person's overall self-concept is their academic self-concept (Marsh et al., 2019). That is, domain-specific self-concept is reported as an imperative construct that plays a significant role in learners' academic abilities at secondary level (Jaiswal & Choudhuri, 2017).

In general, Jaiswal and Choudhuri (2017) describe self-concept as how a person perceives themselves based on their behavioural traits, experiences and interactions with their surroundings. According to Darling-Hammond et al. (2020),

learners with a positive self-concept demonstrate an autonomous mind-set, determination and a drive to achieve their goals, which is evident in their abilities.

Several studies conducted on self-concept in recent years have revealed that learners' concept of self and academic success are interrelated (Behera & Samal, 2015; Herrera et al., 2020; Jansen et al., 2015; Marsh, 2014; Marsh & Köller, 2004; Schütte, 2015; Trautwein & Möller, 2016). The literature revealed that learners' self-concept has the potential of affecting learners' academic behaviour, career choices, achievements and educational aspirations positively or negatively (Herrera et al., 2020).

Furthermore, recent literature studies have shown that the learners' academic achievement is strongly influenced by their perceptions of themselves as positive. Particularly, learners with a positive self-concept are more likely to perform better and achieve more qualitative results (Ehm et al., 2019; Herrera et al., 2020; Tus, 2020). A positive self-perception is also reported as a construct that has the potential of reducing the rise of learners' learning complications (Muttaqin et al., 2020). Also, a negative self-concept is shown to prevent learners from fully utilising their capabilities, as they do not know their true potential (Sieberer-Nagler, 2016).

Despite the implications of learners' self-concept as a contributing factor in their academic realm, debatably, very limited scientific research has been conducted specifically on learners' Life Sciences self-concept within the South African context. To date, significant research has been conducted on STEM subjects (Science, Technology, Engineering, and Mathematics) self-concept (Direito et al., 2017; Ertl et al., 2017; Herrera et al., 2020).

In addition, it is still unclear if self-concept substantially correlates with academic achievement. Wu et al. (2021) conducted a longitudinal study on the relationship between academic success and academic self-concept. Their findings showed that academic self-concept was highly correlated with achievement and vice versa, in contrast to prior studies that found no significant relationship between these two dimensions (Noviyanti et al., 2019). Such findings stressed the necessity for more research in the area of learners' Life Sciences self-concept within the South African context. Hence, the researcher identified the need to explore the nature of Grade 11 learners' Life Sciences self-concept further and determine how Life Sciences self-concept relates to learners' academic achievement.

1.3 Significance of the Study

Ensuring that all learners, regardless of circumstances, have equitable access to high-quality education is one of the primary objectives of our educational system. The current study may be useful to Life Sciences educators to identify learners' needs, support them, and monitor their progress. This study may also help educators, parents, policy makers and researchers in education to build an inclusive school environment, curriculums and transition programmes that will help learners develop and maintain a positive Life Sciences self-concept. The findings of the current study will also add to existing literature on the phenomenon in a South African context.

1.4 Purpose Statement

This mixed methods sequential explanatory study's purpose was to explore the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in KwaZulu-Natal Province. This method involved gathering and analysing the

quantitative data first, then collecting and analysing qualitative data to explain the quantitative findings in depth.

1.5 Research Aims and Objectives

1.5.1 Aim(s)

The study's primary aim was to investigate the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in KwaZulu-Natal Province.

1.5.2 Objectives of the Study

The primary objectives of this study were:

1. To determine the nature of Grade 11 learners' Life Sciences self-concept.
2. To determine if there was a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept.
3. To determine the relationship between Grade 11 learners' Life Sciences self-concept and academic achievement.
4. To explain the nature of Grade 11 learners' Life Sciences self-concept.

1.6 Research Questions

The four research questions this study intended to address were as follows:

1. What is the nature of Grade 11 learners' Life Sciences self-concept?
2. Is there a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept?
3. What is the relationship between Grade 11 learners' Life Sciences self-concept and academic achievement?
4. Why do Grade 11 learners have a specific Life Sciences self-concept?

1.7 Research Design and Methodology

To explore the nature of Grade 11 learners' Life Sciences self-concept in selected secondary schools, the researcher adopted a pragmatic paradigm and explanatory sequential mixed methods design. The study focused on gathering, analysing and collaborating both quantitative and qualitative data in a single study (Creswell & Creswell, 2018). The researcher gathered and analysed the quantitative data first, followed by explaining the results in depth using qualitative research (Creswell & Creswell, 2018). The sample of the study consisted of 133 Grade 11 Life Sciences learners from three conveniently selected secondary schools in Amajuba District in KwaZulu-Natal.

The researcher adopted a purposive and convenience sampling method. Sampling was convenient since the researcher selected schools and learners based on their convenient locations and easy accessibility. A Self-Description Questionnaire II (SDQ II) adapted from Marsh (1990) was administered to 133 participants. Of the 133 participants, only 10 purposively selected respondents participated in the face-to-face semi-structured interviews. Academic achievement was measured using the learners' Life Sciences term marks obtained from their subject teachers. Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS). For the quantitative data analysis, descriptive and inferential statistics were used, and for the analysis of qualitative data, content analysis was used.

1.8 Chapter Division

This thesis was organised into six chapters: Chapters 1 to 6. Each chapter presented the different stages of the study as follows:

Chapter 1: Introduction

A thorough overview of the research was presented in Chapter 1. This chapter provided a summary of the current study. This chapter includes aims, objectives and the significance of the study, as well as research questions.

Chapter 2: Literature Review

In Chapter 2, the relevant research on learners' self-concept, forms of self-concept and the relationship between self-concept and other factors, including academic achievement, was reviewed.

Chapter 3: Theoretical Framework

Chapter 3 outlined the theoretical models that underpinned the current study. It also presented the link between adopted models and the current study.

Chapter 4: Methodology and Design

The research design and methods are outlined in Chapter 4. The research paradigm, study design, sample and sampling procedure, data collection and analysis procedure were all discussed in this chapter.

Chapter 5: Findings and Discussion

Chapter 5 presented the findings, discussion and interpretation.

Chapter 6: Summary of findings, Limitations, and Recommendations

The last chapter presented the summary, recommendations and limitations.

1.9 Chapter Summary

The aim of this study was to explore the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in KwaZulu-Natal Province. Chapter 1 covered the background, aim(s) and objectives, significance of the study, research questions and research design and methodology. The next chapter presented a review of the literature about learners' self-concept and the correlation between self-concept and other significant constructs.

Chapter 2

Literature Review

2.1 Introduction

Chapter 1 presented an outline overview of an entire thesis. The current chapter presented relevant literature to explore the nature of Grade 11 learners' Life Sciences self-concept, gender differences in Grade 11 learners' Life Sciences self-concept and the connection between learners' academic achievement and Life Sciences self-perceptions. Chapter 2 began with a summary of the literature concerning self-concept as a construct, followed by academic self-concept. Lastly, the significance of self-concept and academic achievement and how these two constructs are related was then argued.

2.2 Self-concept as a Construct

Since the mid-1970s numerous studies have been conducted on the topic and this may be due to the significant role played by self-concept in learners' academic achievement (Hattie & Anderman, 2019). In the literature, the word "self-concept" has been a significant educational and psychological construct in various academic contexts for several years (DeWitt & Archer, 2015; Jaiswal & Choudhuri, 2017). Early scholars considered self-concept as a single structure, arguing that it is nearly difficult to differentiate between its constituent parts (Marsh et al., 2005).

However, a model developed by Shavelson et al. (1976) shows that the concept of self is treated as hierarchical and multidimensional. Self-concept has specific domains (such as Life Sciences, Mathematics, History and English, to mention a few) and is a subcomponent of one general academic self-concept component.

Figure 2.1

Hierarchical and Multidimensional Model of Self-concept by Shavelson et al. (1976)

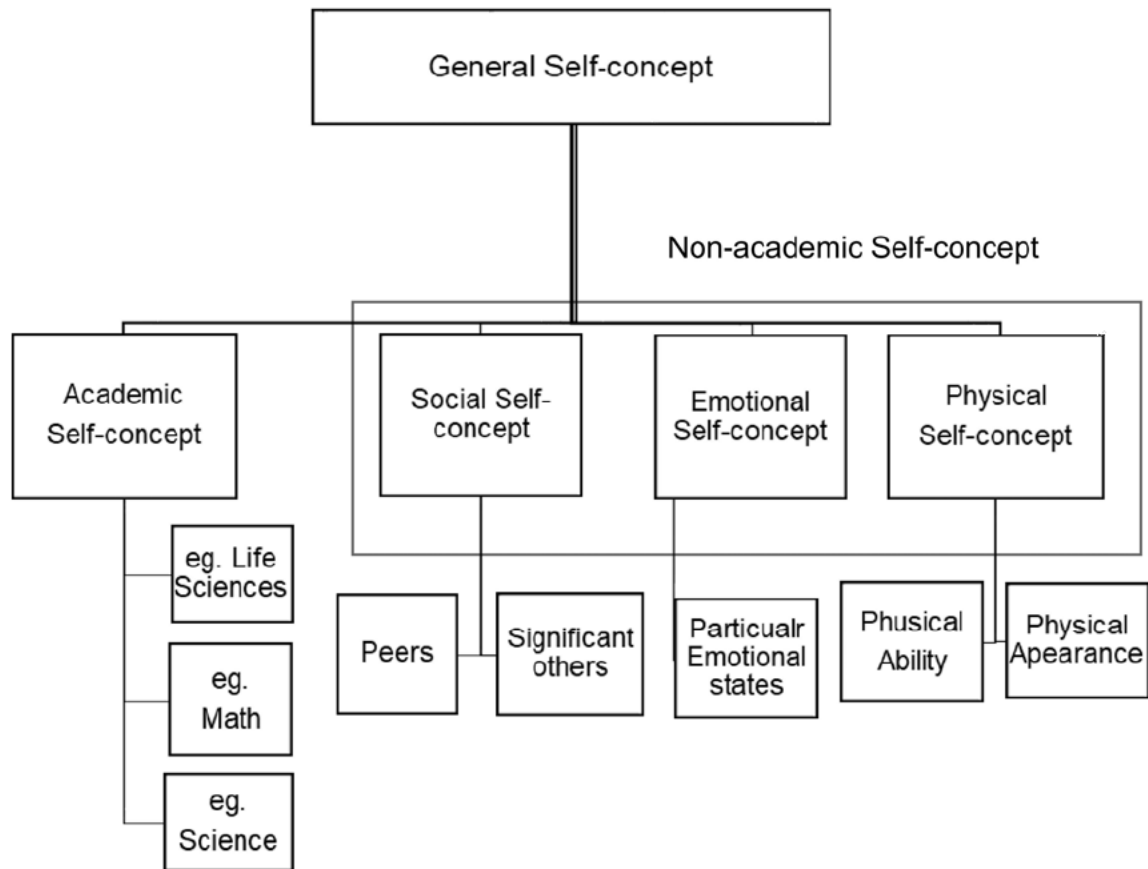


Figure 2.1 shows that the academic element covers self-concepts explicit to general school domains, whereas the non-academic component covers social, emotional and physical self-concepts (Trautwein & Möller, 2016). Through the research of Shavelson et al. (1976), various studies on self-concept and learners' academic achievement have been published (Ehm et al., 2019; Herrera et al., 2020; Jaiswal & Choudhuri, 2017). These researchers treated self-concept as a multifaceted concept and found that biological, environmental and social/dimensional comparison elements all had an impact on it.

Self-concept in educational settings refers to how individuals perceive their capabilities in relation to a specific realm. It is made up of ability-related and evaluative self-perceptions (Peiffer et al., 2020). A publication by Cherry (2018) revealed that each person has a unique self-concept different from the self-concept of others and can be influenced by gender and age. However, some characteristics are common among people, and they suggest that:

- I. Self-concept displays itself distinctively with each person.
- II. Self-concept differs from negative to positive.
- III. Self-concept carries emotional, academic and efficient dimensions.
- IV. Self-concept changes with context and over time.
- V. Self-concept impacts an individual's life directly (Cherry, 2018).

2.3 Self-concept and Gender

Gender differences in educational research are still a topic of interest worldwide (Ertl et al., 2017). Prior research demonstrates that the academic self-concept of females and males differs statistically significantly (Arafah et al., 2020; Behera & Samal, 2015; De Silva et al., 2018; Dominguez-Lara et al., 2019). Behera and Samal (2015) explored a self-concept assessment of secondary learners regarding their gender differences, and the findings revealed a statistically significant difference in self-concept between female and male learners. Descriptive data showed a higher and better self-concept in secondary schools' males than females.

However, when exploring a specific science domain, these gender relations are much more complex. A study by Direito et al. (2017) revealed that females are more fascinated by Life Sciences and less fascinated by Physical Sciences. Furthermore, literature shows that male learners are likely to maintain high expectations and a

positive self-concept about their academic performance in Physical Sciences and Mathematics compared to females (Direito et al., 2017). Another research conducted in science and technology also suggested that males have a stronger science self-concept than females (Simpson et al., 2016; Wan & Lee, 2017). Behera and Samal (2015) conducted a critical analysis of the role that gender and self-concept play in secondary school learners' motivation, and their findings revealed that learners' self-concept is directly affected by gender, whereby male learners showed a higher interest and a positive self-concept than female learners. However, the findings by Arafah et al. (2020) showed that female learners had a stronger intellectual self-concept than male learners.

On the contrary, prior research revealed that gender does not affect learners' self-concept directly (Babu & Krishnamoorthy, 2016; Biswal, 2016; Dominguez-Lara et al., 2019; Hamed et al., 2017; Kumar, 2016; Puhan & Nibedita, 2017). Puhan and Nibedita (2017) conducted a study on the effects of gender, location and self-concept on secondary school learners. Their results showed that there is no major difference in the self-concept of higher secondary school learners between females and males.

