DYNAMICS OF SUBJECT CHOICES: A FRAMEWORK TOWARDS THE SELECTION OF ADVANCED LEVEL MATHEMATICS SUBJECTS OFFERED BY THE MINISTRY OF PRIMARY AND SECONDARY EDUCATION (MoPSE), ZIMBABWE

by

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DECLARATION

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DEDICATION

This thesis is dedicated to my son, Ozni Tichinashe Matiza, in the hope that he will one day walk his own academic path and rise even higher than this achievement has taken me.

It is also dedicated to the memory of my late father, Ruramayi Aaron Chikusvura, who knew this day would come long before I could see it myself, even when I was so little. I made it, VaTina!

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ABSTRACT

This study focused on a curriculum that provides learners at Form 5 and 6 (also known as Advanced Level) with the option to choose among five A-Level mathematics subjects, which are Statistics (6046), Pure Mathematics (6042), Mechanical Mathematics (6021), Additional Mathematics (6002), and Mathematics (6082). It is essential to offer careful guidance in subject selection at this level, as the choices made will lay the groundwork for future tertiary education. Learners frequently experience confusion and fail to make informed decisions owing to a lack of structured guidance when choosing the appropriate A-Level mathematics pathway, a challenge that this study sought to address by exploring the dynamics of subject choices and developing a framework for selecting Advanced-Level mathematics subjects offered by the Zimbabwe Ministry of Primary and Secondary Education (MoPSE). The study was theoretically grounded in the Rational Choice Theory (RCT) and the Social Cognitive Career Theory (SCCT), which served as complementary analytical lenses for examining the subject selection phenomenon, with the former positioning learners as rational decision-makers who weigh available subject options against their academic strengths and career aspirations. The latter illuminates how external social influences, including teachers, parents and peers, shape learners' self-efficacy beliefs and subject selection decisions. In contrast, the concept of the Zone of Proximal Development (ZPD) further informed the study's recognition that learners navigating subject selection often require scaffolded support from more knowledgeable others (MKO) to bridge the gap between their existing understanding and the informed choices they need to make.

A qualitative research design was employed within an interpretive paradigm, involving 30 A-Level learners, five mathematics teachers and five school heads from five purposively selected high schools in the Bulawayo Metropolitan Province, Zimbabwe, with data collected through document analysis, open-ended questionnaires and focus group discussions, coded using ATLAS.ti software, and analysed thematically using a Braun and Clarke’s six-phase analytical framework, preceded by a preliminary pilot study conducted to assess instrument suitability and the overall viability of the research design. The findings revealed that the dominance of pure mathematics in school offerings, limited subject-selection guidance, the selective willingness of teachers to offer certain subjects, and inconsistent parental involvement significantly restrict learners' access to diverse A-Level mathematics subjects. These factors also undermine informed decision-making.In response, the study developed the VENE framework, a four-stage cyclical and iterative guidance tool

comprising Verification, Exploration, Navigation and Engagement. It is designed to support learners, teachers, school heads and parents throughout the subject selection process.The framework is grounded in the study's empirical findings and aligned with its theoretical foundations. Initial testing confirmed it as contextually fit and practically applicable, representing the first cycle of an Educational Design Research (EDR) process.

Based on these findings, the study recommends formal subject guidance for learners and parents, greater involvement of mathematics teachers in subject reselection, structured peer mentorship programmes, and stronger career guidance in high schools. Further research should test the VENE framework across diverse contexts, including rural, marginalised, and private school communities, and compare regional education systems. The study concludes that A-Level mathematics subject selection in Zimbabwe is socially mediated and guidance-dependent. Structured institutional support, informed stakeholder engagement, and a coherent selection framework from early high school can improve this process.

KEYWORDS

Dynamics; subject choices; framework; Zimbabwe; Bulawayo Metropolitan Province; Ministry of Primary and Secondary Education (MoPSE); Zimbabwe School Examination Council (ZIMSEC); Advanced level mathematics; subject combination; career guidance.

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LIST OF ACRONYMS AND ABBREVIATIONS

A-Level	Advanced Level
ATLAS-ti	Qualitative Data Analysis Software
CBC	Competence-Based Curriculum
DSF	Student Funding Directorate
EDR	Educational Design Research
GCSE	General Certificate of Secondary Education
H2	Higher 2
H3	Higher 3
HBC	Heritage-Based Curriculum
MKT	Mathematical Knowledge for Teaching
MKO	More Knowledgeable Other
MoPSE	Ministry of Primary and Secondary Education
NUSTSEP	National University of Science and Technology Schools Enrichment Programme
O-Level	Ordinary Level
RCT	Rational Choice Theory
SCCT	Social Cognitive Career Theory
STEM	Science, Technology, Engineering, and Mathematics
UNISA M & D	University of South Africa Master's and Doctoral
VENE	Verify, Explore, Navigate and Engage
ZIMSEC	Zimbabwe School Examination Council
ZPD	Zone of Proximal Development

CHAPTER 1: ORIENTATION TO THE STUDY

1.1 Introduction and background

Advanced mathematics subject choices occupy a pivotal position in learners' academic and career trajectories worldwide. Research consistently demonstrates that the subjects learners select at the advanced secondary level function as gatekeepers to tertiary education and professional pathways (Norris and Noyes, 2025; Lent et al., 1994). In the context of STEM education, the decision to pursue advanced mathematics determines access to university programmes in engineering, medicine, economics, data science and the natural sciences (Norris and Noyes, 2025). The dynamics influencing these choices are multifaceted, encompassing self-efficacy, prior performance, teacher guidance, parental aspirations, peer influence and curriculum structure (Lent and Brown, 2019; Bandura, 2001). Understanding these dynamics is essential for designing effective guidance systems.

Nitzan-Tamar and Zehavit Kohen (2022) found that learners globally choose advanced mathematics based on teacher availability, university requirements and curriculum paths. United Kingdom (UK) studies show prior performance and the perceived importance of mathematics for Science, Technology, Education and Mathematics (STEM) jobs shape A-Level involvement (Norris & Noyes, 2025; Robinson et al., 2025; Jones, 2021; Brown & Micklewright, 2020). Foster (2022) discusses the use of confidence assessments in formative mathematics evaluations but does not address subject selection or the impact of access to specialist teachers. Kaur (2024) found that teachers in their study generally believed streaming practices were the most effective way to group secondary mathematics learners.

Research from Europe, including Finland and the Netherlands, also demonstrates that learners' decisions to select advanced mathematics subjects are influenced by their future study plans, their perception of the value of mathematics and the availability of specialised teachers. Obalalu (2020) highlight that in many instances, A-Level learners in Uganda choose a mixture of subjects without prior knowledge of what the subjects entail, that is, whether it is likely to shape their aspired careers. This is a situation in which subjects are predetermined for learners without their consent, resulting in significant negative consequences that restrict learners' ability to study certain subjects in higher education. The same authors also bemoan the

influence of parental and peer pressure, as well as the self-fulfilling prophecy (where learners tend to choose subjects outside their capabilities, skills, talents, interests, and passions in pursuit of fame), on A-Level learners' subject choices.

Correspondingly, in Pakistan, parents have been observed to impose their subject preferences on their children without considering their children's interests (Ashraf, 2019). Equally, Ndihokubwayo et al. (2022) observed that some learners research the subjects they select, while others are assigned subjects based on overall performance or parental preference. These authors recommend that career development stakeholders caution learners about the consequences of poor choices.

A study conducted in Finland by Kaleva et al. (2019) revealed that the choice of advanced mathematics by high school learners has a significant impact on their admission outcomes, as it is believed that advanced mathematics would be beneficial for learners' future studies and careers. Likewise, a study by Hove, Masache and Showa (2016) at the National University of Science and Technology in Zimbabwe found that learners' final mathematics results and final grades in all subjects at the A-Level significantly impact their performance in mathematics during the first year. However, there is little clarity on which A-Level mathematics subjects offer advantages after completing high school. Addressing this gap, the current study aims to establish a framework to help learners, parents and teachers select the most appropriate MoPSE mathematics subjects for each learner's needs and goals

Evidence from the African continent further contextualises these dynamics. In South Africa, Jansen et al. (2021) found that underrepresentation in advanced mathematics is linked to resource constraints, inequitable teacher distribution and historically entrenched socio-economic disparities. In Nigeria, Owoyele and Toyobo (2008) established that parental occupation and socio-economic status significantly predict learners' subject selections. In Kenya, Makori et al. (2019) demonstrated that inadequate career guidance at secondary school level leads to uninformed choices that misalign with tertiary ambitions. In Rwanda, Ndihokubwayo et al. (2022) observed that subject assignment by school administrators constrains learner agency. These studies underscore that uninformed mathematics subject selection is part of a broader continental pattern requiring systemic intervention.

In Zimbabwe, MoPSE A-Levels mark completion of secondary schooling and determine university progression. The curriculum, revised in 2015 following national stakeholder consultations, introduced a Competence-Based Curriculum, adding new mathematics subjects to better align with evolving educational goals. Under the Competence-Based Curriculum (2015-2022), MoPSE introduced pure mathematics, statistics, additional mathematics, and mechanical mathematics as possible A-Level mathematics subjects. The period from 2023 to 2024 served as an evaluation and transition phase during which the Heritage-Based Curriculum was developed. In 2024, the Heritage-Based Curriculum (2024-2030) extended these options to include five subject choices, covering Mathematics for forms 5-6. The mathematics for form 5-6 subject is a double major, meaning it includes three courses, which are pure mathematics, statistics and mechanics. However, resource limits and scheduling challenges led some schools to offer only selected subjects, restricting learner choice. On the contrary, Oduor (2021) recommends that all schools provide equal subject options to ensure fairness.