2.4 Academic Self-concept

Studies on academic self-concept in STEM fields are a hot topic in education (Allen-Handy et al., 2020; Ertl et al., 2017; Hahm, 2021; Trautwein & Möller, 2016). Generally, academic self-concept (ACS) refers to an insight learners have into their abilities in a particular academic sphere (Arens et al., 2017). ASC involves the way learners feel about themselves and their views in relation to their academic abilities and perceptions (Trautwein & Möller, 2016). Early research indicated that ASC is an essential factor in determining various educational outcomes such as individual future

goals, motivation to learn, choices of subjects and career aspirations (Arafah et al., 2020; Marsh et al., 2019).

Academic self-concept plays a critical role in establishing effective communication and collaboration between teachers and learners within the academic realm (Darling-Hammond et al., 2020). Research studies showed that a positive academic self-concept reduces the likelihood of learning issues in learners. That is, the outcome of reducing learning difficulties is learners' improvement in their academic performance (Muttaqin et al., 2020).

Furthermore, a person's development in terms of intellectual abilities, effectiveness and motivation to produce better achievements is related to their academic self-concept (Darling-Hammond et al., 2020). According to Jensen et al. (2019), academic self-concept and academic interests are assumed to be domain-specific constructs. That is, learners feel more self-confident and more interested in some specific domains than others. A substantial correlation between interest, self-concept and professional objectives has been shown in several research (Direito et al., 2017). However, the findings of these studies contradict one another. A study by Direito et al. (2017) reported that learners previous academic self-concept significantly influenced their future interest in their academics. On the other hand, prior interest in their academics had only a minimal impact on their future self-perception. That is, having a better perception of oneself is more likely to lead to increased interest, not vice versa.

Prior literature further suggested that highly motivated learners with a positive view of their abilities and capabilities in science show a high interest, effort and engagement in science (Rüschepöhler & Markic, 2020). In addition, a study by

Jensen et al. (2019) identified self-concept as the main influencing factor in a learning process and science subject outcomes. This is in accordance with research by Herrera et al. (2020), which found a link between learners' self-concept and academic success.

Lastly, academic self-concept was divided into three primary segments by Hattie (2014) and other researchers: ability self-concept, achievement self-concept and classroom self-concept (Ananda, 2017; Doménech-Betoret et al., 2017; von Keyserlingk et al., 2021).

2.4.1 Ability Self-concept

The term ability self-concept refers to an individual's self-beliefs, which can be either extensive or domain specific (Trautwein & Möller, 2016). Self-concept of ability is shown as one of the most crucial motivational constructs in educational research (von Keyserlingk et al., 2021). In this facet, learners use various sources of evidence and different judgement standards to form a domain-specific ability self-concept (Müller-Kalthoff et al., 2017). According to Dicke et al. (2018) findings, a learner who compares him or her to high-achieving learners is known to have a lower ability of self-concept, while a learner, who compares him or her to low-achieving fellow learners is known to be more positive about his or her abilities. Commonly, a learner's perception is associated with their academic abilities, which include their level of confidence, competence and tendency to approach learning independently (Ananda, 2017).

2.4.2 Achievement Self-concept

Achievement self-concept refers to individual opinions associated with learners' actual academic achievement (Herrera et al., 2020). This involves learners' willingness to achieve better results, not being easily satisfied with their performance and a

combination of pride and shame when it comes to poor academic achievement (Doménech-Betoret et al., 2017; Herrera et al., 2020).

2.4.3 Classroom Self-concept

Classroom self-concept refers to learners' perceptions about their achievement abilities in the classroom, such as an aspiration to present in front of the class and how they perceive the responses from their peers or educators during teaching and learning (Marciniak, 2015). A study by Cooper et al. (2018) revealed that learners are more likely to participate actively in class if they have a stronger academic self-concept. Also, the traits of learners have the potential to impact their perception of their academic abilities, leading to an impact on their involvement in group conversations and their academic victory in interactive learning environments.

2.5 Types of Academic Self-concept

Academic self-concept is categorised as positive or negative (Marsh, 2014).

2.5.1 Positive Academic Self-concept

A positive academic self-concept is defined as one's ability to achieve positive outcomes despite any negative or challenging experiences (Marsh, 2014). According to Ackerman (2020), learners that have a positive academic self-concept are assured, capable of solving problems, aware that others may not always share their opinions on all of their feelings and desired behaviours and can improve themselves.

In addition, learners with positive academic perceptions can communicate positively with teachers and their classmates (Ackerman, 2020). Studies on academic achievement and self-concept showed that performing well is associated with a

positive academic self-concept (Arens et al., 2017; Nandika, 2020). It has been discovered that learners who have a positive academic insight of themselves demonstrate socially acceptable behaviour (Miao et al., 2018). A study by Miao et al. (2018) reported that learners are more likely to participate than their classmates if they maintain a high academic self-concept.

2.5.2 Negative Academic Self-concept

A negative academic self-concept refers to one's negative views about themselves (Marsh, 2014). Learners with a negative self-concept get angry easily and cannot stand the critics they receive, and they are less interested in almost everything they do (Ackerman, 2020). Moreover, they cannot express gratitude or recognise the qualities of others. They are also scared of competition and reluctant to contend with their peers (Ackerman, 2020; Redmond & Barrett, 2015).

Sieberer-Nagler (2016) conducted a study on effective classroom management and positive teaching. The findings showed that a negative academic self-concept is better equipped to utilise their talents and skills to their fullest extent since they are unaware of their potential. Nandika (2020) carried out a study about the academic self-concepts of learners in the 2019/2020 academic year. The findings revealed that learners' social abilities are negatively impacted by a poor academic self-concept, but learners who are doing well academically can boost their peers' self-esteem.

2.6 Development of Self-concept

A study by Marsh (2014) revealed that the concept of self does not originate from genetics but from constant and varied experience. The development of self-concept in learners is determined by their social relationships and cultural contexts

with their peers (Jensen et al., 2019). ASC develops through the comparison of individual prior achievement and performance across multiple subjects and by comparing one's abilities with the abilities of others in class (Sewasew & Schroeders, 2019). Ethnicity, age, gender and environment are just a few of the variables that might affect how one develops their self-concept.

The literature suggests that social and dimensional comparisons are the ones that are most important for a person's formation of their self-concept (Wigfield et al., 2020; Wolff & Möller, 2022). Self-concept develops with time, and some learners develop science self-concept by comparing their academic performance with the academic achievement of their peers. Others develop science self-concept by comparing their subjects' academic achievement (dimensional comparison) (Casino-García et al., 2021; Jensen et al., 2019). Social and dimensional comparisons, which influence the development of academic self-concept in a particular field support the internal/external model (Müller-Kalthoff et al., 2017). A reciprocal internal/external frame of reference model by Möller et al. (2014) suggests that internal/external comparisons are two distinct but related frames of reference that learners use to compare their academic proficiency levels.

2.6.1 Social Comparison

Self-concept develops through the process of social comparison, which occurs when a learner compares his/her abilities with other learners in the same grade or class (Jenßen, 2021; Miao et al., 2018). Social comparison is also referred to as external comparison. In this approach, social comparisons are often operationalised in terms of the effect of learners' particular marks or accomplishment ratings on their ability self-concept in the relevant topic (Möller et al., 2020). According to Jenßen

(2021), social self-concept has the potential of influencing the happiness and wellbeing of an individual. Positive correlations exist between social self-concept and a variety of outcomes, including increased happiness (Adigun, 2020), greater and better academic achievement (Colmar et al. (2019), greater and more pro-social behaviour (Guo et al., 2018) and lastly, overall greater wellbeing (Casino-García et al. (2021).

2.6.2 Dimensional Comparison

Theorists like Möller et al. (2014) claimed that learners link their success in one domain to their self-perceptions of their domain-specific capabilities. Marsh (1986) internal/external model, which proposes the combined use of social comparisons and dimensional comparisons to develop a strong academic self-concept in a specific realm, is the source of inspiration for dimensional comparison (Möller et al., 2016). Learners develop dimensional comparisons by contrasting their performance in one subject with their performance in another. In other words, if learners' verbal accomplishment is lower than their mathematical achievement, their verbal self-concept will suffer, whilst their mathematical self-concept will benefit from dimensional comparisons (Möller et al., 2016).

Wolff et al. (2018) studied the impact of social, temporal and dimensional comparisons on academic self-concept. Their research showed that accomplishment comparison effects and dimensional comparison effects are interdependent. In addition, von Keyserlingk et al. (2021) found evidence for the influence of self-concept on future accomplishment in dimensional comparison. In other words, self-concept in a particular domain strongly foretold success in domains that were related to it and negatively predicted success that was unrelated to it (von Keyserlingk et al., 2021).

Research on dimensional comparisons has shown that these effects are frequently more pronounced when learners' grades are used in place of achievement tests, as grades convey more silent input about learners' achievement than achievement tests do (Wolff et al., 2018). von Keyserlingk et al. (2021) explored the effect of dimensional comparison on learners' ability self-concepts in Mathematics and German using learners' scores instead of accomplishment tests in an additional analysis. Results showed a statistically substantial prognostic effect of dimensional analogies on both Mathematics and German self-concept.

2.7 Academic Self-concept and Motivation

Academic self-concept is the utmost imperative concept in motivation research since it is revealed that positive ASC is linked to greater levels of motivation, success and overall life satisfaction (Arens et al., 2017). The strongest predictor of learners' motivation is their academic self-concept, which has been found to improve their motivation (Marsh et al., 2019). Marsh et al. (2019) reported that learners' academic self-concept influences their class involvement. That is, a positive attitude and high enthusiasm for learning develop in learners when they have a positive view of themselves (Arafah et al., 2020). Also, according to Jensen et al. (2019), learners with a positive academic self-concept tend to understand their academic abilities and potentialities better.

The utilisation of flexible learning tactics, as well as motivation and fun, are all important for improving learners achievement (Clem et al., 2021), whilst learner motivation has been demonstrated to be negatively impacted by adverse feelings, such as boredom (Clem et al., 2021). Findings by Rady et al. (2016) show that learners who have low academic self-concept lack confidence in their abilities and are unable

to take criticism well. According to Ehm et al. (2019), a negative self-concept affects learners' performance, and they also revealed that a lack of motivation is another factor that hinders the high performance of learners. Arafah et al. (2020) explored the contribution of self-concept and self-efficacy to learning outcomes of Physical Sciences and achievement motivation. They discovered that a learner's inspiration is directly influenced by their self-concept and self-efficacy. This is similar to a study by Marsh et al. (2019) that shows that learners with no motivation lack control over their abilities and desire. That is, learners become less motivated in each goal they are aiming for (Waluyohadi, 2019).

Noviyanti et al. (2019) explored directed discovery learning based on interest and self-concept thereby improving students' critical thinking in Biology. Their findings revealed that learners who have a negative academic self-concept frequently lack motivation, which might result in unsatisfactory academic performance. Noviyanti et al. (2019) further explored gender differences in achievement motivation, and their findings show a major difference in female and male learners' achievement motivation, with females recording a higher mean score than males.

Achievement motivation can be affected by parents in society, considering gender differences. That is, parents may emphasise more on boys to achieve better in school than girls (Kang et al., 2021). However, one most stimulating study claimed that there is no mutual relationship between inspiration and self-concept, although the same variables are closely related to others (Kang et al., 2021). Sivrikaya (2019) explored the relationship between academic motivation and the academic achievement of students. The findings demonstrated that learners' academic motivation levels were above average. There was no discernible difference between

the female and male learners in terms of academic motivation, scale or sub-dimensions. Although males scored better on average for academic motivation, females scored more on average for academic achievement (Sivrikaya, 2019).

2.8 Academic Self-concept and Academic Achievement

According to prior literature, numerous research has explored the connection between psychological dimensions, such as self-concept and academic achievement. (Herrera et al., 2020; Sewasew et al., 2018; Susperreguy et al., 2018; Wolff et al., 2018). Their research findings revealed that academic achievement is interrelated to self-concept. The current researcher and numerous other researchers were drawn to the robust link between academic self-concept and academic accomplishment (Susperreguy et al., 2018).

The literature revealed that learners' achievement in a specific subject is significantly influenced by academic self-concept rather than non-academic self-concept (Trautwein & Möller, 2016). Herrera et al. (2020) study explained the connection between academic success and the concept of self in an academic domain in two ways. Firstly, learners' academic self-concept determines the amount of time learners take to grasp content and perform tasks independently. Secondly, when a learner is examined in their work performance level, the way they perceive their capabilities and academic self-concept is directly affected. A study by Seaton et al. (2015) also confirmed that academic achievement and independence are more prevalent in learners who have high levels of ASC.

A larger body of research shows that a positive self-concept and positive academic achievement are correlated with one another (Arafah et al., 2020; Herrera et al., 2020; Jaiswal & Choudhuri, 2017; Parker et al., 2015; Sewasew et al., 2018).

Parker et al. (2015) examined the relations between Mathematics and English self-concept trajectories across secondary schools, and their research showed a positive correlation between learners' academic self-concept and their academic outcomes. Their findings further reported that a school's overall academic achievement is also a major cause of low self-concept in learners and that school failure might also affect learners' academic success. According to Emmanuel et al. (2014) study, self-concept is a powerful predictor of academic achievement. However, there was no significant relationship between academic achievement and academic motivation.

Rodiah et al. (2020) carried out a study on the connection between senior high school academic self-concept and Biology learning outcomes. The results showed a strong and favourable link between learners' academic self-concept and their outcomes in learning Biology. That is, if academic self-concept is improved, learners' Biology learning outcomes will also improve. These findings support those of Jensen et al. (2019), who found a significant positive link between academic self-concept and science learning outcomes.

Despite a large body of research studies showing a significant relation between ASC and academic achievement (Arafah et al., 2020; Ehm et al., 2019), research by Noviyanti et al. (2019) shows that learners with a low self-concept will not always achieve poor results, as well as learners with a high academic self-concept will not always achieve good marks. Their conclusion was that self-concept develops from an ongoing learning process that provides experience and satisfaction to learners so that the initial negative self-concept changes in a positive direction (Noviyanti et al., 2019). One of the current study objectives is to determine if learners' Life Sciences self-

concept correlates with academic achievement to clear the arguments, since it is unclear if self-concept correlates significantly with academic achievement.

2.9 The Role of Self-concept and Interest in Promoting Science Career Goals

There is no clear mechanism reported explaining factors that influence learners' career goals. However, numerous models and studies pointed to interest and self-concept as crucial constructs that influence learners' career goals in science (Direito et al., 2017). According to the literature, one of the key factors that determine one's goals in science, particularly in the lower secondary school years, is one's self-concept (Lau, 2020). Learners assess their chances of success in future occupations using their perception of self, such as their self-concept. At the ages of 11 or 12, they begin to consider their future careers (Kang et al., 2021).

Lau (2020) examined the indirect impacts of self-concept on career calling and resilience for employment readiness. Results show that learners' self-concept has a great impact in choosing a career, thus when a learner understands who they are and what they want, they become more aware of what they want to be in the future. Rizal et al. (2021) also reported that learners with positive perceptions in science and technology are expected to select careers in those fields.

Literature also shows that a positive self-concept increases participation in science-related activities and career goals (Lau, 2020). To date, the general agreement between researchers has not been confirmed. Studies revealed that learners' positive domain-specific self-concept might improve their desire to pursue further studies in that field (Guo et al., 2017; Kang & Keinonen, 2017). Other studies indicated that when pursuing a career, one's seeming competence matters more than abilities (Sax et al., 2015). Despite the fact that this view is primarily based on success,

learners are more inclined to choose careers in science based on their perceived academic aptitude than on actual academic achievement.

Considering gender self-concept and career goals of female and male learners, the literature suggested that there is no strong relationship between self-concept and aspiration for females, whereas talent variables indicated a reasonable correlation with science goals for males (Kang et al., 2021). In order to predict scientific objectives, they thus showed that gender-specific relationships between interest and self-concept exist. Male interests were closely linked to their future scientific goals since the self-concept of the participating learners was higher and more stable over a three-year period, but female self-concept had no impact on scientific aspirations (Potvin & Hasni, 2018). These findings, which establish a connection between interests and intention, mostly concur with the findings of earlier investigations (De Silva et al., 2018).

In contrast, several studies contradicted earlier findings that self-concept is essential for one's professional development and found no connection between self-concept and career aspirations (Guo et al., 2017; Sahin, 2017). A study by DeWitt and Archer (2015) shows that career desires in science and technology are still based on race, class and gender. The findings by Direito et al. (2017) also suggested that self-concept affects female learners' interest in science but not that of male learners. That is, making money and inventing new things is important for females, whilst being a leader is more significant for males (Direito et al., 2017).

2.10 Educational Implication

Arafah et al. (2020) reported that self-concept is generally believed to be a crucial factor in learners' behaviour and academic performance. Other researchers reported that school underperformance is also a major cause of learners' low self-

perception (Colmar et al., 2019; Herrera et al., 2020; Kamoru & Ramon, 2017; Tus, 2020). School underperformance plays a significant role in learners' self-image; it damages their self-image, and they often end up doubting their competences (Trautwein & Möller, 2016). Colmar et al. (2019) confirmed these findings by reporting that issues and challenges might reduce learners' self-concept, yet poor self-concept can also lead to issues and challenges.

Furthermore, according to research, self-concept and academic achievement are mutually correlated, therefore enhancing academic self-concept will boost academic achievement and the other way around. (Colmar et al., 2019; Herrera et al., 2020; Tus, 2020). General agreement between researchers has also been confirmed, suggesting that learners who are failing to succeed academically are likely to have low self-concept (Susperreguy et al., 2018).

Also, the learning environment influences learners' attitudes towards learning and negatively affects their academic performance (Byers et al., 2018). Learners who understand academic self-concept have control over success and failures in engaging in academic work, and they are likely to acquire high marks compared to learners who have no understanding of academic self-concept (Guo et al., 2021). Their perception of themselves as academically capable has a significant impact on how well learners follow the educational and learning process in classrooms. (Ackerman, 2020; Afgani et al., 2019).

The sociocultural context has also been found to be essential in the formation of a learner's academic self-concept depending on the social relationships in school and the wider cultural setting. The learner-teacher relations seem to be critical for academic self-concept development (Dudovitz et al., 2017; Raufelder et al., 2015).

2.11 Chapter Summary

This chapter has reviewed the literature that supported the focus of this study. From the literature, it is evident that the concept of self is referred to as a multi-dimensional concept with more than a few definitions and meanings. Prior research suggested that self-concept is not a congenital construct, as it develops over time, and self-concept development can either be through social or dimensional comparisons. There is now minimal agreement regarding the importance of the link between academic success and one's self-concept. According to some scholars, motivation, academic success and career aspirations are significantly correlated.

Other researchers argue that a positive self-perception does not automatically translate into high academic achievement and neither does a negative self-concept. Previous literature also reported that male learners perform better than female learners in STEM subjects, while females perform well in Life Sciences. On the contrary, other studies revealed that there are no major differences between female learners and male learners when it comes to self-concept and academic achievement. The current study revealed if there are any gender differences in terms of learners' Life Sciences self-concept. Chapter 3 presented the models that underpinned the current study and how they linked with the current study.

Chapter 3

Theoretical Framework

3.1 Introduction

The literature review on self-concept as a construct, self-concept types and academic self-concept was covered in the preceding chapter. In addition, the correlation between self-concept and academic achievement was also discussed in the previous chapter. The current chapter provided literature on theories selected to support the current study. According to Gabriel (2008), theories are developed to describe, forecast and comprehend a particular subject. They are also frequently used to test and advance existing knowledge while staying within certain crucial boundaries and expectations. Theoretical frameworks are supporting structures for theories used in research; they present and specify the theory that explains why the research problem under a particular study exists (Gabriel, 2008).

Theoretically, the current study adopted two different but related models namely, the revisited Reciprocal Effect Model (REM) by Seaton et al. (2015) and the Generalised Internal/External Frame of Reference Model (GI/EFRM) by Möller et al. (2016). The REM suggests that academic achievement and self-concept are mutually interrelated (Seaton et al., 2015). The GI/EFRM implies that learners' academic success influences their self-concept in one reliable domain (external reference), but negatively in another domain (internal reference) at a particular period (Möller et al., 2016).

The researcher was able to gain a greater understanding of the nature of Grade 11 learners' Life Sciences self-concept by using these two models.

The Reciprocal Effect Model allowed the enlightenment of the link between Life Sciences self-concept and learners' academic achievement. The generalised Internal/External Frame of Reference Model allowed the researcher to explain why learners have a specific Life Sciences self-concept.

3.2 Reciprocal Effect Model (REM)

According to Seaton et al. (2015) Reciprocal Effect Model, academic achievement and self-concept are inversely associated. This model is known to predict a reciprocal relationship between learners' self-concept and academic achievement, whereby previous achievement is connected to learners' self-concept, and previous academic achievement is related to future advances in achievement. The Reciprocal Effect Model theory shows that academic achievement and self-concept are interdependent and reinforce one another (Marsh et al., 2015; Seaton et al., 2015).

According to Ehm et al. (2019) study, learners' self-concepts have a strong effect on learners' academic achievement and significantly correlate with school in education. Other studies have presented that learners with low academic achievement are likely to have low self-concept, and learners who keep positive attitudes about their academic perceptions or self-concept obtain higher results (Colmar et al., 2019; Herrera et al., 2020; Tus, 2020). Several prior studies have provided evidence to support this theory. Learners with positive perceptions about a specific subject are expected to be fascinated by it and do well in school and vice versa (Ehm et al., 2019). Furthermore, the majority of REM studies have offered pragmatic data to support both the impact of earlier success on subsequent academic efforts and the converse (Marsh, 2014).

Herrera et al. (2020) supported and found REM empirical, arguing that academic self-concept and academic achievement support each other. Arens et al. (2017) conducted a study on mathematical reciprocal impacts spanning five waves and three accomplishment tracks on self-perception, academic performance and achievement test results self-concept. This study considered a lengthy time covering Grades 5 to 9 in order to evaluate the interaction between self-concept and achievement. Their results validated the reciprocal model's argument of developmental equilibrium for self-concept and accomplishment through time. Additionally, they demonstrated some robust and multifaceted reciprocal relationships between mathematical self-concept and mathematical achievement.

Ehm et al. (2019) analysed the development of academic self-concept and achievement in elementary school children, and their study supported REM, which implies that achievement influences self-concept (skills development model) and that academic self-concept influences self-perception and achievement (self-enhancement model).

According to Seaton et al. (2015) revisited model, the theory is centred on achieving a balanced connection between self-concept and learners' academic achievement. According to the reciprocal paradigm, increasing academic accomplishment raises academic self-concept, and raising academic self-concept raises academic achievement (Seaton et al., 2015). This model takes into account the long-term correlation between academic self-concept and success in a number of domains (Möller et al., 2014).

On the contrary, Preckel et al. (2013) explored the concept of self in adolescence, a longitudinal study of the interaction between learners' perceptions in the academic and social spheres. The results showed that while there was a strong positive correlation between academic self-concept and achievement, there was no significant relationship between social self-concept and achievement. The findings revealed that improving learners' self-concept in both social and academic spheres is a goal that can be achieved. However, there is a challenge in coordinating social and academic goals.

3.3 The Generalised Internal/External Frame of Reference Model

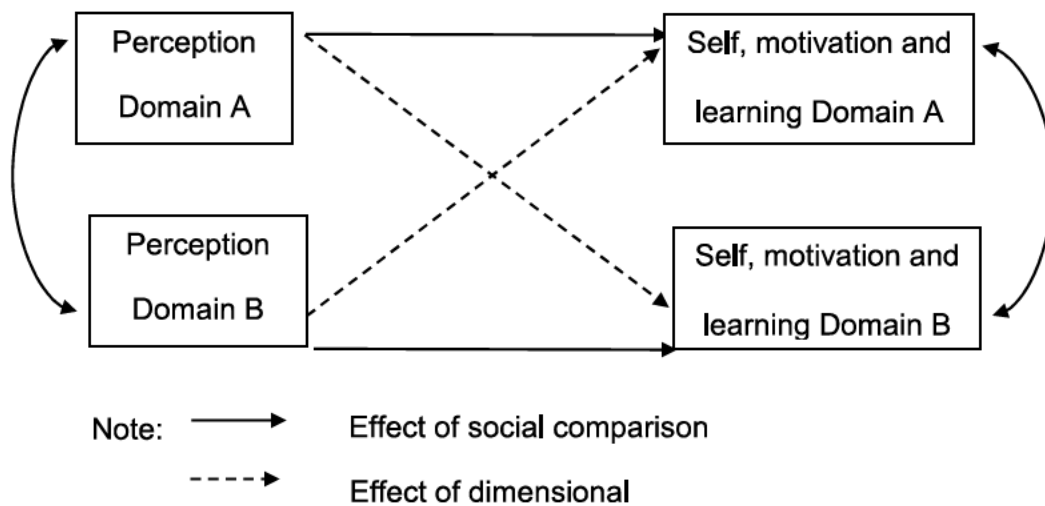
One framework that describes the development of learners' academic self-concept is the internal/external (I/E) frame of reference models, which showed that both internal and external comparisons of their skills helped to enhance their academic self-concept (Möller et al., 2014). The I/E model was originally developed to enlighten why linguistic and mathematical perceptions are almost completely uncorrelated despite achievement in the same subject being significantly associated (Marsh et al., 2015). That is, learners think of themselves as primary verbal or mathematical personnel despite the fact that learners who are good in one domain also tend to be good at the other, not both.

According to the internal and external model, academic self-concept is determined in relation to two frames of reference: internal (dimensional comparison) reference and external (social comparison) reference for a specific school subject (Marsh et al., 2015; Möller et al., 2014). However, the I/E model is only restricted to the relationship between Mathematics and verbal constructs.

Therefore, Möller et al. (2016) introduce a generalised I/E model (Figure 3.1), which helps researchers determine I/E-like relationship amongst self-determining and dependent variables.

Figure 3.1

The Generalised I/E Model: An Extension of the I/E Model by Möller et al. (2016)



In the model by Möller et al. (2016), learners compare their abilities with the abilities of their peers and compare their abilities across their subjects. In order to create an opinion about one's standing in a specific domain, a learner could, for instance, compare his or her view of that domain to that of another learner. When comparing their perceptions of a specific domain A with their perceptions of aspects of a specific domain B, learners also conduct a dimensional comparison and draw judgements about their position in domain A relative to their standing in domain B. Both comparisons could impact various domain-specific cognitive and learning patterns (see Figure 3.1).

According to Möller et al. (2016), the benefits of social comparisons for self-evaluations occur when learners believe they are superior to most of their peers in a given topic. But for a certain area, the results of dimensional comparisons typically have a detrimental impact. In addition, if they perceive themselves better in a particular domain (for example, domain A) than in a different domain (for example, domain B), they might neglect their domain B activities.

Guo et al. (2017) explored the expectations of achievement and learners' goals in science: Dimensional comparison process. Their study explored achievement across Physical Sciences, Earth Science, Chemistry and Biology, and the findings showed robust support for social comparison, showing that good achievement in one area enhances learners interest in science, which in turn predicts their aspirations in that area. Casino-García et al. (2021) study reported that a strong social self-concept and high self-esteem are necessary for achieving professional success, working with people and engaging in leadership activities.

3.4 Link between Theoretical Framework and the Study

The main aim of the current study was to determine the nature of Grade 11 learners' Life Sciences self-concept. To understand the nature of Grade 11 Life Sciences self-concept, as well as the link between learners' Life Sciences self-concept and academic achievement, the following models namely, the Reciprocal Effect Model by Seaton et al. (2015) and the Generalised Internal/External Frame of reference by Möller et al. (2016) were used. The first model namely, the Reciprocal Effect Model provides insight into how learners' self-concepts develop. The last model, the Generalised Internal/External Frame of reference by Möller et al. (2016), provides insight into how self-concept correlates with academic achievement.