Learners under the Ministry of Primary and Secondary Education (MoPSE) choose from five A-Level mathematics subjects. However, a lack of guidance often leads to poorly thought-out decisions that impact their career prospects. Unlike other examination boards, which include pure mathematics and one other applied mathematics subject, Zimbabwe's MoPSE A-Level curriculum expanded from four to five mathematics subjects, reflecting shifts in curricular priorities. Examples of such examination boards include the Cambridge International Examinations (CIE) board, which offers Pure Mathematics and one applied option (either Mechanics or Statistics), and the South African National Senior Certificate (NSC), which includes Mathematics and Mathematical Literacy as its primary options. The expansion of the MoPSE curriculum to four mathematics subjects occurred under the Competence-Based Curriculum (CBC) reform of 2015, which followed a series of national stakeholder consultations. The motivation for this expansion was to broaden learners' exposure to diverse mathematical pathways, including Statistics, Additional Mathematics and Mechanical Mathematics, alongside Pure Mathematics, in order to better align the curriculum with Zimbabwe's socio-economic development goals and the evolving demands of tertiary education and the labour market (MoPSE, 2015). The Heritage-Based Curriculum (2024–2030) subsequently extended these options to include Mathematics for Forms 5–6 as a fifth subject, a double major covering Pure Mathematics, Statistics and Mechanics. Nevertheless, A-Level mathematics learners often struggle to make informed subject selections, highlighting the need

for an effective guidance framework. Although MoPSE's Secretary's Circular No. 10 OF 2024 prescribes placements based on competencies, school resource limitations can override learner interests. This practice highlights the need for a practical and equitable A-Level mathematics subject selection guiding framework. To develop such a framework, the researcher adopted a qualitative methodological approach, emphasising participatory techniques and stakeholder consultations. Key methods included focus group discussions with learners, questionnaires filled in by mathematics teachers and school heads to gather comprehensive insights. This approach ensured the framework is grounded in real-world experiences and accurately addresses the learners' needs.

As alluded earlier, Nitzan-Tamar and Kohen (2022) found that learners globally choose advanced mathematics based on teacher availability, university requirements and curriculum paths. United Kingdom (UK) studies show prior performance and the perceived importance of mathematics for Science, Technology, Education and Mathematics (STEM) jobs shape A-Level involvement (Norris & Noyes, 2025). Foster (2021) discusses the use of confidence assessments in formative mathematics evaluations but does not address subject selection or the impact of access to specialist teachers.

1.2 Problem statement

Despite the variety of Advanced Level Mathematics subjects offered by MoPSE, the process for selecting these subjects remains poorly understood and ineffective. Iannelli (2013), Anders et al. (2018), and Owoyele and Toyobo (2008) have established that learners' subject choices have a profound and lasting impact on their future academic and career aspirations. Selecting an inappropriate set of subjects can lead to significant long-term academic and professional disadvantages that shape learners' educational and occupational paths (Norris & Noyes, 2025; Owoyele & Toyobo, 2008). Examining the implications of subject choices in Zimbabwe reveals several critical challenges for learners in public government high schools. The limited availability of subjects often leaves learners feeling constrained, particularly those aspiring to fields with specific prerequisites. There is often inadequate guidance on aligning A-Level mathematics subject selection with future aspirations, so learners may not fully understand the benefits of specific subjects for their career trajectories. Furthermore, the curriculum lacked uniformity, allowing learners to register for more than one mathematics subject, even though they may study some independently, leading schools to use these results to augment their overall pass rates.

Mosia et al. (2025) focused on access and participation challenges in mathematics education in South Africa, examining how socio-economic inequalities and resource constraints limit engagement with advanced-level mathematics. In institutions where a wider range of subjects is offered, complications such as timetable conflicts can arise, leading schools to offer subjects that best align with their logistical capabilities (Kiernan et al., 2023). The interplay of learner confidence, resource allocation and external influences yields persistent disparities. This lack of a practical, evidence-based guide to supporting A-Level mathematics subject selection prevents learners from making decisions that align with their potential and future aspirations, hindering STEM development nationwide.

This gap highlights the need for further research to understand the dynamics of subject choices and their direct influence on academic progression. The study sought to address this research gap by exploring how the variety in A-Level mathematics subjects affects learners' readiness and subsequent academic success at the university level. By developing a comprehensive framework for selecting A-Level mathematics subjects offered by MoPSE, this research aimed to provide practical solutions and new insights that align educational choices with future academic and career goals. This aim supports Ndlovu's (2017) argument that clear guidelines foster confidence and prevent confusion in subject selection.

1.3 Motivation for the study

In Zimbabwe, high schools face staffing shortages and resource constraints, which significantly limit the range of A-Level mathematics subjects they can offer. As a result, learners often have limited options and must choose from what is available, rather than what is optimal for their academic and professional goals. This can lead to frustration, especially when learners are unable to enrol in their preferred higher education programmes. Moreover, the subject selection process is not only influenced by available school options but also by external pressures, such as parental expectations and peer influence. This results in choices that may not align with the learner’s personal goals and interests, encapsulating the concept of self-fulfilling prophecy, in which external beliefs shape decisions that may not serve the learner's best interests (Fagbolu et al., 2020). A framework in subject guidance would help align choices with personal and career goals, mitigating these widespread challenges.

From the researcher's perspective, as validated by feedback from learners who had taken the MoPSE A-Level mathematics examinations, restricting oneself to studying only one A-Level mathematics subject can pose significant disadvantages when applying to study university programmes, particularly those that require a broader understanding of mathematics. With this context in mind, the researcher was motivated to explore the complexities surrounding subject choices, considering influences from peers, teachers and parents. According to Vidal-Rodeiro (2019), it is of utmost importance to carefully consider subject choices during A-Level studies to ensure that learners are well prepared for higher education. The absence of specific MoPSE A-Level mathematics subjects often leaves learners at a disadvantage when they apply for programmes that require prerequisites they have not studied.

By synthesising insights from the works of Kiernan, Walsh and White (2023), Javed (2018) and Vidal-Rodeiro (2019), the researcher was motivated to develop a comprehensive guiding framework to assist learners in making informed decisions about MoPSE A-Level mathematics subjects. The proposed VENE framework aims to support stakeholders, including teachers, school heads and parents, in guiding learners when selecting MoPSE A-Level mathematics subjects to study, thereby ensuring that learners receive informed guidance in their choices. However, the framework is not limited to the MoPSE Zimbabwe curriculum but can be used in other similar curriculum offerings. The VENE framework comprises four core stages: Verifying, Exploring, Navigating and Engaging. This framework is adaptable and aims to provide a structured approach for effective subject selection.

1.4 Rationale for the study

Subject choice plays a critical role in shaping learners' academic pathways and future career opportunities. However, many learners make these choices with limited guidance or a poor understanding of the long-term implications. Previous studies have explored general factors influencing subject selection, but there is limited research on how personal interests, parental influence, career aspirations and school resources intersect in the Zimbabwean context. It was necessary for the researcher to explore the key factors influencing learners' subject choices and to understand how these choices impact their academic performance and career readiness. The findings will help teachers, schools and policymakers develop more effective subject-choice guidance programmes.

1.5 Significance and possible contribution of the study

The study is significant for several reasons:

- **Policy development:** By uncovering the dynamics influencing subject choices, the findings will assist MoPSE in formulating policies that encourage balanced and informed selection of A-Level mathematics subjects. Preliminary estimates suggest that improved alignment of subject selections with learners' interests and career goals could raise STEM enrolment by up to 15%, providing a clearer path to future education and career opportunities.
- **Educational planning:** Schools and educators can use the insights to improve guidance and resource allocation, ensuring learners have adequate support when making A-Level mathematics subject choices.
- **Learner empowerment:** Understanding these dynamics will help learners make decisions aligned with their career aspirations and academic strengths, reducing mismatches and dropout rates.
- **National development:** Promoting informed subject selection in mathematics contributes to building a skilled workforce in STEM fields, which is essential for Zimbabwe's socio-economic growth.
- **Research contribution:** The study provides the VENE framework: a practical, evidence-based guide for supporting A-Level mathematics subject selection, which also serves as a theoretical reference for future research.

1.6 Purpose of the study

The purpose of the study was to explore the dynamics of subject choices. This exploration sought to understand the factors that influence learners' subject choices at A-Level. Understanding the dynamics of A-Level mathematics subject selection is essential, as it can help consolidate the foundations of career decisions learners make. By analysing the views of A-Level mathematics learners, teachers and school heads, the researcher intended to develop a framework to guide subject selection. Ultimately, the study aimed to fill a research gap in the support provided to learners as they navigate their early career pathways.

1.7 Aims and objectives of the study

The main aim of the study was to design a systematic guiding framework that can be used to guide the selection of MoPSE A-Level mathematics subjects. This framework also focuses on the stages that learners can follow when selecting their subjects. The following were the intended objectives of the study:

1. Analyse factors that inform learners' mathematics subject choices at A-Level.
2. Explore teachers' influence on learners' mathematics subject choices.
3. Explore the nature of parents' or guardians' involvement in mathematics subject selection at A-Level according to learners', teachers' and school heads' perspectives.
4. Presents guidelines for the design and implementation of a framework for selecting Advanced-Level Mathematics subjects offered by the MoPSE.

1.8 Research questions

The study was guided by the following main research question:

- What systematic guidance framework can be designed to guide the selection of MoPSE A-Level mathematics subjects?

The researcher posed the following secondary (sub) questions, which support and are derived from the main research question stated above:

1. What informs the mathematics subject choices for learners at A-Level?
2. How do teachers influence learners' mathematics subject choices?
3. How do learners, teachers and school heads perceive the role of parents or guardians in the selection of A-Level mathematics subjects?
4. In what ways can learners be assisted to select suitable Advanced-Level mathematics subjects offered by MoPSE?

1.9 Operational Definition of Terms

The following key terms were defined to provide a shared understanding of the language used in the study.

1.9.1 Dynamics

In the context of educational research, dynamics refers to the complex and ever-changing interplay of factors that influence a particular phenomenon (Siddiqui & Ahamed, 2020). In the

study, the term dynamics encompasses the various forces, interactions and relationships that shape learners' choices regarding A-Level mathematics subjects.

1.9.2 Subject choices

Subject choice is the deliberate and pivotal process by which learners identify and select specific subjects to pursue, especially during crucial stages of their educational journey, such as high school (Sukaesih, 2019). This decision-making process is shaped by several factors, including individual passions, future career ambitions and specific academic strengths (Reis, Baum, Madaus, & Gelbar, 2025). Each learner navigates this selection to align their selected subjects with their future job aspirations, ensuring a more personalised and fulfilling educational experience.

1.9.3 Framework

A curriculum framework is a structured plan or compilation of standards and learning objectives that outlines the material to be acquired, establishing explicit, measurable criteria for the knowledge and skills learners are expected to attain (Christison & Murray, 2021). It functions as an essential supporting framework for the learning process (Serpell, 2020). The study conceptualises a framework as a guide designed to facilitate good decision-making.

1.9.4 Zimbabwe

Zimbabwe is a landlocked country in Southern Africa, surrounded by South Africa to the south, Botswana to the south-west, Zambia to the north, and Mozambique to the east and north-east. Zimbabwe offers a local curriculum under the MoPSE. The high schools sampled in this study are located in Bulawayo Metropolitan Province, Zimbabwe.

1.9.5 Bulawayo Metropolitan Province

Bulawayo Metropolitan Province is an exclusively urban province located in the city of Bulawayo, Zimbabwe and falls under the administrative and educational authority of the Ministry of Primary and Secondary Education (MoPSE). The province's five MoPSE districts, Bulawayo Central, Khami, Mzilikazi, Imbizo, and Reigate, organise curriculum implementation, teacher deployment, assessment administration and school monitoring (Mpofu & Sibanda, 2021).

1.9.6 **MoPSE**

In Zimbabwe, the Ministry of Primary and Secondary Education (MoPSE) is the key government agency responsible for monitoring and overseeing primary and secondary schools nationwide (Nyamudzodza, Mthombeni, Siziva, Sifile, & Manuere, 2021). This ministry has a

broad scope and oversees the creation and implementation of important policies that shape the educational environment. Its responsibilities include creating a robust educational framework, developing a curriculum that addresses a range of learning needs, establishing effective pedagogical strategies and developing evaluation techniques that precisely gauge student performance. For the administration and issuance of A-Level mathematics certificates, MoPSE collaborates with ZIMSEC, which is responsible for this.

1.9.7 Zimbabwe School Examinations Council (ZIMSEC)

The national body responsible for conducting public examinations at the primary and secondary school levels in Zimbabwe is the Zimbabwe School Examinations Council (ZIMSEC). It was founded under the ZIMSEC Act of 1994 and is responsible for creating and grading examinations, issuing certificates and ensuring the integrity and quality of national assessment systems. ZIMSEC plays a crucial role in modernising examination procedures and coordinating assessments with the CBC and HBC framework (Chinyoka & Shumba, 2020; Maringe & Nyikahadzoi, 2022).

1.9. 8 Advanced Level Mathematics

Mathematics, according to Yadav (2017), is the study of assumptions, their properties and their applications. Mathematics is divided into two branches for simplicity: Pure and Applied mathematics. The MoPSE A-Level general certificate is the school-leaving qualification awarded to learners who have completed their secondary or pre-university studies. The A-Level is divided into two years of study: Form 5 (commonly known as the lower six) and Form 6 (also known as the upper six). Learners complete an A-Level by taking a final examination, which determines whether they will continue to university (RocApply, 2022). A-Level mathematics is divided into four subjects according to the MoPSE curriculum: Mathematics for Forms 5 and 6, pure mathematics, statistics, Mechanics Mathematics and Additional Mathematics.

1.9.9 Subject combination

Subject combination refers to the set of subjects that learners select at the start of the academic session to study for their high school years, whether at the high school or university level. This enables learners to study numerous subjects concurrently (Team Leverage Edu, 2022). Subject combination is the set of subjects learners specialise in at A-Level to prepare for university education. In the MoPSE curriculum, the final two years of high school prepare learners for

university (Zimbabwe Curriculum Framework for Primary and Secondary Education 2015-2022).

1.9.10 Career guidance

Career guidance, as defined by Brain Wonders (2022), is a counselling programme that helps learners select the best career path based on their educational and professional choices. In terms of a professional foundation, high school is the most important stage. Many learners make poor subject choices owing to a lack of understanding and confusion. When schools and parents fail to provide adequate counselling to learners, career counsellors should intervene. Academic counselling was used as a synonym for career guidance.

1.10 Structure of the thesis and synopsis of chapters

The scope was intentionally delimited to focus on the specific context of Bulawayo Province, Zimbabwean government public secondary schools and the A-Level mathematics curriculum offered by MoPSE, allowing for a targeted and in-depth exploration of the dynamics influencing subject choices within this educational system. While acknowledging the potential influence of broader socioeconomic factors, the study focused on the perspectives of learners, teachers and school heads directly involved in the A-Level mathematics subject selection process, ensuring that a manageable and relevant study was conducted that provided actionable insights for developing a guiding framework for A-Level mathematics subject selection. The study was structured into seven chapters; the synopses of each chapter are detailed below:

Chapter 1: Orientation to the study: This chapter presents an overview of the research context, covering the introduction and background, the problem statement, the justification for the study, the rationale for the research, and the possible importance and contributions of the inquiry. The researcher aimed to improve comprehension of the process for selecting for MoPSE A-Level mathematics, given the little research on this topic. Additionally, the chapter defines key terms to provide conceptual clarity and consistency across the study, thereby laying a solid foundation for subsequent chapters.

Chapter 2: Theoretical framework: This chapter presents Rational Choice Theory (RCT) and Social Cognitive Career Theory (SCCT), which serve as theoretical lenses for viewing

learners as independent decision-makers who are influenced by both direct and indirect sources, including peers, teachers and parents. The chapter explains the framework's constituent elements and explores the underlying concepts that inform subject selection dynamics. It demonstrates how external variables shape learners' decisions about which mathematics subjects to pursue at A-Level, and how these variables have direct and indirect impacts on learners.

Chapter 3: Literature review: The literature review focuses on subject selection and its implications for MoPSE A-Level mathematics subject choices, particularly on existing literature on learner guidance during A-Level subject selection. This chapter reviews the literature on factors affecting learners' A-Level subject choices, the roles of teachers and parents in shaping these decisions and approaches to supporting learners in selecting A-Level mathematics subjects. By synthesising these domains, the review illuminates the distinctive challenges and opportunities learners encounter when making the critical decision of choosing A-Level mathematics subjects, with particular attention to mathematics.

Chapter 4: Research methodology: The methodology chapter outlines the research design, paradigm and methodological approach adopted by the researcher, with particular emphasis on qualitative techniques. It describes the study's setting, participant selection procedures and diverse data gathering strategies, including document analysis, questionnaires and focus group discussions. Additionally, it examines trustworthiness considerations to ensure the credibility and reliability of research findings, especially within the study's specific context, where these are essential for generating valid and applicable insights. Ethical considerations are also addressed.

Chapter 5: Data presentation, discussion and interpretation of findings: This chapter presents and examines data gathered through focus group discussions, questionnaires and document examination. The findings are situated within extant literature and the adopted theoretical frameworks, foregrounding key emergent insights derived from the data. This examination establishes a basis for comprehending the dynamics of subject selection and their influence on learners. The chapter explores various strategies utilised by learners, teachers, parents, and school administrators, emphasising the importance of guidance for learners in subject selection.

Chapter 6: The development of the VENE framework arose as a direct consequence of the patterns, insights and lacunae revealed through the study's findings. During data analysis, a coherent understanding emerged concerning the interactions among learners, educators and contextual elements influencing the phenomenon under examination. These findings revealed recurrent themes that existing models could not adequately explain, necessitating the development of a more comprehensive, context-sensitive framework.

Chapter 7: Conclusion and recommendations: The concluding chapter synthesises the study's principal findings, reflecting upon the determinants influencing MoPSE A-Level mathematics subject selections and the function of external influencers such as teachers and parents in these decisions. It provides actionable recommendations for MoPSE, educational institutions, parents and future research endeavours.

1.11 Chapter summary

This chapter provides a comprehensive outline of the research setting, including the introduction and contextual foundation for subject selection dynamics, specifically in relation to the MoPSE A-Level mathematics curriculum. It outlines the problem statement, justification, aim, research objectives, and the formulated research questions that direct the investigation. The chapter emphasises the crucial need for a structured framework to guide the selection of MoPSE A-Level mathematics subjects. Additionally, the chapter defines key terms to maintain conceptual precision and uniformity throughout the study, therefore, establishing a foundation for a thorough exploration of the determinants influencing MoPSE A-Level subject choice.

CHAPTER TWO
THEORETICAL FRAMEWORK

2.1 Introduction

In this chapter, the researcher explores the theoretical frameworks that underpinned the current study. Specifically, the chapter delves into two theories, Rational Choice Theory (RCT) and Social Cognitive Career Theory (SCCT), which were employed to shed light on how learners' choices, as well as subtle influences such as peers, teachers and parents, contribute to their decision to pursue respective MoPSE mathematics subjects at A-Level. These theories provided a comprehensive understanding of the factors that influence learners' subject selection, and in the subsequent sections of this chapter, the researcher provides a detailed introduction to both RCT and SCCT. Additionally, the researcher examined the practical implications of these theories, particularly regarding how they suggest that learners make rational choices when selecting subjects to study. Overall, this chapter provided a detailed exploration of the theoretical foundations that informed this study and highlighted the crucial roles of RCT and SCCT in explaining learners' decision-making processes.

2.2 Rational Choice Theory (RCT)

The RCT, first introduced by economist Adam Smith in 1776, posits that individuals are rational decision-makers who carefully weigh the costs and benefits of their choices based on their self-interest. This theory suggests that individuals have the agency to select their preferences, indicating that learners are forward-looking actors who thoughtfully choose educational subjects from their available options (Zimmermann, 2019). The RCT is underpinned by the concepts of rationality of actors, self-interest and the background influence. According to Ortiz (2005), the concept of rationality of actors refers to the idea that individuals make choices that maximise their expected utility. Self-interest implies that individuals choose options that are in their best interest, while the background hand suggests that the market mechanism guides individuals towards making the best choices for themselves and society (Krstic, 2022). In summary, RCT provided a framework for understanding the decision-making process of learners and how they select from a range of MoPSE A-Level mathematics subjects based on their self-interests and influence from peers, teachers and parents.

Figure 2.1 presents a schematic illustration of the various strands of the RCT. The diagram provides a clear, concise representation of the critical subjects of the RCT framework.



Figure 2.1: The Rational Choice Theory by Adam Smith in 1776.

Source: Adapted from (Main, 2023).

2.2.1 Rational actors

People often make decisions based on various factors, including social, political, economic, cultural and psychological influences (Cruz, 2022). Furthermore, Madinah (2022) argues that the decision-making process is driven by the quest for personal gain, with individuals choosing the best possible option. In this study, it can be inferred that A-Level mathematics learners are rational actors. This is because learners weigh the benefits of selecting specific A-Level mathematics subjects to maximise utility. For example, when A-Level learners must choose a mathematics subject to study, they will select the one they perceive as giving them an edge in tertiary education. Learners' preferences, therefore, play a role in this decision.

However, even with defined preferences, learners may not fulfil them if they lack guidance. People make decisions by logically weighing what will best serve their own needs, according to the theory. Making choices does not necessarily involve formal calculations but rather the selection of the option that maximises their satisfaction or utility when faced with a set of choices. A-Level mathematics learners, for instance, tend to prefer subjects that offer the highest subjective expected utility, which ultimately shapes their educational aspirations (Zimmermann, 2019).