3.5 Chapter Summary

In this chapter, the theoretical frameworks that underpinned the study were presented. The Reciprocal Effect Model by Seaton et al. (2015) and the Generalised Internal/External Frame of Reference by Möller et al. (2016) were explained as to how they were going to be used to make sense of data and the findings. The research approach adopted in the current study is provided in the next chapter.

Chapter 4

Research Methodology and Design

4.1 Introduction

Chapter 3 provided the literature on the two theories that underpinned the current study namely, the Revisited Reciprocal Effect Model (REM) by Seaton et al. (2015) and the Generalised Internal/External Reference Model (GI/ERM) by Möller et al. (2016). The selected theories assisted the researcher to determine the nature of Grade 11 learners' Life Sciences self-concept and the correlation between learners' Life Sciences self-concept and learners' academic achievement. The previous chapter also explained how the adapted models were linked to this study

The methods and design of the research were described in this chapter. Firstly, this chapter presented the research paradigm, research approach and research design. The data collection methods used were also discussed, followed by the selection of participants and sampling procedures. Lastly, the validity, reliability and ethical considerations were discussed.

4.2 Research Questions

The methodology used in this study was informed by the following four research questions:

1. What is the nature of Grade 11 learners' Life Sciences self-concept?
2. Is there a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept?
3. What is the relationship between Grade 11 learners' Life Sciences self-concept and academic achievement?

4. Why do Grade 11 learners have a specific Life Sciences self-concept?

4.3 Research Paradigm

A research paradigm is defined as a set of traditions and beliefs regarding to how researchers view the world (Creswell & Creswell, 2018). Pragmatism, in the view of Creswell and Creswell (2018), is a paradigm that encourages the employment of both quantitative and qualitative methodologies in a given study. Mertens (2019) identified pragmatism as one of the paradigms that provides a fundamental philosophical framework for mixed methods research. Other researchers also supported the use of the pragmatic paradigm since there is a difference between pragmatism as a philosophy and what works from everyday pragmatic behaviours (Denzin & Lincoln, 2021; Johnson et al., 2017; Morgan, 2022).

The researcher adopted a pragmatic paradigm to explore the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in KwaZulu-Natal Province. This paradigm was used since it is not devoted to a single system of philosophy (Creswell & Creswell, 2018). Exploring the nature of Grade 11 learners' Life Sciences self-concept alone was inadequate. Therefore, the researcher selected a pragmatic paradigm so that the quantitative findings are further explained as to why learners had a specific Life Sciences self-concept.

4.4 Research Approach

The current study used a mixed methods approach which guided data collection and analysis. A mixed methods approach involves collecting quantitative and qualitative data and combining the two methodologies (Creswell & Creswell, 2018). The mixed methods approach, as reiterated by Johnson et al. (2017), is when the

researcher combines elements of quantitative and qualitative methods for an in-depth understanding of the quantitative data.

This approach enables the researcher to gather, analyse and combine quantitative and qualitative data in order to find insights into the perspectives of both methods (Creswell, 2021). In the current study, the researcher chose a mixed methods of the theory that integrates quantitative and qualitative approaches and provides a more thorough understanding of Grade 11 learners' Life Sciences self-concept than either approach alone (Creswell & Creswell, 2018).

The quantitative approach was used in this study to explore the nature of Grade 11 learners' Life Sciences self-concept, to relate the Life Sciences self-concept of female and male Grade 11 learners and to explore the link between Life Sciences self-concept and academic achievement. The qualitative method explained why Grade 11 learners had a specific Life Sciences self-concept in depth.

4.5 Research Design

A research design is defined as an enquiry that offers a clear direction for procedures in research (Creswell & Creswell, 2018). The current study adopted an explanatory sequential mixed methods design. In an explanatory sequential mixed methods design, the first quantitative component is implemented, followed by a qualitative component that depends on and is influenced by the original quantitative findings (Clark, 2019). This design allowed the researcher to look deeper into understanding the degree and mechanism that explain the nature of Grade 11 learners' Life Sciences self-concept. The researcher's initial step was to gather quantitative data. A self-Description Questionnaire II developed by Marsh (1990) was adapted to determine the nature of Grade 11 learners' Life Sciences self-concept.

Furthermore, Life Sciences self-concept scores and their Life Sciences term marks were used to determine the relationship between Grade 11 learners' Life Sciences self-concept and their academic achievement. Qualitative data were obtained from the analysis of semi-structured interviews to explain in depth the qualitative statistics findings. The sequential explanatory mixed methods design shown in Figure 4.1 illustrates the interlink between the two phases.

Figure 4.1

Explanatory Sequential Mixed Methods Design [Adapted from Clark (2019)]

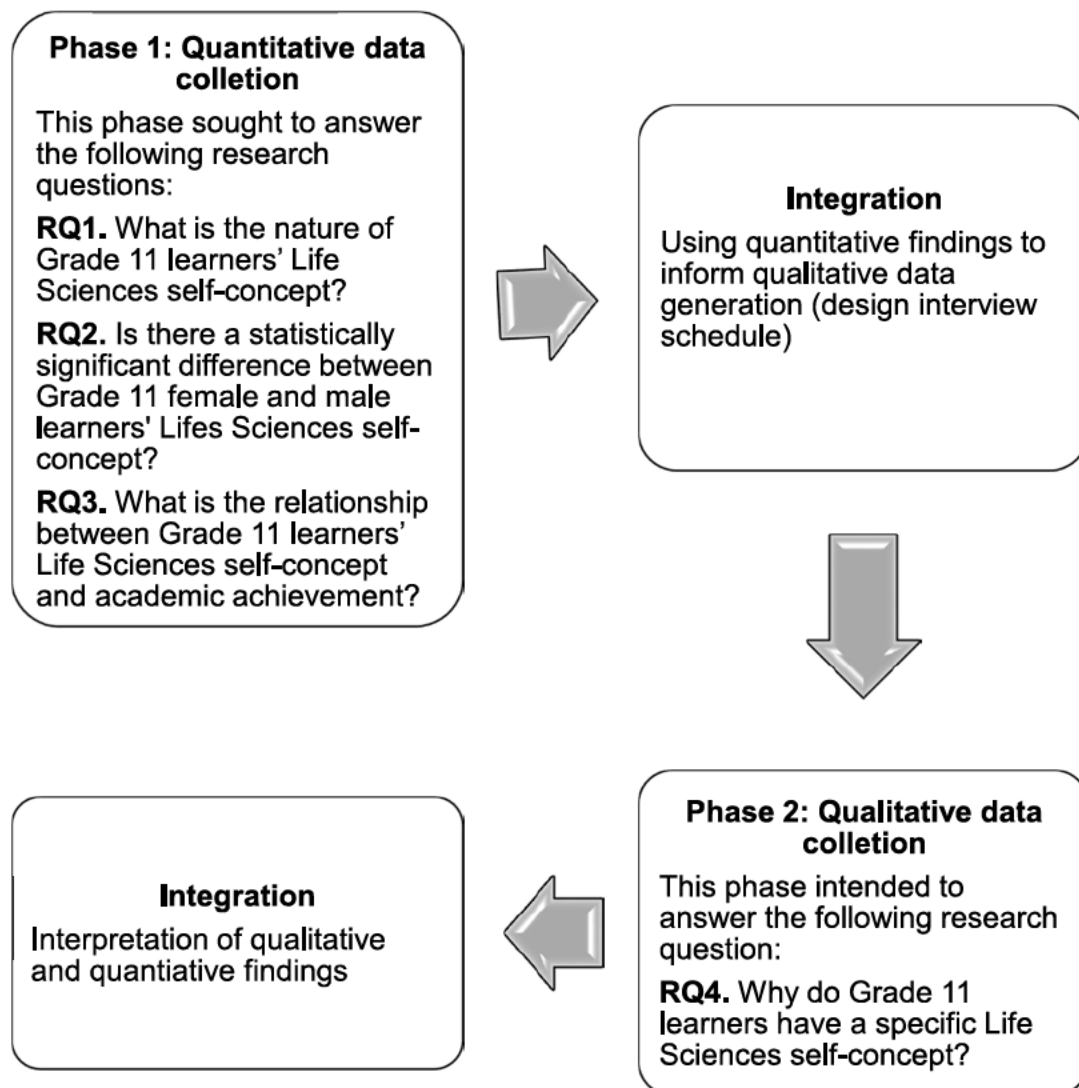


Figure 4.1 presents the interlink between the quantitative phase and the qualitative phase. The researcher first gathered and examined quantitative data before generating qualitative findings in phase two (Creswell & Creswell, 2018). The second phase was designed using the quantitative phase findings (Creswell, 2021). The quantitative data provided general information on the nature of Grade 11 learners' Life Sciences self-concept, while qualitative data explained in depth the qualitative statistics findings. The quantitative and qualitative findings were combined to explain why learners had a specific Life Sciences self-concept.

4.6 Sample and Sampling procedures

Bertram et al. (2015) defined the term “sample” as the entire number of participants in a specific study. The first phase of the current study consisted of 133 Grade 11 Life Sciences learners from selected secondary schools in Amajuba District in KwaZulu-Natal Province. The participants consisted of 87 (65,4%) females and 46 (34.6%) males (Table 4.1).

Table 4.1

Gender of the Participants

Participants	Frequency (N)	Percentage (%)
Female	87	65.4
Male	46	34.6
Total	133	100

For the qualitative phase, only 10 of the 133 respondents were selected, that is, five females and five males (Appendix F). When selecting the 10 participants, their

Life Sciences self-concept scores and academic achievement were all considered (Table 4.2).

Table 4.2

Qualitative Participants Selection Criteria

	Female (N)	Male (N)
Positive Life Sciences and high academic achievement	2	2
Positive Life Sciences self-concept and low academic achievement	1	1
Negative self-concept and high academic achievement	1	1
Negative Life Sciences self-concept and low academic achievement	1	1

Cohen et al. (2018) described sampling as a technique in which participants are carefully chosen for research. In this study, the researcher adopted purposive and convenience sampling. Convenience sampling was used to select schools and learners based on their accessibility to the researcher (Cohen et al., 2018). Travelling to these schools and making appointments was convenient and easy since they were within a 50 km radius of the researchers' workstation. Appointments with respondents were done through the principal, and learners were visited in their classrooms. Furthermore, learners choose Life Sciences as the subject of choice in Grade 10. However, at this level, their exposure to the subject was inadequate yet, so it was difficult to explore the link between the learners' Life Sciences self-concept and

academic achievement. While Grade 12 learners would have been ideal for this study, they were inaccessible due to the intense focus on matric examination preparation.

Purposive sampling in qualitative research is referred to as a type of non-probability sampling in which a researcher uses their discretion in selecting people to participate in their surveys (Cohen et al., 2018). Purposive sampling was used for the selection of qualitative participants. Ten participants out of the 133 were selected to assist the researcher in explaining the nature of Grade 11 learners' Life Sciences self-concept in depth. These participants were selected based on their knowledge of the phenomenon.

4.7 Data Collection and Analysis Procedures

A data collection method is the process of collecting and analysing data on the parameters of interest (Creswell & Creswell, 2018). It enables the researcher to respond to the stated research questions and evaluate findings (Mertens, 2015). Data collection is achieved through the use of different methods such as interviews, questionnaires, observations or document analysis depending on the research approach (Cohen et al., 2018). Adopting a mixed methods approach enabled the researcher to utilise instruments from both quantitative and qualitative approaches.

4.7.1 Quantitative Data Collection

A Self-Description Questionnaire II (SDQ II) was used to generate quantitative data. A questionnaire is an essential instrument used to generate data beyond the physical reach of the researcher (Cohen et al., 2018). Grade 11 learners' Life Sciences self-concept was determined by a Self-Description Questionnaire II (SDQ II)

developed by Marsh (1990) for secondary school learners (Grade 10 – 12). The SDQ II is a 102-item (False/True) instrument used to measure adolescents' self-concept.

The original SDQ II has 11 subscales namely, Mathematics, physical, verbal, appearance, general self-concept, honesty, trustworthiness, physical abilities, emotional stability, parent relation and school general. Seven of these subscales contain 10 items each, while four of them contain 8 items each because of their high coefficient alphas. The Cronbach alpha of each original scale ranged between .80 and .90 (Marsh, 1990).

The current study only covered a domain-specific concept of self, which is the Life Sciences self-concept. According to a multidimensional model, school subjects are the sub-component of the academic component (Shavelson et al., 1976). Hence the researcher used the Mathematics subscale to measure Life Sciences self-concept (Appendix D). Motivational or emotional items were not covered in the current study. Lee and Kung (2018) emphasised the necessity of separating the academic elements (e.g. Mathematics, Life Sciences or English) from the non-academic elements of self-concept. Furthermore, they reported that in order to determine the academic elements that are essential for enhancing learners' academic achievement, the self-concept must be measured from a multidimensional perspective (Lee & Kung, 2018).

The self-description questionnaire II is a six-point Likert scale: 1- false, 2- mostly false, 3 - more false than true, 4 - more true than false, 5 - mostly true and 6 - true. The six-point Likert scale provided more reliability than the five-point Likert scale, according to validity from alpha coefficients (Chomeya, 2010). Pimentel and Pimentel (2019) reported that a six-point scale also encourages participants to think about the topic more carefully and make a decision that either tends positively or negatively. A

questionnaire had a total score of 60, whereby a score ranging from 10 to 29 was categorised as negative. A score ranging from 30 to 60 was categorised as positive.

Learners' academic achievement was assessed using the learners' Life Sciences term results obtained from their educators. For ease interpretation, Table 4.3 shows that the researcher adopted the Department of Basic Education's seven levels of competence grading scores ranging from 1 - Not achieved to 7 - Outstanding achievement.