2.2.2 Self-interest

When making tough decisions, personal gain often takes a backseat to other factors, and it is common for learners to choose a subject that aligns with their future job aspirations (Koksharov & Agarkov, 2015). This preference for self-interest is particularly evident when the decision benefits the individual. According to RCT, the choice of subjects that learners study at A-Level is influenced by three critical factors: learner interest, usefulness and success (Levin & Milgrom, 2004). This is because a learner's success in tertiary education is strongly linked to their grasp of foundational concepts at the A-Level. Additionally, a learner's interest in a subject at the A-Level is shaped by its practicality in tertiary education. The current study reinforces the theory, indicating that learners and parents who are knowledgeable about the different mathematics subjects offered by MoPSE can make informed decisions about which subject to study at A-Level. By understanding the benefits and drawbacks of each subject, learners and parents will be better equipped to make insightful choices regarding A-Level mathematics.

2.2.3 Background Influence

Background influence represents the underlying forces that affect learners' choices but are not visible to them (Bates, 1974). In the case of A-Level mathematics subject selection, the reference group (background influencers), which includes parents, teachers, friends and classmates, plays a significant role in influencing learners' decisions. The reference group exerts this influence through two mechanisms: imitation and adoption, which guide learners in the status aspects of their subject selection (Imitation learning, 2021). Learners imitate the educational aspirations of role models, such as their teachers and parents, and adopt the educational expectations of those who encourage them to achieve.

However, critics of the Rational Choice Theory (RCT) argue that it fails to account for the origins of actors' preferences. As stated by Dowding (2019, it is not always feasible to make the best sensible decision in every circumstance. The sources of learners' interests may lie in their outcome expectations, that is, what they perceive to benefit from studying certain A-Level mathematics subjects. Another criticism of RCT is that it favours individual choice and thinking processes, and thus, it can only showcase individual behaviour, not the collective mindset.

2.3 Social Cognitive Career Theory (SCCT)

Social Cognitive Career Theory (SCCT), conceptualised by Lent, Brown and Hackett, extends Albert Bandura's (1986) main social cognitive theory to the realm of career choice foundations. According to Lent and Brown (2019), the framework delineates a threefold paradigm wherein career-related actions emerge from the interplay of three fundamental cognitive elements. Self-efficacy beliefs denote individuals' assessments of their capability to effectively execute career-related activities and behaviours. Outcome expectations encompass beliefs on the anticipated results of engaging in specific career paths or activities, which include both the likelihood of these outcomes materialising and their desirability. Personal goals signify people's choices to participate in certain activities or attain certain professional objectives, which assist in structuring, sustaining and directing career-related conduct over time. For example, SCCT suggests that learners who consider themselves proficient in mathematics and expect positive outcomes from a mathematics-related career are more likely to be interested in mathematics and set goals to study mathematics at A-Level (McDonough, Sawyer, Wilks, & Jacque, 2021).

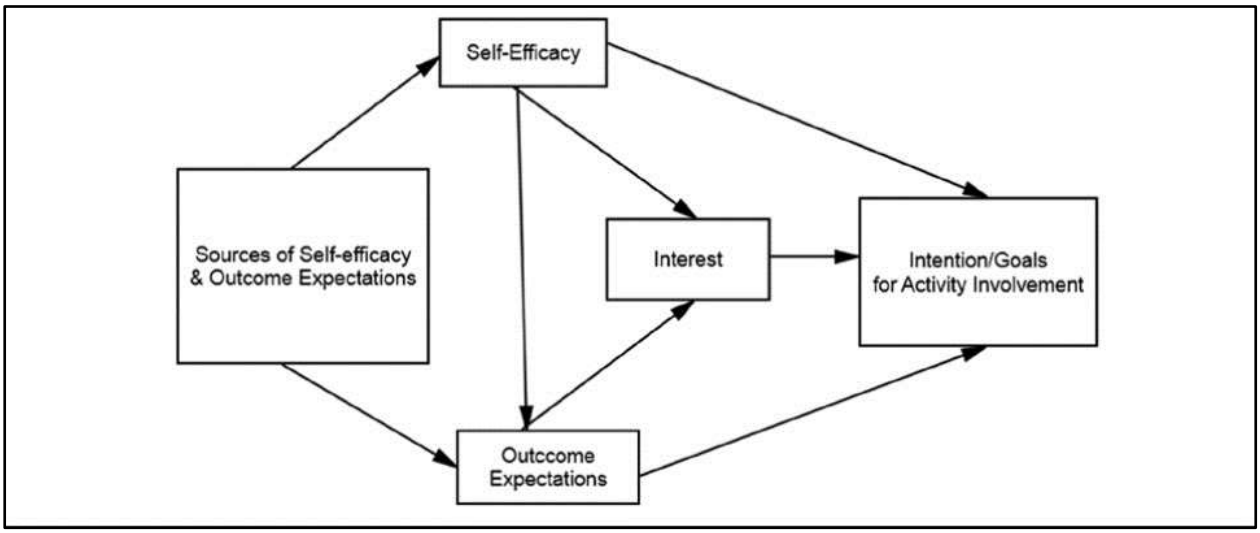

Figure 2.2: The Social Cognitive Career Theory by Lent, Brown and Hacket (1994; 2000). Source: Adapted from (Lee, Flores, Navarro & Kanagui-Munoz, 2015)

2.3.1 Self-efficacy

Self-efficacy beliefs denote an individual's evaluation of their capacity to perform an action, summarised by the question 'Can I do this?' This assessment profoundly affects learners' subject selection. Learners possessing strong self-confidence select challenging subjects (Palmer & Skott, 2017). As a result, learners exhibit heightened interest in mathematics and greater motivation to study additional complementary mathematics subjects (Park et al., 2019).

In the SCCT, confidence in oneself and expectations of outcomes are pivotal in cultivating interests, which, in turn, affect A-Level mathematics subject choices (Fernandez Garcia et al., 2019). The idea posits that self-assurance and expected outcomes cultivate learners' interests, thereby influencing their A-Level subject selections (Lent & Brown, 2019). SCCT acknowledges that humans function neither under extreme environmental control nor in perfect independence (Bandura, 2001). According to Mozahem (2021), the link is reciprocal: whereas the surroundings may limit available possibilities, individuals actively choose which elements of their prospective environment to engage with. In practice, learners' subject selections are determined by their institutions' offerings, illustrating the impact of the institutional environment. Bandura (1989) characterises this active interaction with external factors as a selection process, influenced by an individual's self-belief, leading individuals to avoid subjects they see as beyond their capabilities, irrespective of the accuracy of such views (Bandura, 1977). Moreover, social persuasion that is support from significant others such as teachers, parents and peers raises an individual's confidence (Dowling & Elliott, 2017). Persuasion by key stakeholders affects learners' choices of A-Level mathematics subjects by directly or indirectly altering their outcome expectations.

2.3.2 Interest and Outcome Expectations

Outcome expectation denotes the anticipated effect of an activity or behaviour (Alshahrani et al., 2018). Oben and Rooyen (2022) assert that the high school level is the best phase for intervening in career goals, choices and aspirations. This study indicates that high school learners' subject selections are impacted by the school setting, which indirectly shapes their interests by affecting their expectations for A-Level mathematics outcomes. Outcome expectations refer to experiences projected to transpire in the future. It pertains to an individual's beliefs on the outcomes of his or her performance. Outcome expectations focus on the inquiry, 'If I engage in this action, what will be the result?' Bandura (1986) regards result expectancies as a significant subject of performance; nonetheless, he posits that actions were more reliant on self-assessments of performance capacities.

Medugorac, Sverko and Babarovic (2019) note that SCCT proposes that self-efficacy leads to more positive outcome expectations, and both self-efficacy and outcome expectations help shape career goals in two ways: directly and indirectly through their influence on interests. In relation to this study, it is worth noting that learners' interests are directly influenced by the academic guidance information provided to them by parents and schools regarding A-Level

mathematics subject choices. This theory explains how interest is related to a career goal and action as they are exposed to conditions and requirements for pursuing mathematics at A-Level (Radebe & Mushayikwa, 2023). SCCT encompasses external factors that either diminish or enhance human control over a career, including support systems (Fomina, Potanina, & Morosanova, 2020). It also highlights factors that impact the processes by which individuals develop academic and career interests (Tomperi, et al., 2022).

According to the SCCT, external influences, such as family and school, impact learners' learning experiences, which in turn affect their self-efficacy and outcome expectations. Nyambuya and Onyango (2020) echo that secondary school learners lack adequate knowledge of career choices at their level of education. This leads them to select a subject combination based on their interests, which may result in the wrong future career choice in the world of work. The SCCT has also served as a lens through which to analyse and describe factors, both internal and external, that influence career decisions. For instance, it can be assumed that learners' selection of subjects at A-Level is mostly affected by external factors, which include the guidance offered by the school, as well as parental and peer influence.

Lent, et al. (as cited in Meier, 2022) suggest that most learners prefer to follow a structured plan when pursuing their career goals. Nevertheless, several factors may affect a learner's ability to achieve these goals, including cognitive factors such as self-efficacy and sense of belonging, personal factors such as socio-economic status and living situation, and environmental factors such as school support programmes and academic barriers. Additionally, external factors interact with learners' self-efficacy and their aspiration for academic distinction, which may not necessarily support success in post-A-Level studies. Furthermore, a learner's self-belief significantly influences their career choices (Meier, 2022).
Delivering efficient career guidance strategies can promote career decisions, whereas supports and barriers may facilitate or impede these choices (Medugorac, Sverko & Babarovic, 2019).

The SCCT resonates well with the RCT as it has good applicability in school career education guidance and provides a comprehensive framework for explaining and predicting career development (Lent & Brown, 2019). In the same vein, Wang, Liu and Deng (2022) concur that the SCCT framework offers a theoretical basis for career guidance. SCCT, which emanates from constructivism, stresses how people's beliefs, values and experiences shape their interests and choices (Sellami, Al-Rakeb, & Tok, 2023). SCCT is a theory that seeks to explain what

affects people's choices. Len and Brown (2019) assert that the SCCT provides a complete framework for evaluating and anticipating career pathways.

2.4 Practical implications of the theoretical frameworks

Von Fellenberg (2006) defines subject interest as the congruence between an individual's self-interests and the educational prospects provided by their chosen field of study. Even the most self-assured learners may experience periods of diminished self-esteem owing to uncertainty over their academic trajectory or the selection of A-Level mathematics subjects (Madden, Webber, Ford, & Crowder, 2018). The difficulty of the subject is irrelevant if the learner has an interest in it. Sahu, Dash and Das (2021) discovered that learners exhibit heightened motivation to study a subject when they possess substantial extrinsic incentives, intrinsic interest in the subject and ample support and encouragement from others. Consequently, encouragement from external sources, such as family, friends and educators, is classified as extrinsic motivation. Educators should be aware of the potential advantages of academically relevant hobbies to help their learners select appropriate A-Level mathematics courses (Wild, 2022).