Table 4.3

Scale of Achievement for the National Curriculum Statement Grade 10 - 12 [adapted from the Department of Basic Education (2015)]

Achievement level	Marks (%)	Achievement description
7	80 – 100	Outstanding achievement
6	70 – 79	Meritorious achievement
5	60 – 69	Substantial achievement
4	50 – 59	Adequate achievement
3	40 – 49	Moderate achievement
2	30 – 39	Elementary achievement
1	0 – 29	Not achieved

4.7.2 Quantitative Data Analysis

The statistical software for the social sciences (SPSS) was used for the analysis of quantitative data. Prior to doing any analysis, the following responses to the negatively phrased items were inverted so that all varied along a single scale

(positively worded), where six denoted the highest level of self-concept and one denoted the lowest self-concept:

- I wish I did not have to study Life Sciences
- Life Sciences is a boring subject
- Life Sciences notes are difficult to memorise
- I am not doing well in Life Sciences

Descriptive and inferential statistics were used to analyse the quantitative data. Descriptive statistics describe or summarise features from a collection of data (Cohen et al., 2018). The descriptive statistics used included frequencies, means and standard deviation.

Inferential statistics measure the difference between groups, if there is a statistical significance between certain parameters (Cohen et al., 2018). These include hypothesis testing, correlations, regression and multiple regression, different testing and analysis of variance (Cohen et al., 2018). In the current study, the correlation between Grade 11 learners' academic achievement and their Life Sciences self-concept was determined using Pearson's correlation coefficient. To further determine the nature of Grade 11 learners' Life Sciences self-concept, gender differences were also considered. An independent *t*-test was used to determine gender differences in Grade 11 learners' Life Sciences self-concept. Direito et al. (2017) suggested that it is important to consider gender when exploring academic self-concept and academic achievement. That is, gender has been shown to influence learners' Life Sciences self-concept and later affect learners' academic achievement.

4.7.3 Qualitative Data Collection

Semi-structured interviews were used to understand why Grade 11 learners' had a specific Life Sciences self-concept. A semi-structured interview is commonly used in qualitative research (Petrescu et al., 2017). It is a particular kind of interview where the interviewer asks only a few predetermined questions and the remaining enquiries are spontaneous (Cohen et al., 2018). According to Creswell and Creswell (2018), interviews are largely used in qualitative research because they provide rich descriptive data that helps the researcher in comprehending the study's phenomenon of the study. The interviews proved to be useful because, through prompts and probes, the researcher was able to ask thought-provoking questions that provided answers to the research questions (Cohen et al., 2018).

In the current study the interview questions were informed by the quantitative findings. The semi-structured interview was selected because, in addition to providing verbal information, it also gives researchers the chance to observe participant body language, tone of voice and pitch (Creswell, 2021). To compare and contrast participants' responses, the same set of questions was asked to all 10 participants. Participants from the same school were interviewed on the same day, and the researcher conducted the interviews in an empty classroom to minimise distractions and help the respondents stay focused during the interview. The researcher supplemented the notes taken during the interview with audio recordings made with the participants' permission. The audio recordings enabled the researcher to focus on the interview and later playback to gain a full import of the participants' responses (Creswell & Creswell, 2018).

4.7.4 Qualitative Data Analysis

Content analysis was adopted to analyse qualitative data. Cohen et al. (2018) defined content analysis as the technique of summarising and presenting the key ideas and insights from transcribed data. Qualitative content analysis is used to identify the existence of particular themes or concepts in a given qualitative data set (Krippendorff, 2018). Interviews, open-ended enquiries, field study notes, conversations or any instance of communicative language could serve as a source of data (Cohen et al., 2018). The analysis of content was accomplished by the interpretation of the interview verbatim transcripts, establishing frequencies and developing themes through coding (Cohen et al., 2018; Krippendorff, 2018).

Firstly, the researcher read through the transcribed text and created smaller meaning units (Table 4.4). For contextualisation, the final list of meanings was read alongside the original text. Then, the researcher highlighted relevant codes and recorded frequencies. Once the texts were coded, the researcher organised codes into categories. These categories were then organised into themes by grouping those that were similar and separating those that were distinctive (Krippendorff, 2018).

Table 4.4

A Summary of a Qualitative Content Analysis

Meaning unit	Code	Category	Theme
I find Life Sciences an interesting subject. Life Sciences is the	Life Sciences is an interesting subject. (<i>n</i> = 7)	Interesting subject	The learners' interest in Life Sciences as a determinant of Life

subject I love the most. I find life Sciences interesting. I learn interesting things in Life Sciences. Life Sciences is one of my favourite subjects. I learn interesting things in Life Sciences.			Sciences self-concept.
I am not performing well. So far I am not happy with my Life Sciences performance. My performance motivates me even more to love Life Sciences. Doing Life Sciences as one of my subjects	I perform well in Life Sciences I do not perform well in life Sciences (n = 8)	Academic achievement	The learners' Life Sciences self-concept was influenced by academic achievement.

has motivated me
to do well.

I do not compare
my achievements
to anyone. I like
doing things on my
own. I don't
believe in
comparison. I am
always inspired by
her academics.

I do not look up to
anyone.

(*n* = 8)

Inspired by
classmates.

(*n* = 2)

Comparisons

Social and
dimensional
comparisons
influenced
learners' Life
Sciences self-
concept
development.

The subject that is
required in order to
pursue my desired
career. They
require Life
Sciences as a
prerequisite. I want
to do medicine.

Life Sciences is
required to pursue
a desired career
choice.

(*n* = 8)

Career choices

Career choice as a
determinant of
learners' Life
Sciences self-
concept.

4.8 Validity

Validity refers to how well a method measures what is meant to measure (Cohen et al., 2018). It is achieved differently in quantitative and qualitative research. In quantitative research, validity is achieved through proper sampling, the use of appropriate instruments and the appropriate treatment of instruments for data analysis (Cohen et al., 2018). The current study used construct validity. Construct validity is the extent to which a research instrument measures the intended construct. In this study, the Self-Description Questionnaire II adapted from Marsh (1990) demonstrated homogeneity since this instrument only measured one construct (Life Sciences self-concept).

Validity in qualitative research is attained by openness, the volume of data collected, the individuals contacted, the degree of triangulation and the researcher's objectivity (Cohen et al., 2018). Cohen et al. (2018) suggested that it is crucial to avail transcripts to participants so that they can check their accuracy and ensure that their views are correctly captured. To validate the qualitative data, respondent validation (member checking) was used. The researcher revisited the participants to allow them to read the transcripts so that they could elaborate, clarify, confirm or disprove certain aspects of the interview. The themes were finally refined and validated by correlating and comparing themes, comparing the data to the themes and triangulating the detected themes using various data sources (interview data and field notes).

4.9 Reliability

For quantitative data reliability, internal consistency was adopted, and Cronbach alpha was calculated. The Cronbach alpha (α) is a measure of the internal

consistency among the items. It offers an inter-item correlation by averaging all potential split-half reliability coefficients, and it is categorised as follows:

- $>.90$ – very highly reliable
- $.80 - .90$ highly reliable
- $.70 - .79$ reliable
- $.60 - .69$ minimally reliable
- $< .60$ unacceptably low

Taber (2018) suggested that the reliability level is acceptable at $.70$. Table 4.4 presents the internal consistency coefficients. The reliability coefficient for the current study was $.829$, meaning that it was highly reliable.

Table 4.5

Internal Consistence Coefficient

Items	N of Items	Reliability coefficient (Cronbach alpha)
SDQ II	10	.829

Because data in qualitative research is based on face-to-face interactions, personal narratives and interviews, reliability can be difficult to prove. However, the criteria stated by Cohen et al. (2018) to establish reliability in a qualitative study are credibility, transferability, dependability, confirmability, honesty, faithfulness to participants, rigour, trustworthiness, richness, scope of data collected and originality.

Creswell (2021) asserts that approaches like member checking and numerous data-gathering methods help qualitative research to achieve credibility and accuracy.

In this study, triangulation was achieved using different data collection methods namely, a questionnaire and semi-structured interviews.

4.10 Ethical Considerations

Before acquiring data, informed consent is required from study participants (Creswell & Creswell, 2018). Permission to collect data from secondary schools was granted by the KZN Department of Education (Appendix B). Ethical clearance was obtained from the UKZN Higher Degrees Office (Appendix A). After permission was granted, three selected schools were visited. The school principals gave their approval for the study to be conducted. The information statements and consent forms were distributed to the participants and explained (Appendix C).

In keeping with the code of ethics, all the participants signed an assent form as an indication that they agreed to take part in the study. Since the learners were minors, parental approval was also obtained. The study was conducted at convenient times for the participants and educators to ensure that teaching and learning were not disturbed. In the event that they felt uncomfortable participating in the study, participants were free to withdraw at any time. Throughout this study, anonymity was maintained by using pseudonyms in place of participants' and schools' true identities. Lastly, hard copies of data were stored safely under lock and key to which only the supervisor and researcher had access. Electronic data were password protected.

4.11 Chapter Summary

In this study, a pragmatic paradigm was adopted. An explanatory sequential mixed methods design was used to determine and explain the nature of Grade 11 learners' Life Sciences self-concept. A Self-Description Questionnaire II, Life Sciences

terms marks and semi-structured interviews were the instruments used to generate qualitative data. SPSS and content analysis were used to analyse quantitative and qualitative data respectively. In the next chapter, the findings emanating from a Self-Description Questionnaire II, learners' Life Sciences term marks and semi-structured interviews were presented and discussed.

Chapter 5

Findings and Discussion

5.1 Introduction

Chapter 4 outlined the research methodology and design used to explore the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in KwaZulu-Natal Province. The four research questions that this study intended to address are as follows:

1. What is the nature of Grade 11 learners' Life Sciences self-concept?
2. Is there a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept?
3. What is the relationship between Grade 11 learners' Life Sciences self-concept and academic achievement?
4. Why do Grade 11 learners have a specific Life Sciences self-concept?

The current study adopted a sequential mixed methods design. Data generation instruments used were a Self-Description Questionnaire II (Appendix D), learners' Life Sciences term marks and semi-structured interviews (Appendix E). SPSS was used to analyse scores from a Self-Description questionnaire II. The semi-structured interviews were used to determine the nature of Grade 11 learners' Life Sciences self-concept in depth. Content analysis was used to formulate themes that emerged from the learners' responses. In this chapter, quantitative results are presented first followed by qualitative results to explain the quantitative findings. A discussion of the findings is presented thereafter.

5.2 Quantitative Findings

5.2.1 *The Nature of Grade 11 Learners' Life Sciences Self-concept*

The purpose of the first question was to determine the nature of Grade 11 learners' Life Sciences self-concept. To answer this question, Self-Description Questionnaire II scores were analysed using SPSS. The results showed that the group mean value for Life Sciences self-concept was 45.86 (Table 5.1) in the range of 10 – 60. It means that the nature of Grade 11 learners' Life Sciences self-concept was positive. Furthermore, the standard deviation for Life Sciences self-concept was relatively high, revealing that the Self-Description Questionnaire II scores were widely dispersed (Marsh, 1990).

Table 5.1

A Descriptive Summary of Grade 11 Learners' Life Sciences Self-concept

	Min	Max	Mean	Std. Deviation
Life Sciences self-concept	14	60	45.86	8.51
Note:				
Scores				
Negative Life Sciences self-concept	10 – 29			
Positive Life Sciences self-concept	30 – 60			

The results in Table 5.2 show high mean ratings for items 1, 2, 3, 4, 6, 7, and 10. Items 5, 8 and 9 had low mean ratings. This result suggests that learners had a positive perception about Life Sciences as a subject. However, some participants found Life Sciences as a difficult subject to comprehend.

Further, Table 5.2 shows that in item 9, most learners did not always do well in Life Sciences, while item 6 and 7 show that a majority of learners were doing well in Life Sciences, and they were also getting good marks. The results for these two sets of items were evidently contradictory, which is an unexpected result. A possible explanation could be that the learners' Life Sciences self-concept was not solidly formed nearly two years after commencing studies in Life Sciences.

Table 5.2

Life Sciences Self-concept Descriptive Statistics

	Ratings						Mean
	1	2	3	4	5	6	
	Frequency	N	N	N	N	N	
1. I enjoy learning Life Sciences	02	01	02	16	39	73	5.23
2. I look forward to learning Life Sciences in school	01	03	03	22	41	63	5.18
3. I wish I did not have to study Life Sciences*	94	26	06	03	00	04	5.45
4. Life Sciences is a boring subject*	90	30	07	02	02	02	5.46
5. Life Sciences notes are difficult to memorise*	37	14	19	30	18	15	3.81
6. I am not doing well in Life Sciences*	30	34	18	29	10	12	4.10
7. I get good marks in Life Sciences	10	10	18	30	38	27	4.20
8. Work in Life Sciences class is easy for me	14	11	17	33	34	24	3.97

9. I have always done well in Life Sciences	16	11	18	35	39	14	3.83
10. Life Sciences is one of my best subjects	12	02	18	43	32	26	4.65
Mean average							4.59

Note:

1 – False	4 – More true than false
2 – Mostly False	5 – Mostly true
3 – More False than True	6 – True

*Negatively worded questions whose ratings were reversed.

5.2.2 Grade 11 Female and Male Learners' Life Sciences Self-concept

The second research question investigated if there was a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept. Mean, standard deviation and independent *t*-test were calculated. Table 5.3 shows that the female and male learners' Life Sciences self-concept mean values were both categorised as positive. However, the mean value for female learners ($M = 47.21$) was greater than the mean value for male learners ($M = 43.30$). This suggests that female learners had a more positive Life Sciences self-concept than male learners. The standard deviation for male learners ($SD = 9.79$) was greater than the standard deviation for female learners ($SD = 7.46$). This suggests that the male learners' Life Sciences self-concept scores were more widely dispersed compared to the female learners' Life Sciences self-concept scores.

Table 5.3

Descriptive Statistics for Grade 11 Female and Male Learners' Life Sciences Self-concept

Gender	N	Mean	Standard Deviation	Standard Error Mean
Female	87	47.21	7.46	.799
Male	46	43.30	9.79	1.44

Furthermore, a *t*-test using independent samples was conducted to see if there was a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept.