The researcher employed the Rational Choice Theory (RCT) and the Social Cognitive Career Theory (SCCT) to serve a dual purpose in this study, in guiding the construction of data collection instruments and providing an analytical lens for interpreting the data generated. In terms of data collection, the RCT informed questionnaire items that probe how learners weigh the costs and benefits of each mathematics subject option, while the SCCT shaped questions that explore external influences on learners' self-efficacy and outcome expectations. In terms of data analysis, the RCT provided a structure for examining how perceived academic demands, career utility and resource constraints shaped learners' subject selection decision-making. Conversely, the SCCT offered an analytical lens for examining how self-efficacy beliefs and outcome expectations were shaped by social influences, including teacher guidance, peer interaction and parental aspirations. Together, the two theoretical frameworks ensured that both the rational and social dimensions of subject selection were captured, enabling a comprehensive, theoretically grounded interpretation of the findings. In terms of data analysis, the RCT provided a framework for examining how perceived academic demands, career utility and resource constraints shape learners' decision-making about subject selection. The SCCT offered an analytical lens for examining how learners' subject selection was shaped by

background influences, including teacher guidance, peer interaction and parental aspirations. Together, the two frameworks ensured that the rational and social dimensions of subject selection were captured, enabling a comprehensive, theoretically grounded interpretation of the findings.

The SCCT postulates that an individual's expectations about their abilities and interests are the principal factors that explain behavioural differences among individuals. This indicates that self-confidence, rather than merely quantitative or objective skill, is the most critical factor influencing an individual's educational and professional decisions. SCCT further posits that individuals' interests, self-efficacy and expectations regarding the outcomes of their decisions significantly influence the decisions they make. Lent, et al. (1994) contend that a person's interests, self-efficacy and result expectancies are reliably and inextricably linked to decision-making goals. This suggests that individuals are more inclined to pursue activities that may benefit themselves and those in their proximity.

If a learner chooses a subject that he/she believes brings about the best outcome, that maximises his/her utility (payoff) under subjectively conceived constraints. Constraints affect learners' choices in two ways. First, constraints make some of the possible alternatives impossible. For example, a learner cannot do more than one A-Level mathematics subject if the school's curriculum does not involve all the mathematics subjects being offered by MoPSE. Constraints such as school provisions change the alternative subjects that a learner may study. If the learner interacts with peers, the others' choices become subjective constraints on him/her, and his/her choices become constraints on the others. This simply means that through interaction with peers, teachers and parents, learners may select A-Level mathematics subjects based on social persuasion from these groups of people.

Othman et al. (2019) identified three phases in the learners' decision-making process, which are the search phase, evaluation phase and choice phase. During the search phase, learners actively gather information from various sources, such as peers and teachers. In the evaluation phase, they assess and rank the gathered information to make informed decisions. Finally, in the choice phase, they make their decision based on the evaluation and proceed with their selected option (Ahmed & Hossain, 2023).

Learners as rational actors

Learners' subject choices not only demonstrate their interest but are constrained to what respective schools offer in their curriculum and information provided by academic career guidance officers, teachers and parents. For instance, learners may study pure mathematics only because that is what is available at a certain school. This can make subject selection ultimately constrained. However, most Zimbabwean high schools leave the options open in such a way that learners may register for A-Level mathematics subjects that are not being offered in their school curriculum. Sources of learners' interests in selected Mathematics subjects may be linked to the peers, teachers and parents who, in this study, are background influencers according to RCT. These are termed proximal environment influences, which have a significant impact on a learner's interest regarding subject selection (Mustajab et al., 2017).

The interest of learners in mathematics can be positively or negatively affected by environmental factors such as teachers, family or friends in the field. This study aimed to gain insights into the dynamics of subject choices. As learners' interests grow, encouragement and support from loved ones can have a significant impact on their decision to select mathematics as a subject at A-Level.

SCCT primarily concentrates on educational and professional decision-making, the articulation of career interests and the attainment of academic and professional objectives via perseverance (Lent et al. 1994). The SCCT was pioneered by Lent and associates (1994) to elucidate and forecast the evolution of a person's academic interests and ambitions. The strength of RCT lies in its application of intentional explanation, as articulated by Elster (1983, in Hedstrom and Swedberg, 1996). To fully understand the purpose of an endeavour, one must comprehend the outcomes one aspires to attain. Nonetheless, it illustrates the normal response of an ordinary person in an ordinary scenario. Learners will strategically choose A-Level mathematics subjects that enhance their probability of obtaining university admission, in accordance with this framework (Stacey, 2021).

According to Barger et al. (2022), learners' parents and other family members significantly influence their educational decisions. The mathematics subjects that learners choose at A-Levels are something that parents have some say over. This is because children often want their parents' love and financial support; it is reasonable to assume that they will be financially and educationally accountable for their children's future success. Learners are more likely to strive for academic and professional success when they get constructive criticism and direction from their parents (Kewalramani & Phillipson, 2022). Barger et al. (2022) and Han et al. (2022)

concluded that parents and guardians are more likely to push their children to pursue A-Level mathematics if they themselves demonstrate interest in the subject.
Against this background, people tend to choose the option that will benefit them the most when offered a choice. When people act on their thoughts, they prioritise their own interests. To put it simply, the theory proposes that, given a choice between two options, learners would nearly always choose the one that improves their academic performance.

2.5 Chapter summary

This chapter presented two theoretical frameworks that guided and related to the study, RCT and Social Cognitive Career Theory SCCT. According to RCT, learners are rational actors who make A-Level mathematics subject choices based on self-interest, although external factors such as peers, parents and teachers can also influence these decisions invisibly. Conversely, SCCT explains how learners' interest in A-Level mathematics subjects is shaped by their expectations and self-efficacy. In the following chapter, these two theories provide the foundation for exploring scholarly work on factors that influence learners' A-Level mathematics subject selections, including their self-perceptions and the subtle influences of peers, teachers and parents. Finally, the chapter highlights how academic career counselling provided by schools can impact learners' interests and appropriate A-Level mathematics subject selection.

A third conceptual lens that informed this study is Vygotsky's (1978) Zone of Proximal Development (ZPD), which refers to the space between what a learner can accomplish independently and what they can achieve with the support of a more knowledgeable other (MKO), such as a teacher, parent or peer. In the context of A-Level mathematics subject selection, learners typically operate within their ZPD: they are aware that subject choices must be made but lack the specialist knowledge to evaluate subject demands independently. This concept aligns with SCCT's emphasis on external social influence and with RCT's recognition that rational decision-making requires access to information, implying the MKO is the mechanism through which that information and scaffolded support are provided, a dynamic that is operationalised structurally in the VENE framework presented in Chapter 6 (Lantolf & Poehner, 2014; Vygotsky, 1978; Wertsch, 1985).

CHAPTER THREE
REVIEW OF RELATED LITERATURE

3.1 Introduction

This chapter explores the relevant literature on subject selection, analysing academic research and articulating ideas on the dynamics of subject choices. The researcher conducted a comprehensive, well-supported examination of current subject choices in high schools. This section is divided into two parts for enhanced convenience. The initial section examines the factors affecting learners' subject choices, encompassing self-perception, peer, teacher and parental influence. The second section analyses the literature on the significance of assisting high school learners in selecting A-Level mathematics subjects. The concepts articulated in this part are essential for discerning the problem's fundamental elements and for offering alternate viewpoints on the dynamics of subject choice. This chapter's sections enabled the researcher to understand how scholars perceive the mechanisms that influence high school learners' subject choices.

3.2 Factors influencing learners' subject choices.

Since school-age children spend a large amount of time in classrooms and other learning environments, teachers and peers have a greater impact on their educational decisions than parents. The self-perception of learners, together with the influence of teachers, peers and parents, significantly impacts the critical process of selecting A-Level subjects.

Learners in high school are supposed to have some freedom to choose what they want to study, but according to Thomson et al. (2018), that freedom is limited by the options available to them in their educational setting. The decision-making process encompasses several stakeholders, including parents, teachers, parents and administrators, who influence learners' choices (Lopez & Bauyot, 2025).

According to Humayon, Raza, Khan and Ansari (2018), a person's desire to commit to studying a particular subject, as well as external social factors such as peer and role-model influences, can affect their subject choice. This aligns with previous studies demonstrating that teachers and peers influence learners' career choices (Bergin, 2016; Humayon et al., 2018). In the school setting, a learner's perception of a subject usually depends on what they typically

hear others say about it (Rehema et al., 2023). Learners' self-perception of academic ability is also a significant factor in their subject selection, as they tend to choose subjects in which they believe they will be most academically successful (Jansen et al., 2021). Choosing subjects can be a complex decision for learners, as it determines the profession they intend to pursue. As learners try to make career choices in secondary school, they face the challenge of aligning their choices with the corresponding subjects (Magro & Musumeci, 2019). Choosing appropriate subjects is a vital step in achieving educational goals, and various factors contribute to the decision, including school policy, parental guidance, peer influence and accidental choice (Owoyele & Toyobo, 2008).

3.2.1 Learners' self-perceptions

Mutodi and Ngirande (2014) define self-perception as an individual's mental image or understanding of mathematics that develops through social interactions and is shaped by experiences at school, including those influenced by parents, teachers and peers. Some learners experience anxiety towards mathematics and feel inadequate when confronted with mathematical concepts. They regard mathematics as difficult, cold, abstract, and in many cultures, largely masculine (Nishikawa & Izuta, 2017). Learners who have a positive perception of mathematics are influenced by two main factors: teacher factors related to competence and learners' internal factors, such as interest. Learners like mathematics because they feel the subject will be useful in everyday life (Turmuzi et al., 2023). Mathematics' self-perception has been defined as one's beliefs about one's competence in mathematics (Ireson & Hallam, 2009).

Learners' academic self-perceptions relate to their intrinsic academic motivation and academic self-confidence, which ultimately enhance learners' engagement and focus on studies needed to excel in the competitive academic environments of modern times (Hassan et al., 2021). A student's self-perception in mathematics encompasses their impressions of the subject. Educational stakeholders must consider learners' mathematical knowledge and context if they are committed to addressing the persistent issue of learners' reluctance to pursue mathematics at A-Level. Learners' perceptions of mathematics may be shaped by their early educational experiences as well (Markovits & Forgasz, 2017).