Null Hypothesis: There is no statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept.

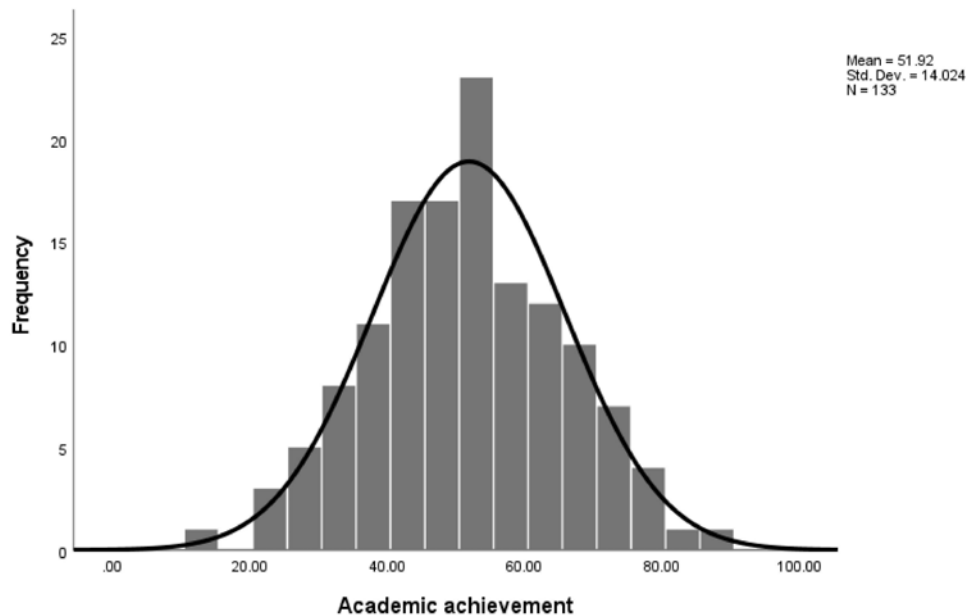
Table 5.4 shows that the probability (sig. 2-tailed) value was .02, which is less than .05, the null hypothesis is rejected. This result suggests that there was a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept ($t_{(73.26)} = 2.37, p < .02$). These findings were expected since the majority of learners in South Africa who take Life Sciences as a subject are females, and most Life Sciences teachers are females.

Table 5.4*Independent Samples t-test of Female and Male learners' Life Sciences Self-concept*

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	<i>F</i>	<i>Sig.</i>	<i>T</i>	<i>Df</i>	<i>Sig. (2-tailed)</i>	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.49	.22	2.58	131	.011	3.91	1.52	.91	6.92
Equal variances not assumed			2.37	73.26	.020	3.91	1.65	.63	7.20

5.2.3 The Relationship between Grade 11 Learners' Life Sciences Self-concept and Academic Achievement

The third research question sought to find out the link between Grade 11 learners' Life Sciences self-concept and academic achievement. To determine the relationship between secondary school learners' Life Sciences perception and academic achievement, learners' academic achievement was also statistically analysed. Figure 5.1 shows that the academic achievement group mean value was 51.92%. As per the Department of Basic Education (2015), this finding suggests that the majority of participants achieved adequate results. Figure 5.1 also shows that the academic achievement standard deviation was high ($SD = 14.02$), which indicates that data is dispersed in relation to the mean.

Figure 5.1*Life Sciences Learners' Academic Achievement*

To compare academic achievement for female and male learners, mean values were calculated. Table 5.5 shows that the mean female score ($M = 54.10$) was significantly greater than the mean male score ($M = 47.80$). These findings suggest that female learners had better academic achievement than male learners. The standard deviation for the male learners' academic achievement was greater than the standard deviation for female learners. This shows that male learners' academic scores were more widely dispersed than those of female learners.

Table 5.5*Descriptive Statistics for Female and Male Learners' Academic Achievement*

Gender	N	Mean	Std. Deviation	Std. Error Mean
Female	87	54.10	12.72	1.36
Male	46	47.80	15.53	2.29

The *t*-test of independent samples was conducted to evaluate if the difference between the female and male Grade 11 learners' Life Sciences academic achievement was statistically significant.

Null Hypothesis:

There is no statistically significant difference between female and male learners' academic achievement.

Table 5.6 shows that the probability (sig.2-tailed) value was .021, which is less than .05, the null hypothesis is rejected. This shows that there was a statistically significant difference in the academic achievement of female and male learners in Life Sciences ($t_{(76,46)} = 2.37, p < .021$). These findings were anticipated given that the majority of South African female learners major in Life Sciences.

Table 5.6

Independent Samples t-test results for Female and Male Learners' Academic Achievement

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	<i>F</i>	<i>Sig.</i>	<i>T</i>	<i>Df</i>	<i>Sig. (2-tailed)</i>	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	3.19	.076	2.51	131	.013	6.30	2.51	1.34	11.26
Equal variances not assumed	-	-	2.36	77.46	.021	6.30	2.67	.99	11.60

Table 5.7 shows that there was a strong positive correlation ($r = .491$, $p < .01$) between Grade 11 learners' Life Sciences self-concept and their academic achievement. This finding shows that as Learners' Life Sciences self-concept increases, their academic achievement also increases.

Table 5.7

Correlation Matrix for Grade 11 Learners' Life Sciences Self-concept and Academic Achievement

		Life Sciences Self-concept	Academic Achievement
Life Sciences Self- concept	Pearson correlation	1	.491**
	Sig. (2-tailed)		<.001
	<i>N</i>	133	133
Academic Achievement	Pearson correlation	.491**	1
	Sig. (2-tailed)	<.001	
	<i>N</i>	133	133

Note: ** Significant level of .01 (2-tailed), when the *p* value is less than .01 there is a significant relationship.

5.3 Qualitative Findings: Explaining why Grade 11 Learners have a Specific Life Sciences Self-Concept

The quantitative findings indicated that Grade 11 learners' Life Sciences self-concept was positive. Female learners showed a more positive Life Sciences self-concept than male learners. Furthermore, quantitative findings showed a robust positive correlation between Grade 11 learners' Life Sciences self-concept and academic achievement. The fourth research question sought to explain why Grade 11 learners had a specific Life Sciences self-concept. To answer this research question, quantitative data were used. The qualitative results identified four main themes:

1. Learners' interest in Life Sciences as a determinant of their Life Sciences self-concept.

2. The learners' Life Sciences self-concept was influenced by their academic achievement.
3. Social and dimensional comparisons influenced learners' Life Sciences self-concept development.
4. Career choices were a determinant of the learners' Life Sciences Self-concept.

Learners' Interest in Life Sciences as a Determinant of their Life Sciences Self-concept

The learners' responses demonstrated interest in Life Sciences as an important construct that influenced their Life Sciences self-concept. Six out of 10 participants who had a positive Life Sciences self-concept reported that they find Life Sciences an interesting subject. This is evident in Ayanda's response when she said: *"Life Sciences is an interesting subject, and it is relatable to day-to-day life. We learn about everything: plants, animals and humans."* Nosipho also mentioned that her perceptions of Life Sciences were positive because she finds Life Sciences as a stimulating subject: *"Ahh, I think positive; I find Life Sciences interesting."*

On the contrary, one of the participants who had a negative Life Sciences self-concept shared different views about Life Sciences as a subject, and she showed less interest in Life Sciences. She revealed that Life Sciences is boring and difficult to understand when she was asked about her perceptions of Life Sciences. Neli mentioned that: *"Life Sciences is not an interesting subject, instead, I find it boring and a difficult subject."*

The study's findings indicate that if a learner is interested in a specific domain, he or she is likely to develop a positive perception of that specific domain. Also, if a

learner is not interested in a specific domain, his or her interest in that specific domain will be negative and subsequently lower his or her domain-specific self-concept.

The learners' Life Sciences Self-concept was Influenced by their Academic Achievement

The findings from the qualitative phase revealed that Life Sciences self-concept was influenced by academic achievement. Five out of 10 participants who performed well in Life Sciences had a positive Life Sciences self-concept. Nosipho is one of the participants who performed well in Life Sciences and had a positive Life Sciences self-concept. She was asked if she regretted choosing Life Sciences as one of her subjects and why her perceptions of Life Sciences were positive. She revealed that her performance in Life Sciences played a significant role in her positive Life Sciences self-concept. She shared that: *"I do not regret choosing Life Sciences as one of my subjects, and my academic achievement motivates me even more to love Life Sciences."*

Learners' responses further revealed that 2 out of 10 participants who did not perform well academically had a negative Life Sciences self-concept. These participants' responses demonstrated that their academic achievement influenced their perceptions of Life Sciences. That is, their low academic achievement in Life Sciences resulted in a negative Life Sciences self-concept. Siphesihle responded to a question asking about his perceptions in Life Sciences: *"My perceptions in Life Sciences are negative since I am not doing well in Life Sciences."* Neli also mentioned that: *"I think it is because of my academic achievement. I haven't been doing well in Life Sciences."*

According to these findings, learners who perform well academically are likely to have a strong positive Life Sciences self-concept, whereas learners who do not perform well academically are more likely to have a negative Life Sciences self-concept.

Social and Dimensional Comparisons Influenced Learners' Life Sciences Self-concept Development

The findings of the current study revealed that Life Sciences self-concept development was also influenced by social and dimensional comparisons. Two out of 10 participants developed a Life Sciences self-concept by comparing their academic abilities with their peers, while 8 out of 10 of the participants compared their academic abilities across their subjects.

Learners' who had a negative Life Sciences self-concept compared their academic abilities to better-performing learners. Siphesihle compared his academic abilities with the abilities of her classmate who was a top achiever. Siphesihle mentioned that: *"Nosipho from our class motivates me; I am always inspired by her academic performance."* Sphephelo also mentioned that he compared his academic achievement with a group from his class that he studied with: *"I have a group in my class that I compete with; we study together and compare our marks"*.

Eight out of ten participants reported that they compared their academic abilities across their subjects. This was evident in Nosiphos' response when she said: *"I do not compare myself to anyone; it leads to unnecessary pressure. I compare my achievements across my subjects"*

These findings suggest that learners who compare their performance across domains are those with a positive Life Sciences self-concept, while a learner with a

negative Life Sciences self-concept relates his or her abilities with another person or a group.

Career Choices was a Determinant of the Learners' Life Sciences Self-concept

Participants who had an interest in pursuing career choices that require Life Sciences as a prerequisite had a positive Life Sciences self-concept. Out of 10 participants, 7 reported that career choices also played a significant role in their positive Life Sciences self-concept development. This was evident in Mike's response when he said: *"I chose Life Sciences as a subject because a career that I want to pursue requires Life Sciences as a pre-requisite, and it involves a number of topics that we cover in Life Sciences"*. Phumzile also confirmed the significance of career choices in her Life Sciences self-concept development when she was asked about her perceptions of Life Sciences: *"Ahhh... I think my positive perception towards Life Sciences is from the fact that I am aware of what I want to be in the future, and without Life Sciences, I won't be accepted at university."*

These findings suggest that learners who are aware of their career choices show a positive self-concept in a specific domain, and also, if they understand the requirements to enrol for a university programme, their perceptions and abilities towards a specific domain are likely to be positive.

5.4 Discussion of Findings

The previous sections provided quantitative and qualitative findings. The current section provided an in-depth discussion of the findings. The findings were discussed under four subtopics derived from the research questions: What is the nature of Grade 11 learners' Life Sciences self-concept? Is there a statistically significant difference between Grade 11 female and male learners' Life Sciences self-

concept? What is the relationship between Grade 11 learners' Life Sciences self-concept and academic achievement? Why do Grade 11 learners' have a specific Life Sciences self-concept?

5.4.1 The Nature of Grade 11 learners' Life Sciences Self-concept

The results of the current study revealed that the nature of Grade 11 learners' Life Sciences self-concept is positive. These findings show that the majority of Grade 11 learners in Amajuba District hold positive views and abilities about Life Sciences. A study by Cherry (2018) revealed that self-concept displays itself distinctively with each person and differs from positive to negative.

The current study's findings are similar to the findings by Ackerman (2020) who revealed that secondary school learners hold positive views and abilities about their academics. His findings showed that learners with a positive academic self-concept are confident and can overcome problems and improve themselves. Herrera et al. (2020) findings also revealed that a learner with a positive academic self-concept faces challenges in maintaining or enhancing the learning results that were attained the year before or the preceding term. They also demonstrated that a learner has the bravery to display his or her skills in front of others and can inspire others to complete the work that has been allocated to them. Muttaqin et al. (2020) study reported that a strong academic self-concept minimizes the development of learning problems in learners and enables them to do better in their academics.

However, a study by Arafah et al. (2020) revealed that a learner with a low academic self-concept views himself or herself as a hopeless and inactive person and does not want to interact with his or her classmates. Additionally, he or she lacks a strong desire to study. Arafah et al. (2020) findings are in contrary to the findings of

the current study where 94.7% of the participants reported a positive self-concept in the field of Life Sciences.

The quantitative findings also demonstrated that a majority of learners did not always do well in Life Sciences, while other sets of results revealed that a majority of learners were doing well in Life Sciences, and they were also getting good marks. The results for these two sets of items are evidently contradictory. A possible explanation could be that the learners' Life Sciences self-concept was not solidly formed nearly two years after commencing studies in Life Sciences (transitioning). Prior literature showed a decrease in learners academic self-concept during secondary school transition (Coelho & Romão, 2017; Onetti et al., 2019). According to Coelho and Romão (2017) learners are placed in a new classroom with new subjects that can be regarded as a new frame of reference and they are generally expected to be more independent and responsible for their own work. These adaptations may have a negative impact on their Life Sciences self-concept (Onetti et al., 2019).

Furthermore, learners' responses from semi-structured interviews demonstrated that the nature of their Life Sciences self-concept was influenced by interest in Life Sciences, academic performance, comparisons and career choices.