Learners' negative attitudes toward mathematics have been shown to diminish their engagement with the subject. Brown et al. (2008) found that learners' perception of

mathematics as lacking relevance to future career prospects constituted a primary factor in their decision to discontinue mathematical studies beyond O-level. Conversely, Smart and Rahman (2008) argue that learners demonstrate greater enjoyment of academic subjects when they perceive the content as personally relevant. Building on this premise, Hulleman and Harackiewicz (2009) contend that increased pedagogical emphasis on relevance facilitates stronger student identification with particular pathways, thereby enhancing the likelihood that students will select those subjects when allowed to do so. The critical relationship between perceived relevance, subject identification and sustained academic engagement in mathematics education. Given the researcher's belief that it is not evident that learners choose A-Level mathematics subjects based on their likes and dislikes, the study sought to determine how learners' self-perceptions are affected by external influences.

The key finding of Cuff's (2017) study on perceptions of subject difficulty and choice was that teachers, parents and friends sometimes discouraged young people from selecting subjects they believed were too challenging. When choosing their A-Level subjects, learners consider different factors such as their future aspirations, academic abilities, school offerings and advice given to them. Vidal Rodeiro's (2019) study explored how these factors impact higher education participation. It found that learners have the freedom to choose what they want to study. The study highlights the importance of choosing subjects based on personal goals and abilities rather than external pressures. Learners with strong O-level mathematics results often carry that confidence forward, making the move to A-Level studies smoother (Poompavai, Poongothai, & Divya, 2025; Idnay et al., 2025).

Situational influences in scientific classes, individual interest in science and self-perception were found by Cheung (2017) to impact learners' interest in science. Even those who continue with science subjects do so to improve their chances of being admitted into public universities, as most undergraduate subjects require chemistry and physics as prerequisites for entry (Marvin & Ryugo, 2023). Some A-Level mathematics subjects are selected by learners not because they are interested in them but because they are prerequisites for entry into tertiary education.

Interest is a powerful motivational process that energises learning, guides academic and career trajectories, and is fundamental to academic achievement (Marvin & Ryugo, 2023). Several factors influence learners' subject choices. Kiernan, Walsh and White (2023) highlight the

importance of subject selection guidance in schools and peer influence in shaping these decisions. This suggests that learners' subject choices are not fixed but can be influenced by new experiences, information and guidance (Davies & Ercolani, 2019). However, it is important to note that biases and perceptions about the status of certain subjects may limit the effectiveness of these influencing factors. This implies that increasing learner participation in selected subjects requires addressing both practical barriers and the negative stereotypes associated with those subjects. As such, the researcher aimed to establish whether learners' self-perceptions affect subject selection; that is, the study sought to investigate whether learners' cognitive views of mathematics explain why they choose to study it.

It is also crucial to recognise that high school learners remain in their adolescent phase. This is the period when individuals begin to consider employment opportunities and positions in the job market, selecting subjects that will help them achieve their targets (Ajayi1, Moosa & Aloka, 2023). A study conducted by Kaleva, et al. (2019) revealed that in Finland, the mathematics subject chosen by learners had a significant impact on their university admission outcomes. Learners who opted for advanced mathematics believed it would benefit their future studies and careers. However, some learners were discouraged by their teachers, parents and friends from choosing more challenging subjects. The study also found that a lack of foundational concepts was one reason why some subjects were perceived as difficult. For instance, MoPSE only offers Mechanics at A-Level, which is unpopular among learners who choose mathematics subjects.

In a study by Vidal Rodeiro (2019), where he examined the impact of A-Level subject choice and learners' background characteristics on higher education participation, it was revealed that learners can decide which and how many subjects they wish to study depending on different factors which include career aspirations, their academic ability, the provision at their school or college or the advice given to them.

In 2019, Vidal Rodeiro conducted a study that uncovered the power learners have to shape their own futures. By carefully considering their career aspirations, academic abilities, and available resources, learners can choose which, and how many, to pursue. It was envisaged that the findings of the study will inspire learners to recognise how much control they have over their educational paths and encourage them to make informed decisions. Results from a study by Sarkodie, Asare and Asare (2020) evinced that factors influencing learners' choice of subjects largely depend on career desire, employment opportunities and academic records. This aligns

with Palmer, Burke, and Aubusson's (2017) findings, who found that learners' interests and perceived needs for future study or career plans are the most important factors in both choosing and rejecting subjects. Quinlan and Renninger (2022) assert that learners who exhibit minimal to no interest are often ill-equipped to establish objectives or self-regulate their engagement with content of selected subjects in the absence of support from peers or an environment designed to foster significant connections to the material. The same authors found that learners who were more engaged in their subject also tended to pursue that passion in their professions.

Another consideration in subject selection is the perceived difficulty of the subject (Cuff, 2017). Because of this, subject selection in secondary schools is meant to be a student-specific choice. The opportunity to choose subjects is available to some learners but not to others, despite all being in the same public school. Having treated learners in different secondary schools unequally, the A-Level results attained from inequality cannot and should not be judged equally (Cuff, 2017). Learners continue to face challenges related to ineffective and inaccurate career decisions when in secondary school. This predicament leads them to choose wrong careers, resulting in low-level functioning in the later stages of their work life (Ajayi, Moosa, & Aloka, 2023). Yet unexamined is how learners' self-perceptions influence subject selection at A-Level.

However, learners may need more information about the multiple subject options available (Chaturapruek et al., 2021). They sometimes require additional resources to decide (Ryan et al., 2001). When deciding which mathematics subjects to study, learners use different sources of information in their decision-making process (Rodriguez-Simmonds et al., n.d). Dellar (1994) found that learners appeared to access informal channels, such as parents and peers, to obtain relevant information. Learner engagement with mathematics has been observed to decline during the junior secondary phase of education. Berger, Mackenzie and Holmes (2020) identify several factors as critical determinants of subject selection, including learners' mathematical self-concept, their perceptions of the utility value of mathematics and the intrinsic value they assign to the subject.

3.2.2 Peer influence

Parents provide financial and emotional assistance for their children's education. However, these children often form close relationships with their peers at school, who may significantly impact their choice of academic subjects. Additionally, learners spend a significant amount of

time with their friends, which allows for the exchange of knowledge, career advice, emotional support, and the opportunity to serve as role models for one another (Salim, et al., 2023). Sharf (2013) posits that young people are often seen as in the exploration phase of their lives, hence they need help throughout this period. Marvin and Ryugo (2023) have shown that the initial stages of interest require assistance from others and ongoing support to flourish. Consequently, learners seek guidance from their peers to choose which A-Level mathematics subjects to pursue, as they are in the same age group.

During the period of professional development, peers provide diverse advice and assistance about potential jobs to pursue in the future. This is because they are in the same age group and can relate to comparable experiences (Indianti, 2015; Kurniawan, et al., 2021). Hence, to choose appropriate subjects, it is important to obtain substantial peer endorsement to enhance self-perception across all A-Level mathematics subjects.

Zhang and Huang (2018) identify information and advice sharing as a key aspect of peer support. Salim, et al. (2023) have confirmed that this exchange is necessary to obtain the most up-to-date knowledge and anticipate potential issues in the future labour market. The acquired information is anticipated to provide learners with a comprehensive understanding of their future paths and aid them in making well-informed choices about the selection of A-Level mathematics subjects. Acquiring a comprehensive understanding of the content of all A-Level mathematics subjects enhances learners' self-assurance, capacity for informed decision-making, and ability to adapt to upcoming changes (Salim et al., 2023).

This understanding aligns with research by Mtemeri (2020) on the influence of peer pressure on the career decision-making of high school learners in the Midlands Province, Zimbabwe. The study's findings revealed that learners' actions or decisions are influenced by their peers in several aspects of career choices. This finding aligns with the situation in Nigeria, where Salami (2019) discovered that many individuals seeking admission to undergraduate programmes end up pursuing jobs that are not fit for them. Many factors, including peer pressure and recommendations from friends, primarily influence this. Previous work demonstrates the need for peer support to facilitate seamless career choices. Nevertheless, it is still unclear whether peer influence begins in high school, when individuals choose a subject that shapes their future careers.

Peers had a positive influence on learners' career choices during their last year of school (Mehmedova, 2017). However, individuals may rely on uninformed peers for important information and may be influenced by peer pressure while making these choices (Mehmedova, 2017). According to Salim, et al. (2023), relying solely on peer support is insufficient for improving career adaptability, as it is an external factor. As reported by Oduh, Agboola and Eibhalemen (2020), the impact of peer group influence on the job selection of secondary school learners was minimal. These findings align with those reported by Salim et al. (2023), who found that peer support alone is insufficient for improving career adaptability. Their findings suggest that internal factors are necessary to help learners adjust to changes in the job market and make career decisions.

3.2.3 Teacher's influence on learners' subject choices

The term 'teachers' refers to all school staff who advise learners on subject selection, including those at all levels. In this context, 'all levels' refers to teachers across all forms and subjects from Form 1 through to Form 6, who may come into contact with learners during the subject selection period, not only specialist A-Level mathematics teachers. It is also acknowledged that some school staff who are not classroom teachers, such as school counsellors, deputy heads responsible for academic administration and career guidance officers, may equally be in a position to advise learners on subject selection. The broader term 'teachers' is used here for convenience, but the analysis recognises that subject selection guidance in schools may be provided by a range of staff members beyond the classroom teacher. Learners are more interested in a subject when they perceive its content as relevant (Smart & Rahman, 2008). Therefore, teachers have the responsibility of explaining the relevance of different A-Level mathematics subjects, effectively serving as ambassadors for these subjects. According to research by Straw and Macleod (2015), having school ambassadors who can provide career guidance may stimulate young minds in mathematics and inspire them to pursue careers in the field. Temel et al. (2025) warn that insufficient details from teachers about subject requirements or assessment methods can lead to poorly informed decisions.

It is of paramount importance to note that one cannot discuss subject selection without acknowledging the influence teachers have on learners' choices, especially at A-Level. This is because teachers are the major pillars in the teaching and learning process (Ndlovu, 2017). Slavit, Nelson and Lesseig (2016) argue that teachers play a dynamically important role in guiding learners' subject selection. Furthermore, Ndlovu (2017) avers that it is the teachers

who know best what the curriculum should look like, hence their duty in assisting learners to select relevant subjects cannot be ignored. Javed (2018) contends that teachers' attributes, ideas and attitudes profoundly influence learners' choices. Learners are more likely to get interested in and choose certain A-Level math subjects when they see how they relate to their daily lives (Singh, 2021). In the same vein, Schwerdt and Wupperm (2011) endorse this perspective, emphasising that teacher guidance is crucial owing to secondary school learners' insufficient maturity to independently make informed judgments regarding choosing subjects. These choices are very important, as they mark a turning point in learners' academic paths and will influence their future career options (Javed, 2018).

A-Level mathematics subjects are a foundational step for tertiary education; hence, it is the teacher's duty to guide learners in choosing appropriate subjects. Differentiating between A-Level mathematics subjects and ranking them in order of usefulness can be challenging for some learners. For example, studying A-Level pure mathematics may seem identical to studying statistics, as both fall under the branch of mathematics. This can only be clarified for those new to these subjects, with proper explanations and assurance from the teachers who teach them. Idnay et al. (2025) and Emino et al. (2025) emphasise the crucial role of transparent curriculum details in guiding student choices and promoting effective learning strategies. This aligns with the broader consensus, as articulated by Sagyi et al. (2025) and Temel et al. (2025), that a clear understanding of the scope and expectations of A-Level mathematics enables learners to make informed decisions and establish realistic, achievable goals.

Mathematics teachers must engage learners with the extensive role of mathematics in numerous careers and clarify its mathematical requirements (Moran, et al., 2013). Brown et al. (2008) advocate integrating mathematics' utility into the educational curriculum. However, teachers across all subjects find it challenging to integrate enriching experiences into their teaching responsibilities within an already congested curriculum (Smart & Rahman, 2008). In other words, in their busy teaching schedules, teachers may promote the uptake of any A-Level mathematics subject regardless of its level of difficulty, because they act as ‘school parents’ and learners religiously follow their advice.

The role of teachers has evolved beyond simply imparting knowledge. They are now expected to inspire and motivate learners, making them interested in the subjects they teach. When teachers are interactive, friendly and professional, learners become more engaged and

motivated to select and study respective mathematics subjects at A-Level. Teachers are responsible for promoting the importance of the subjects they teach and encouraging learners to select them for their future studies and careers. Teachers are ambassadors of the subjects they teach and play a crucial role in shaping learners' learning and career paths. They can help learners understand the relevance and importance of subjects and guide them in making informed decisions. Teachers' encouragement reinforces learners' selection of subjects, as concluded by Javed (2018).

Basham's (2011) study found that teachers played a significant role in career education and guidance, particularly in subject selection. Teachers can quickly identify learners' strengths and weaknesses, and guide them towards appropriate subjects. Learners often seek their teachers' advice when selecting their subjects (Nyambuya & Onyango, 2020). Subject selection is a critical element in determining learners' future careers. More importantly, the role of teachers in predicting learners' future careers should not be underestimated (Ngussa & Charles, 2019).

Teachers need to guide learners toward career-readiness by helping them select appropriate subjects in high school. Teachers need to help learners discern the careers they should pursue and have a better view of what lies ahead for them. Teachers should embrace their role as guides alongside teaching (Cortez, 2019). Moreover, Owusu, et al. (2021) believe that teachers in senior high schools do not play significant roles in influencing learners' career aspirations. However, Venant, Arego and Ngussa (2021) contend that teachers can significantly influence learners during the teaching and learning process. Therefore, teachers should maintain their role in preparing learners for future careers.

Teachers have a positive influence on shaping learners' career paths by guiding them to select appropriate subjects. Teachers are meant to inspire interest in subjects, guide in subject selection and prepare for future careers.

3.2.4 Involvement of parents in subject selection

In Australia, Low et al. (2017) found that learners who wanted to choose a teaching career were influenced by schoolteachers or family members who were teachers. This means that parents' involvement in subject selection cannot be ignored. Therefore, it was essential to gather insights from learners, teachers and school heads on parental involvement in subject selection. Parents play a crucial role in their children's education, including their choice of A-Level

mathematics subjects. Teachers often act as academic advisors, while parents are the backbone of their children's education. Kalla et al. (2023) found that parents have a significant impact on the selection and choice of subjects. According to Kaneez and Medha (2018), parents' views significantly influence their children's subject preferences. Ngussa and Charles (2019) concur, noting that parents' guide and counsel their children in career choices and that the home environment prepares them for their chosen career. Sikora (2018) points out that, in Australia, parents often help their children in selecting their education programmes, which occur primarily through school and subject choices. Parents should participate in their children's education throughout high school, rather than solely during the career selection process. Ordanovska et.al (2025) advocate for a holistic approach where learners consider subjects that align with their future aspirations and innate talents, which can be achieved with the help of parents.

In a case study conducted by Yamin-Ali (2014) on subject selection in a Trinidadian secondary school, learners expressed dissatisfaction with their subject choices, and there was evidence of a mismatch between their career preferences and subject selection, which may have been owing to parental advice. Aziken, Emovon and Emovon (2021) found that many learners in junior secondary school struggle with subject selection owing to conflicting decision criteria, such as friend and parental influence. Kiernan, Walsh and White (2023) argue that many public school learners lack exposure to and knowledge of the importance of certain subjects in secondary school.

MoPSE offers a range of A-Level mathematics subjects, but some parents may not be aware of them. Communication and guidance from schools are necessary for parents and children to make informed choices about these subjects. The study conducted by Seta, et al. (2020) indicates a lack of link between parental guidance and subject selection. The authors recommend that learners should always choose subjects based on their interests, rather than giving in to parental pressure. According to Sarkodie, et al. (2020), parents should discuss subject choices with their children instead of imposing their opinions on them. Naugah, Reiss and Watts (2020) indicate that most parents in Mauritius are confident that, with school guidance, their daughters' self-esteem and abilities will facilitate appropriate subject choice.

Yaqoob, Samas and Iqbal (2017) found that parental guidance significantly influences learners' career decisions in Pakistan. Their study recommended that career

counselling workshops be conducted for learners and their parents. Basham (2011) agrees that consultation with learners and parents is crucial in any career education programme. Furthermore, Albien (2018) notes that parental guidance in subject selection may be limited by parents' insufficient knowledge of the current curriculum and the range of disciplines available at schools. This lack of awareness can hinder their ability to provide effective career counselling to their children. Galliott and Graham (2015) argue that career information and guidance should be provided to learners and their families to help them make the most of the resources and opportunities available to them, leading to tangible benefits. When it comes to helping learners make informed decisions about their future careers, the importance of academic or career-advice offices in high schools cannot be overstated.

In this context, all levels refer to teachers across all year groups and subjects, from Form 1 to Form 6, who may interact with learners during the subject selection period, not just specialist A-Level mathematics teachers. It is also recognised that certain non-teaching staff, such as school counsellors, deputy heads overseeing academic matters, and career guidance officers, may similarly find themselves advising learners on subject choices. The term ’teachers’ is used broadly for the sake of convenience, though the analysis acknowledges that subject selection guidance in schools can come from a variety of staff beyond classroom teachers. It is important to acknowledge that background influence on learners’ subject choices is not confined exclusively to teachers. Parents and guardians constitute a significant source of background influence, as confirmed by learners, teachers, and school heads in their accounts (Chapter 5). Although parents were not included as direct participants in this study, their influence emerged as a recurring theme in the data collected from the three participant groups. This constitutes a deliberate delimitation of the study, grounded in its school-based, qualitative focus, and is acknowledged as a limitation in Section 7.4.

Ibrahim et al. (2017) conducted a study that revealed that family members have a significant influence on learners' course choices. This is because they usually provide financial support to the learners. Sarkodie et al. (2020) suggest that a student's parents' occupation can also influence their major choices. They further explained that this influence is deeply ingrained in Filipino culture because of the respect they have for elders. This suggests that parents have a strong influence on their children's decisions. Kaneez and Medha (2018) argue that parental influence significantly affects the programme choices of their children.

In this context, all levels refer to teachers across all year groups and subjects, from Form 1 to Form 6, who may interact with learners during the subject selection period, not just specialist A-Level mathematics teachers. It is also recognised that certain non-teaching staff, such as school counsellors, deputy heads overseeing academic matters and career guidance officers, may similarly advise learners on subject choices. Background influence on learners' subject choices is not confined exclusively to teachers. Parents and guardians constitute a significant source of background influence, as confirmed by learners, teachers and school heads in their accounts (Chapter 5). Although parents were not direct participants in this study, their influence emerged as a recurring theme captured indirectly. This constitutes a deliberate delimitation of the study and is acknowledged as a limitation in Section 7.4.

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McMaster (2019) found that disparities in subject choices may stem from differences in learners' enjoyment of and confidence in particular subjects across different social backgrounds.

Kim, Kuncel and Pomerantz (2019) note that parents may play a critical role in either facilitating or hindering children's learning in the classroom. From this perspective, researchers, practitioners and policymakers have emphasised parents' involvement in their children's schooling as a critical factor in their children's achievement (Barger et al., 2019). Ngussa and Charles (2019) also recommend that parents should continue to provide career guidance, as this practice has positive results in terms of learners' career choice preparedness.

Dube (2019) identifies several external barriers that hinder career development in low-income contexts, including economic hardship, limited access to career guidance services and resources, and inadequate parental support. In his study on curriculum implementation

challenges faced by primary school teachers in Bulawayo Metropolitan Province, Zimbabwe, Ngwenya (2019) concluded that most parents were struggling to financially support their children's education. Blakes and Mestry (2021) reiterate that parents without the necessary resources are left with little or no choice in their children's education affairs. When it comes to making important decisions about their future careers, some South African high school learners reported feeling unsupported and having difficulty accessing resources and career advisory services (Pillay, 2020; Rabie et al., 2020). The lack of financial resources has resulted in unequal access to education for most learners, even though education is considered the greatest equaliser.

3.3 The role of academic or career guidance offices in high schools

A study by McDonough, et al. (2021) found that learners unfamiliar with a subject tend to have less interest in it. Although most learners are aware of the value of studying pure mathematics at A-Level, not all are aware of the benefits of studying other MoPSE A-Level subjects such as mechanics, statistics and additional mathematics. According to Darolia et al. (2018) and Simpkins et al. (2015), learners make significant decisions about their future STEM jobs and majors during the upper secondary school phase. Learners' experiences in upper secondary school can significantly influence their decision to major in STEM subjects. Some factors in this setting promote mathematical competence, while others discourage it.

The high school years are an important time for learners to reflect on their future and make informed choices about what they want to do. So, it is important to provide students enough knowledge before they choose a subject (Clarke et al., 2011). Career guidance offered to learners has been deemed a significant determinant affecting subject selection. Sheldrake et al. (2022) assert that educational institutions have a duty to educate learners about the diverse opportunities for further education and job paths available to them after finishing high school. Nonetheless, the quality and quantity of career education offerings differ significantly across educational environments in several nations (Groves et al., 2021).