▪ ***Interest in Life Sciences***

Having an interest in Life Sciences as a subject is linked with a positive interest in the subject. These results correlate with Arens et al. (2017) findings, who revealed that a positive academic self-concept is interrelated to a positive interest and overall life fulfilment (Arens et al., 2017).

On the other hand, one of the participants with a negative Life Sciences self-concept reported that they find Life Sciences boring and difficult to comprehend. These

results correspond with those by Colmar et al. (2019), who revealed that learners lose interest in a particular subject if difficulties are experienced. However, these findings contradict the conclusion made by Direito et al. (2017) who claimed that interest is suggestive of only a minor impact on self-concept. That is, a positive Life Sciences self-concept leads to a higher interest in Life Sciences, not the opposite.

The current study findings suggest that if a learner is interested in a particular domain, he or she is likely to develop a positive perception of that specific domain. Also, if a learner is not interested in a specific domain, his or her interest in that specific domain will be negative and subsequently lower his or her domain-specific self-concept. The conclusion is that interest in a specific domain influences learners' subject-specific self-concept positively.

▪ ***Academic Achievement***

The qualitative finding of this study revealed that Grade 11 learners' Life Sciences self-concept was influenced by learners' academic achievement. Learners' responses demonstrated that their academic achievement played a significant role in their Life Sciences self-concept development. The findings of the study concluded that high academic achievement is related to a positive Life Sciences self-concept, and a negative Life Sciences self-concept is linked to a low academic achievement. The results of this study support other studies' findings that excellent academic achievement is enhanced by having a positive self-concept (Arafah et al., 2020; Herrera et al., 2020; Jaiswal & Choudhuri, 2017; Parker et al., 2015; Sewasew et al., 2018). The findings from this study also support the Reciprocal Effect Model.

The findings show that academic achievement is linked to a positive self-concept in a particular subject, while academic failure is linked to a negative self-concept in a particular subject.

▪ ***Social and Dimensional Comparisons***

The majority (8) of the participants developed a positive Life Sciences self-concept by comparing their abilities across their subjects (Dimensional comparison). The literature suggests that social and dimensional analogies are the most crucial forms of analogies for self-concept development (Wigfield et al., 2020; Wolff & Möller, 2022). Two participants who had a negative Life Sciences self-concept reported that they compared their abilities with the abilities of learners who performed slightly better than them. These findings correspond with the findings by Dicke et al. (2018) who reported that a learner who compares his or her abilities to high-achieving learners is known to have a lower self-concept.

Career Choices

The results of this study revealed that career choices influenced learners' Life Sciences self-concept. That is, learners who are aware of their career choices are likely to develop a positive Life Sciences self-concept. Also, learners who have a positive perception of Life Sciences are likely to choose Life Sciences as one of their subjects. According to the literature, one of the key ideas impacting someone's desire to pursue science, particularly throughout the secondary school years, is their perception of themselves (Lau, 2020). According to Rizal et al. (2021), learners who have a good view of themselves and their aptitude for science and technology are likely to pursue careers in those fields.

The current study revealed that career decisions and one's self-perception in the field of Life Sciences self-concept are correlated with one another. Learners who are conscious of their career goals are more inclined to developing a positive self-concept in a specific field.

5.4.2 Grade 11 Female and Male Learners' Life Sciences Self-concept

Female and male Grade 11 learners' Life Sciences self-concept mean values were categorized as positive. Furthermore, the findings of the independent samples *t*-test showed a significant difference between the Life Sciences self-concept of female and male learners ($t_{(73.26)} = 2.37, p < .02$). Compared to male learners, female learners showed a greater self-concept in Life Sciences self-concept. These results concur with those by Direito et al. (2017) who explored a specific science domain self-concept. They revealed that female learners were significantly more interested in Life Sciences than male learners.

The findings of this study also support a large body of research which showed that there is a statistically significant difference between the self-concept of female and male Grade 11 secondary school Life Sciences learners. Arafah et al. (2020) ascertained that the academic self-concept of female and male learners differed significantly. Behera and Samal (2015) critically analysed the importance of gender and self-concept. Their results showed that there is a statistically significant variation between female and male secondary school learners. Rüschenpöhler and Markic (2020) conducted a study about secondary school learners' domain-specific self-concept. They reported a gender gap in a specific domain of self-concept, with males showing a stronger self-concept than females.

The results of this study, however, contradict the findings of a large body of research that claimed that gender does not influence learners' self-concept in relation to a particular subject (Babu & Krishnamoorthy, 2016; Biswal, 2016; Dominguez-Lara et al., 2019; Hamed et al., 2017; Kumar, 2016; Puhan & Nibedita, 2017). Puhan and Nibedita (2017) conducted a study on the impact of gender and self-concept on secondary students. They found no significant distinction between female and male secondary learners.

One of the study's intriguing findings is that there is a major difference between how female and male learners view Life Sciences self-concept. However, the qualitative findings demonstrated that gender did not influence learners' Life Sciences self-concept directly. These findings are in contrast with the findings by Behera and Samal (2015) who revealed that learners' self-concept is directly affected by gender.

5.4.3 The Relationship between Grade 11 Learners' Life Sciences Self-concept and Academic Achievement

A majority of Grade 11 Life Sciences learners achieved adequate results ($M = 51.92\%$). The quantitative results also showed a statistically significant difference between female and male academic achievement learners. The findings of the present study are consistent with those of Dominguez-Lara et al. (2019), who reported that, in general, female learners perform well academically than male learners and have a higher self-concept.

The findings from this study showed a strong positive correlation ($r = .491$, $p < .01$) between learners' Life Sciences concept of self and the academic achievement of secondary school learners. Learners who performed well academically had a positive Life Sciences self-concept, while learners who did not perform well had a

negative Life Sciences self-concept. The qualitative findings demonstrated that performing well academically is linked with a positive domain self-concept, and poor academic achievement is linked with a negative domain-specific perception. Thus, learners with a positive self-concept can overcome challenges, while learners with a negative self-concept are less interested in almost everything they do (Ackerman, 2020).

The results of the current study correlate with those of Rodiah et al. (2020), who reported that Life Sciences learning outcomes correlated significantly with an academic self-concept. The findings of the present study also concur with a substantial amount of prior research that investigated the connection between academic success and self-concept (Herrera et al., 2020; Nandika, 2020; Sewasew et al., 2018; Susperreguy et al., 2018). The quantitative results showed a statistically substantial difference between the academic success of female and male learners.

Nandika (2020) explored the correlation between self-concept and academic achievement. The findings of his research indicate a connection between academic success and a positive view of oneself. Rodiah et al. (2020) led a study on the correlation between Biology learning outcomes and academic self-concept in senior high school. Their research showed a strong link between learners' academic self-concept and their learning outcomes in Biology.

However, Noviyanti et al. (2019) asserted that a learner's weak academic self-concept will not always receive poor grades, and a learner with a good academic self-concept will not always receive excellent grades. The current study's findings conflict with their assertion. These contrasting findings are because self-concept development

is influenced by several factors besides academic achievement (Lipnevich et al., 2016).

Theoretically, the findings of the present study support the Reciprocal Effect Model which claims that academic accomplishment and self-concept are mutually related (Seaton et al., 2015). Higher marks are possible for learners who believe that they are intellectually capable and have confidence in their work. Also, if their grades are positive, then they can show a positive Life Sciences self-concept.

5.5 Chapter Summary

In this chapter, a discussion of the findings was presented. A self-Description Questionnaire II, learners' term marks and semi-structured interviews were used to generate data. The findings of the present study show that Grade 11 learners' Life Sciences self-concept in Amajuba District secondary schools was positive. This study found that there was a statistically significant difference between the self-concept of female and male learners in Life Sciences. However, gender did not directly affect their Life Sciences self-concept. Furthermore, the current study showed that there was a strong positive correlation between Life Sciences self-concept and the learners' academic achievement of Grade 11 learners. Learners' interest in Life Sciences, academic achievement, social and dimensional comparisons and career choices directly influenced learners' Life Sciences self-concept.

The next chapter provided a summary of the findings, limitations of the study, recommendations for future studies and the conclusion drawn from the findings.

Chapter 6

Summary of Findings, Limitations and Recommendations

6.1 Introduction

The previous chapter outlined the findings and discussion of the current study. This chapter presented a summary of findings, recommendations, limitations and conclusions of this mixed methods case study. The primary objective of the present study was to determine how Grade 11 learners in Amajuba District in KwaZulu-Natal Province perceived themselves in the field of Life Sciences. The current study was guided by the following four research questions:

1. What is the nature of Grade 11 learners' Life Sciences self-concept?
2. Is there a statistically significant difference between Grade 11 female and male learners' Life Sciences self-concept?
3. What is the relationship between Grade 11 learners' Life Sciences self-concept and academic achievement?
4. Why do Grade 11 learners have a specific Life Sciences self-concept?

The current study adopted sequential mixed methods to generate and answer the research questions.

6.2 Summary of Findings

This section presented a summary of findings with respect to the literature review, theoretical framework and collected data. The findings that answer four research questions were generated from a questionnaire (Appendix D), semi-structured interviews (Appendix E) and learners' Life Sciences term marks. The current study's findings were summarised using four research questions.

Research Question One: What is the Nature of Grade 11 Learners' Life Sciences Self-concept?

Determining the nature of Grade 11 learners' Life Sciences self-concept was the first research question. The majority of Grade 11 learners (94.7%) had a positive Life Sciences self-concept, while 5.3% had a negative Life Sciences self-concept. These findings show that the nature of Grade 11 learners' Life Sciences self-concept is positive.

Research Question Two: Is There a Statistically Significant Difference Between Grade 11 Female and Male Learners' Life Sciences Self-concept?

The second research question explored whether there was a statistically significant difference in the self-concept of Grade 11 female and male learners in Life Sciences. The results of this research showed that there was a statistically significant difference between the Life Sciences self-perception of female and male learners ($t_{(73.26)} = 2.37, p < 0.2$). Female learners had a higher Life Sciences self-concept than male learners. However, learners' responses did not demonstrate gender as one of the aspects that influenced their Life Sciences self-concept, suggesting that gender did not affect learners' Life Sciences self-concept directly.

Research Question Three: What is the Relationship Between Grade 11 Learners' Life Sciences Self-concept and Academic achievement?

The third research question sought to determine the relationship between learners' Life Sciences self-concept and academic achievement. The findings of the current study showed that there was a strong positive correlation between Life

Sciences self-concept and academic achievement. Learners who performed well had a positive Life Sciences self-concept, while learners who did not perform well had a negative Life Sciences self-concept.

Theoretically, the finding of the present study supports the revisited Reciprocal Effect Model which claims that academic achievement and self-concept are mutually related. That is, learners can get better results if they believe that they are academically competent and are proud of their achievements. Also, if their grades are positive, then they can show a positive Life Sciences self-concept.

Research Question Four: Why Do Grade 11 Learners Have a Specific Life Sciences Self-concept?

The last research question focused on why learners had a specific Life Sciences self-concept. From the learners' responses to semi-structured interviews, it was established that the learners' interest in Life Sciences, academic achievement, social and dimensional comparisons and career choices influenced their Life Sciences self-concept. The current study findings presented that learners who were interested in Life Sciences had a positive Life Sciences self-concept. Performing well academically was connected with a positive Life Sciences self-concept, while poor academic achievement was linked with a negative Life Sciences self-concept.

The current study supports the Reciprocal Effect Model that suggested that academic performance correlates significantly with self-concept. Learners who had a positive Life Sciences self-concept compared their abilities across their subject (dimensional comparisons). Lastly, the findings of the present study revealed that career choices and one's self-concept in the field of Life Sciences were related. Learners who wanted to pursue career choices that required Life Sciences as a

prerequisite had a positive Life Sciences self-concept. A possible explanation is that South Africans view education as one of the ways they could redress their material poverty. Therefore, access to education did not simply mean attaining education but an opportunity to improve one's and their family's positions and economic conditions.

The factors that affected learners' Life Sciences self-concept development are summarised in Table 6.1.

Table 6.1

Factors Affecting Learners' Life Sciences Self-concept

Self-concept Development	Factors Affecting Life Sciences Self-concept Development
Positive Life Sciences self-concept	- Learners' interest in Life Sciences - High academic achievement - Dimensional comparisons - Career choices related to Life Sciences
Negative Life Sciences self-concept	- Lack of interest in Life Sciences - Low academic achievement - Social comparisons

6.3 Limitations of the study

The current study used questionnaires, learners' term marks and semi-structured interviews to get a comprehensive understanding of the nature of learners' Life Sciences self-concept. However, the study had a few limitations.

- The first limitation of the present study was the location and sample type. Participants were in Amajuba District in KwaZulu-Natal. In addition, the researcher only used samples from one cultural group (Blacks), thus the findings cannot be generalised to other cultures.
- Another limitation is that, despite the fact that gender was taken into consideration in the current study, additional social variables, such as cultural preconception, family demographics, race or socioeconomic standing, may also have an effect on learners' Life Sciences self-concept.
- The broadness of the phenomenon limited the current study. Self-concept development is affected by several other factors. Learners' parents and teachers also play a part in learners' Life Sciences development. This makes it impossible to explore Life Sciences self-concept development fully.

6.4 Recommendations

This section presents recommendations made to researchers, various education stakeholders and education levels as necessitated by the conclusions of this study.

6.4.1 Recommendations for further research

For future research, it is recommended to:

- Consider parents and teachers, since they play a part in the development of learners' Life Sciences self-concept.
- Select a large sample size with different cultural groups in future research, as this will enhance the generalisability of results. This will also aid in the accuracy of statistical analysis.

6.4.2 Recommendations to the Department of Education

- Since the academic success and positive self-concept are significantly correlated, secondary schools should engage staff and counsellors who can help learners establish a positive self-concept in Life Sciences.
- Teachers should assist in developing learners' positive Life Sciences self-concept.
- Schools should frequently provide workshops and other assistance programs to give learners the tools they need to improve their self-concept in Life Sciences.

6.5 Conclusion

The study concludes that Grade 11 learners in Amajuba District's Life Sciences self-concept was positive. The self-concept of male and female Life Sciences learners differs statistically. However, learners' gender does not affect learners' Life Sciences self-concept directly. Additionally, there is a significant link between academic achievement and learners' Life Sciences self-concept. In other words, better academic performance promotes a positive academic self-concept, and a positive academic performance promotes better academic performance.

The current study also shows that if a learner is interested in a particular domain, he or she is likely to develop a positive perception of that specific domain. Also, if a learner is not interested in a specific domain, his or her interest in that specific domain will be negative and subsequently lower his or her domain-specific concept. Performing well academically is related to a positive domain-specific self-concept, and poor academic achievement is linked with a negative domain-specific self-concept. The current study's findings demonstrate that there is a mutual correlation between career choices and Life Sciences self-concept. Learners who are aware of their career goals tend to develop a positive domain-specific self-concept. The conclusion is that positive interests in Life Sciences, performing well academically and career choices related to Life Sciences are associated with a positive Life Sciences self-concept.

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Appendices

Appendix A Ethical Clearance, University of KwaZulu-Natal



20 April 2022

Bhekumuzi Innocent Zondi (218087883)
School Of Education
Edgewood Campus

Dear BI Zondi,

Protocol reference number: HSSREC/00003971/2022

Project title: Grade 11 Learners Life Sciences Self-concept: A Case Study in Amajuba District
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 18 March 2022 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

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

This approval is valid until 20 April 2023.

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

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

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

Yours sincerely,



Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee

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

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

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

INSPIRING GREATNESS

Appendix B Permission Letter from the KZNDoe



KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201
Tel: 033 392 1063

Email: Phindile.duma@kzndoe.gov.za

Enquiries: Phindile Duma

Ref.:2/4/8/7242

Mr Bhukumuzi Innocent Zondi
P.O. Box 17615
OSIZWENI
2952

Dear Mr Zondi

TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: "GRADE 11 LEARNERS' LIFE SCIENCES SELF-CONCEPT: A CASE STUDY IN AMAJUBA DISTRICT", in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research.
5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from **15 March 2022 to 31 March 2025**.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

AMAJUBA DISTRICT

Mr GN Ngcobo
Head of Department: Education
Date: 15 March 2022

Appendix C Informed Consent Forms

Dear Parent/guardian

LETTER TO PARENTS/GUARDIANS REQUESTING PERMISSION

My name is Mr BI Zondi. I am a student at the University of KwaZulu-Natal, studying towards a Master's degree specialising in Science Education under the supervision of Dr. T. Chirikure. I am also a Science and Mathematics Lecturer at Majuba TVET College. As a requirement for my degree, I will have to conduct a research study which explores learners' Life Sciences self-concept under the title: *“Grade 11 learners’ Life Sciences Self-concept: A Case Study in Amajuba District.”* Your child is part of the targeted participants for the study.

The main purpose of this study is to explore the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in Kwa-Zulu Natal Province. To do so, I wish to administer a questionnaire and interview the learners as well. The findings of this study will assist in understanding and explaining the nature of learners' Life Sciences self-concept. Furthermore, the findings of this study might help various stakeholders in education to understand and address the poor quality pass rate in Life Sciences.

Therefore, I would like to request the participation of your child in this study. There will be no interruption of your child's normal school programme. The school timetable will be followed. All data collected will be treated with confidentiality, and the name of your child will not be mentioned anywhere in the thesis write-up.

The information and research data that will be collected from learners will remain confidential and will in no way be used as a school-based assessment. Your child will not be exposed to any harm, risk or danger by taking part in this study. Partaking in this study is voluntary, and there will be no negative consequences for refusal to participate.

The summary of the findings will be shared with you, and the school and will remain confidential.

If you have any questions/concerns or queries related to the study, you may contact me, **Mr BI Zondi**, Cell: [REDACTED]; email: [REDACTED]

or my supervisor: **Dr Tamirofa Chirikure**

Tel: 0312603470; Email: chirikure@ukzn.ac.za

or UKZN's Research Ethics Committee:

HSSREC Research Office

Tel: 031 260 8350/4557/3587; Email: hssrec@ukzn.ac.za

Please indicate on the attached form whether you permit your child to take part in this study.

Yours Sincerely,



BI Zondi

PARENT/GUARDIAN CONSENT

I.....
 .the parent/guardian of
acknowledge that I have read
 and understood the content of the request that you have sent to me explaining
 clearly your purpose and intentions of your research study which is titled: *"Grade11
 learners' Life Sciences Self-concept: A Case Study in Amajuba District."*

- I understand the purpose and procedures of the study contained in the information sheet.
- I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.
- I understand that my child may withdraw without prejudice at any time and that his/her identification will remain anonymous throughout the study.
- I declare that my child's participation in this study is entirely voluntary and that s/he may withdraw at any time without affecting any of the benefits that s/he is usually entitled to.
- If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher, **Mr. BI Zondi, Cell: [REDACTED]; email: [REDACTED]**
- If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

The supervisor:

Dr Tamirofa Chirikure

[REDACTED]

or UKZN's Research Ethics Committee:

[REDACTED]

Email: hssrec@ukzn.ac.za

I, therefore, **give consent /do not give consent** (please underline your choice) for my child to participate in your study.

(Please tick in the appropriate box)

	Yes	No
My child can be audio recorded		

Parent/Guardian Signature:Date:

Signature of Witness:.....Date:

Signature of Translator:.....Date:.....

(Where applicable)

Dear learner

LETTER TO LEARNERS REQUESTING ASSENT

My name is Mr BI Zondi. I am a student at the University of Kwa Zulu Natal studying towards a Master's degree specialising in Science Education under the supervision of Dr. T. Chirikure. I am also a Science and Mathematics Lecturer at Majuba TVET College. As a requirement for my degree, I will have to conduct a research study which explores learners' Life Sciences self-concept under the title: *“Grade 11 Learners' Life Sciences Self-concept: A Case Study in Amajuba District.”* Your child is part of the targeted participants for the study.

The main purpose of this study is to explore the nature of Grade 11 learners' Life Sciences self-concept in Amajuba District in Kwa-Zulu Natal Province. To do so, I wish to administer a questionnaire and interview the learners. The findings of this study will assist in understanding and explaining learners' Life Sciences self-concept. Furthermore, the findings of this study might help various stakeholders in education to understand and address the poor quality pass rate in Life Sciences.

Therefore, I wish to invite you to participate in this study. There will be no interruption of your normal school programme. The school timetable will be followed. Your name will not be mentioned anywhere in the analysis of data.

You will not be exposed to any harm, risk or danger by taking part in this study. Partaking in this study is completely voluntary, and there will be no negative consequences for refusal to participate. Your responses will remain confidential. Your identity and the name of your school will not be revealed. A letter requesting permission will be sent to your parents asking them to grant you permission to be involved in the study. You may at any stage withdraw from the study even after giving consent. The summary of the findings will be made available to you and your school and shared with policymakers. Please, complete the attached consent form and return it to me.

Please do not hesitate to contact me, my supervisor or the Research Ethics Committee if you have any queries or seeking clarity about this research.

Thank you for your kind assistance.

Yours Sincerely,



Mr BI Zondi (Student)

Cell: [REDACTED] | Email: [REDACTED]

Supervisor: **Dr Tamirofa Chirikure**

Tel: 0312603470 Email: chirikure@ukzn.ac.za

UKZN's Research Ethics Committee:

HSSREC Research Office

Tel: 031 260 8350/4557/3587

Email: hssrec@ukzn.ac.za

LEARNER'S ASSENT FORM

I....., **agree/ do not agree** to participate in the study entitled "Grade11 Learners' Life Sciences Self-concept: A Case Study in Amajuba District" by Mr BI Zondi

- I understand the purpose and procedures of the study contained in the information sheet.
- I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.
- I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.
- If I have any further questions/concerns or queries related to the study, I understand that I may contact the researcher, Mr. **BI Zondi**, Cell: [REDACTED]; email: [REDACTED]
- If I have any questions or concerns about my rights as a study participant or if I am concerned about any aspects of the study or the researcher, then I may contact:

The supervisor:

Dr Tamirofoa Chirikure



or UKZN's Research Ethics Committee:



I agree to (please tick in the appropriate box):

	Yes	No
Audio recording		

Learner's Signature: Date:.....

Researcher's Signature: Date:.....

Appendix D Self-Description Questionnaire II

SECTION A: DEMOGRAPHIC INFORMATION

Surname and initials	
Age	
Gender	
Race	
School	

SECTION B: SELF- DESCRIPTION QUESTIONNAIRE (SDQ II)

Example

N		False	Mostly false	More false than true	More true than false	Mostly true	True
		1	2	3	4	5	6
1	I am not doing well in Life Sciences				X		

N		False	Mostly false	More false than true	More true than false	Mostly true	True
		1	2	3	4	5	6
1	I enjoy learning Life Sciences						
2	I look forward to learning Life Sciences in school						
3	I wish I did not have to study Life Sciences						
4	Life Sciences is boring						

5	Life Sciences notes are difficult to memorise						
6	I am not doing well in Life Sciences classes						
7	I get good marks in Life Sciences						
8	Work in Life Sciences classes is easy for me						
9	I have always done well in Life Sciences						
10	Life Sciences is one of my best subjects						

Appendix E Interview Schedule

Firstly, I would like to thank you for agreeing to be part of this study. This interview intends to answer why learners have a specific Life Sciences self-concept. The study is voluntary should you wish to withdraw. Your views will be helpful to me, and your name will not be disclosed. Instead, pseudonyms will be given. Your responses will be recorded, and this interview should take you about 20 minutes. The interview schedule consists of two parts namely: Part A - Demographic details of the participants and introduction questions and Part B - Interview questions

Part A – Demographics details

1. Before I start with the interview, I need to confirm your demographic information
 - What is your name?
 - What is your age?
 - Where are you from?

Introduction Questions

1. Learning in the year 2021 has been rough for almost everyone. How is 2022 so far since we are back to our normal lives, and no more lockdowns?
2. Are you comfortable there? Is there anything you like before we resume?
3. Since I will be recording this interview, I will appreciate it if you put your cell phone on silence before we start.

Part B – Interview questions

The following interview questions were informed by the quantitative findings.

1. Why did you choose Life Sciences as the subject?
2. What are your career aspirations and where do you see yourself in the future?

3. What/who inspired you to choose Life Sciences?
4. What is your overall performance in Life Sciences and are you happy with your performance?
5. In terms of your academic performance, what/who motivates you?
6. Do you regret choosing Life Sciences instead of commercial subjects?
7. Quantitative data analysis revealed that you have a negative/positive self-concept of Life Sciences. Why do you think you have such a concept?

Appendix F Qualitative Phase Respondent Demographics

N	Respondent	Gender	Age
1	Phumzile	Female	17
2	Siphesihle	Male	17
3	Ayanda	Female	18
4	Ntando	Male	17
5	Sphephelo	Male	16
6	Siyamthanda	Female	17
7	Nosipho	Female	17
8	Neli	Female	18
9	Sihle	Male	16
10	Mike	Male	17

Note: Pseudonyms are used

Appendix G The interview transcript coding

Data	Code
Bheki: Hi Phumzile	
Phumzile: Good day Mr Zondi	
Bheki: Firstly, I would like to thank you for agreeing to be part of this study. Please note that participation is voluntary should you wish to withdraw and this interview is being recorded	
Bheki: Tell me, why did you choose Life Sciences as one of your subjects?	
Phumzile: Well it is the subject that is required in order to pursue a career that I want.	Life Sciences is required to pursue
Bheki: Ok, where do you see yourself in future?	a desired career
Phumzile: It want to be a Cardiologist	choice.
Bheki: What/who inspired you to choose Life Sciences as your subject?	
Phumzile: My sister, she also did Life Sciences and she used to tell me about her interesting LS projects and content.	Life Sciences is an interesting subject
Bheki: How is your performance in Life Sciences so far and are you happy with your performance?	

Phumzile: I perform well. However, I am not happy with my performance since last year I was getting distinctions only

Bheki: But is your performance poor?

Phumzile: No just that I am not getting grades that I want.

Bheki: In terms of your academic performance what or who motivates you?

Phumzile: I motivate myself. I don't look up to anything/anyone.

Bheki: Do you regret choosing Life Sciences instead of commercial subjects?

Phumzile: I don't, I enjoy doing Life Sciences

Bheki: Remember early this year you completed a Self-Description Questionnaire. Data analysis revealed that you have a positive self-concept towards LS, why do you think your perception towards LS is positive?

Phumzile: Ahh I think it is the amount of work I put in Life Science. Even when we are writing Geography I wake up and study Life Sciences

Bheki: So it means you prefer Life Sciences as compared to other subjects and why?

Phumzile: Not really, just that I find Life Sciences interesting

Bheki: Self-concept is a perception one has about his ability in an academic domain, self-concept develops through social and dimensional comparison. Social is when

you compare your achievement with other learners
while dimensional is within your subjects. How do you
compare your achievement?

Phumzile: I do not compare my achievements with anyone.

I do not look up to
anyone

Bheki: Why?

Phumzile: I am my own role model.

Bheki: ohh interesting and thank you for your time.

Appendix H Editor's Certificate**Registered with the South African Translators' Institute (SATI)****Reference number 1000686****SACE REGISTERED**

18 July 2023

Grade 11 Learners' Life Sciences Self-concept: A Case Study in Amajuba District

This certificate confirms that I edited substantively the above document, including a Reference list. The text, as edited by me, is grammatically correct. The document was returned to the author with various suggestions and tracked changes from me intended to correct errors. After completion of my language editing, the author can accept or reject suggestions/changes before re-submission to the supervisor who will check the content and instances of plagiarism, if any.

Yours faithfully



Dr. K. Zano

Ph.D. in English



Appendix I Turnitin Report