Loan and Van (2015) differentiate between various types of career support in educational institutions, indicating that career guidance focuses primarily on providing information about subjects, professions and career trajectories, whereas career counselling encompasses

individual or small-group sessions that address specific career-related issues, such as A-Level subject selection. The educational programme focuses on helping groups of learners understand how to manage their careers. Maree (2020) notes that young adults often look for career counselling and evaluation to help them make smart decisions, starting with the subjects they need to take.

The main objective of career guidance is to assist learners in making informed decisions based on their interests, passions and abilities, while considering current and future career opportunities (Loan & Van, 2015). The study was prompted by a neglected aspect of who advises learners on selecting A-Level mathematics subjects. Therefore, personnel who offer career sessions on subject selection should be knowledgeable about the subjects they discuss, especially those learners can pursue after A-Level. According to Blotnicky et al. (2018), career awareness is a precursor of aspirations. Therefore, providing sufficient information on careers may influence the uptake of STEM subjects in high schools. A balanced approach that combines awareness with strong support systems is essential for creating an environment where every learner can confidently engage with A-Level mathematics (Steele & Whitaker, 2019; Sari, et al., 2025).

The necessity of such knowledgeable guidance can be theoretically grounded in Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD). Learners navigating A-Level subject choices are typically operating within their ZPD; they possess a basic awareness of available subjects but require scaffolded support from a more knowledgeable other (MKO) to bridge the gap between that awareness and a fully informed decision (Lantolf & Poehner, 2014; Wertsch, 1985). In a school context, the MKO may be a subject-specialist mathematics teacher, a career guidance officer, a school head, or a knowledgeable parent or community representative. This theoretical framing reinforces the argument made throughout this section that personnel providing career guidance on subject selection must be subject literate: an uninformed advisor cannot effectively serve as an MKO and therefore, cannot move the learner meaningfully within their ZPD toward an informed choice.

However, a study by Stephen et al. (2023) found that some learners remain undecided about their career choices after a career awareness programme. This suggests that more career awareness programmes and support are needed to help these learners make informed decisions before choosing their A-Level subjects. In other words, learners remain undecided after advice

on subject selection only if the advisor is less knowledgeable and not adequately trained in persuading learners to study relevant mathematics subjects. Fruitful career sessions on subject selection should encourage learners to study subjects not only based on their interests but also on their usefulness to their aspired careers.

The issue may not simply be an insufficient number of career awareness programmes, but rather a deficit in their quality, focus and relevance. Programmes that are more targeted, subject-specific and career-aligned are more likely to produce informed and decisive subject choices than a larger number of generic awareness sessions. This is consistent with Loan and Van (2015), who distinguish between broad career information and focused career counselling, contending that the latter is more effective in supporting learner decision-making. It should also be noted that some stakeholders, including some parents and community members, may have limited literacy, which may constrain their engagement with written subject guidance materials. Schools should consider appointing a designated liaison (more knowledgeable other) personnel or community representatives to ensure all stakeholders can meaningfully participate in supporting learners' subject selection decisions, in line with Zimbabwe's Heritage-Based Curriculum (MoPSE, 2024).

It should also be noted that some stakeholders involved in subject selection, including certain parents and community members, may have limited literacy, which constrains their direct engagement with written subject guidance materials. In such cases, schools should consider appointing designated liaison personnel or community representatives to ensure that all stakeholders can meaningfully participate in supporting learners' subject selection decisions, in line with the inclusive education principles embedded in Zimbabwe's Heritage-Based Curriculum (MoPSE, 2024). As Vidal Rodeiro (2007) suggests, advice on the subject choice and other options should start earlier in secondary school and be given several times to avoid having fewer alternatives later. Yamin-Ali (2014) agrees with this position and argues that school planning and policy development should focus on providing learners with appropriate support throughout this decision-making phase. Sota and Agi (2020) also suggest that parents should be taught about the significance of choosing subjects and getting career advice through seminars and meetings of the Parents' and Teachers' Association. Nonetheless, in Zimbabwean government high schools, parental engagement is generally confined to consultation days focused on academic achievement. Research on mathematics education in Zimbabwe remains limited, and it has not identified ways to involve stakeholders, such as parents, in the process of choosing subjects.

Zafar (2019) contends that career choice is a pivotal decision in learners' lives, where careful selections result in professional achievement. This indicates that careful selection of A-Level subjects is crucial for making well-informed professional choices. Fitzenberger, Hillerich-Sigg and Sprietsma (2019) endorse this viewpoint, demonstrating that career assistance may substantially improve secondary school students' career planning. The effectiveness of career guidance, however, depends on the specific type of counselling practitioner. Yaqoob, Samas and Iqbal (2017) investigated career counselling in Pakistani schools and discovered that academic career counsellors were non-existent in all surveyed institutions. The authors suggested that further studies examine the reasons behind school administrators' inadequate attention to career advice sessions and their failure to offer learners suitable career counsellors. Against this background, the current study sought to come up with a guiding framework that can be used by high schools in Zimbabwe to guide subject selection.

However, Makondo and Makondo (2020) suggested that school heads could also assist by talking about the importance of mathematics during assemblies. This suggestion still leaves a gap, since talking about the importance of mathematics can be rendered useless if learners are not guided to select A-Level mathematics subjects relevant to their aspired careers. This aligns with Loan and Van's (2015) assertion, clarifying that the most important purpose of career guidance in educational institutions is to prepare learners for the job market.

To help learners gain a comprehensive understanding of the subjects they are opting for, schools should offer career counselling sessions at the grassroots level (Yaqoob, et al., 2017). Vurayayi (2020) agrees that mathematics teachers and related stakeholders should know that every child can succeed in any mathematics subject when appropriately guided in selecting specific mathematics subjects. The goal of education and career advice is to equip learners with the skills and knowledge to interact effectively with individuals who can support their career development, such as parents, teachers and school administrators (Loan & Van, 2015). Blotnicky et al. (2018) warn that learners may not see STEM-based careers as viable career paths if they are denied sufficient support or do not know about the educational and employment prospects STEM talent offers.

Ndlovu (2017) contends that the lack of explicit standards induces uncertainty, whereas policy frameworks provide confidence and direction for implementers, underscoring the necessity for

a guiding framework for topic selection. Young people should have access to high-quality career services from an early age and at each grade level, so they can stay informed about their possibilities and choose the right subjects before making career decisions (Maree, 2020). The subjects learners choose to make a big impact on the careers they can pursue after high school. If learners fail to select the right combinations of subjects, they may not be able to get into certain higher or further education programmes.

Ajayi, Moosa and Aloka (2023) found that schools lacked the necessary infrastructure to provide learners with adequate career guidance and education. In South Africa, limited access to career information services and incorrect subject combinations prevented learners from choosing appropriate career paths after Grade 12. The authors noted that most secondary school learners in townships lack a solid understanding of what can be achieved with specific subjects at the end of Grade 12, making it difficult to select appropriate subject combinations in Grade 10. Furthermore, the absence of career counsellors in township secondary schools made it challenging for learners to determine the ideal subject combinations aligned with their intended career goals. In South Africa, individuals may access career counselling and evaluation exclusively through private practice, hence limiting these services to those who can afford them. Ajayi et al. (2023) proposed that selected teachers at township secondary schools receive training and acquire new competencies to become specialised career counsellors.

Visser et al. (2021) acknowledge that self-directed resources and tools can play a valuable role in encouraging learner autonomy and agency. However, Pillay (2020) argues that while such resources serve as auxiliary enablers of the career exploration process, they cannot replace the need for adequate career guidance and face-to-face counselling services in all high schools. The lack of resources for proper career guidance and education is also evident in the Zimbabwean context. Moreover, Marvin and Ryugo (2023) confirmed similar challenges in Malawi and Japan, where learners demonstrated low awareness of science careers and were undecided about their career paths. Oduh et al. (2020) recommended that schools, in collaboration with the Ministry of Education, should organise at least one mandatory career programme involving professionals and experts from various fields, coordinated by guidance counsellors.

The financial costs associated with career counselling make these services unaffordable for the general population. Consequently, learners in public schools often study subjects based on

availability at nearby schools rather than strategic career planning. The usefulness of subjects is not considered meaningful, leading learners to study a collection of subjects rather than a purposeful combination. The current study addressed these issues, particularly the need to train and upskill designated educators to provide academic counselling on subject selection.

3.4 Chapter summary

Choosing appropriate A-Level mathematics subjects is one of the first significant decisions learners studying under the MoPSE make, and it is far from trivial. However, the task of subject selection often brings with it a sense of pressure and confusion. This pressure is often compounded by well-meaning advice from parents, teachers and peers, making the process seem even more daunting. This chapter explored the crucial factors that influence learner subject selection. An overview of existing studies revealed key determinants including self-perception, peer influence, teacher guidance and parental involvement. The final section examined literature on the importance of academic career guidance in relation to A-Level subject selection. Through this discourse and examination of literature, the researcher acquired insight into the dynamics of subject selection, offering readers a thorough comprehension of the study's emphasis. The chapter also identified gaps in the existing literature, which served as a guide for refining the current study's focus. The following chapter describes the research methodology used to collect and analyse data.

CHAPTER FOUR
RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter provides a thorough description of the research methods utilised to study the dynamics of subject choices and to formulate a guiding framework for choosing MoPSE A-Level mathematics subjects. Data collected through focus group discussions from MoPSE A-Level mathematics learners' focus group discussions, questionnaires completed by mathematics teachers and school heads were transcribed and coded to develop themes that guided the analysis. From the selected schools, focus group discussions were conducted with 30 A-Level mathematics learners, six learners from each of the five different high schools, five teachers and five school heads to gather insights regarding the selection of MoPSE A-Level mathematics subjects. Moreover, five schools identified as School 1 (S1), (S2), (S3), (S4) and (S5) participated in the study. The five MoPSE A-Level mathematics teachers who responded to the questionnaires are coded Teacher 1 (T1), (T2), (T3), (T4) and (T5). The school heads were identified as school head 1 (SH1), (SH2), (SH3), (SH4) and (SH5) (see Table 4.2). The study was guided by four research questions. All four questions were based on research objectives guided by the reviewed literature (see Chapter Three), the Rational Choice Theory (RCT) and Social Cognitive Career Theory (SCCT) developed by economist Adam Smith in 1776 and Lent, Brown, and Hackett borrowing ideas from Albert Bandura's (1986) general social cognitive theory, respectively.

The main question that drove the research process was: What informs the mathematics subject choices for learners at A-Level? The aim of this research influenced the choice of research design, as the researcher intended to explore the perspectives of school heads, A-Level mathematics teachers, and A-Level mathematics learners. Figure 4.1 presents the layout of Chapter 4.

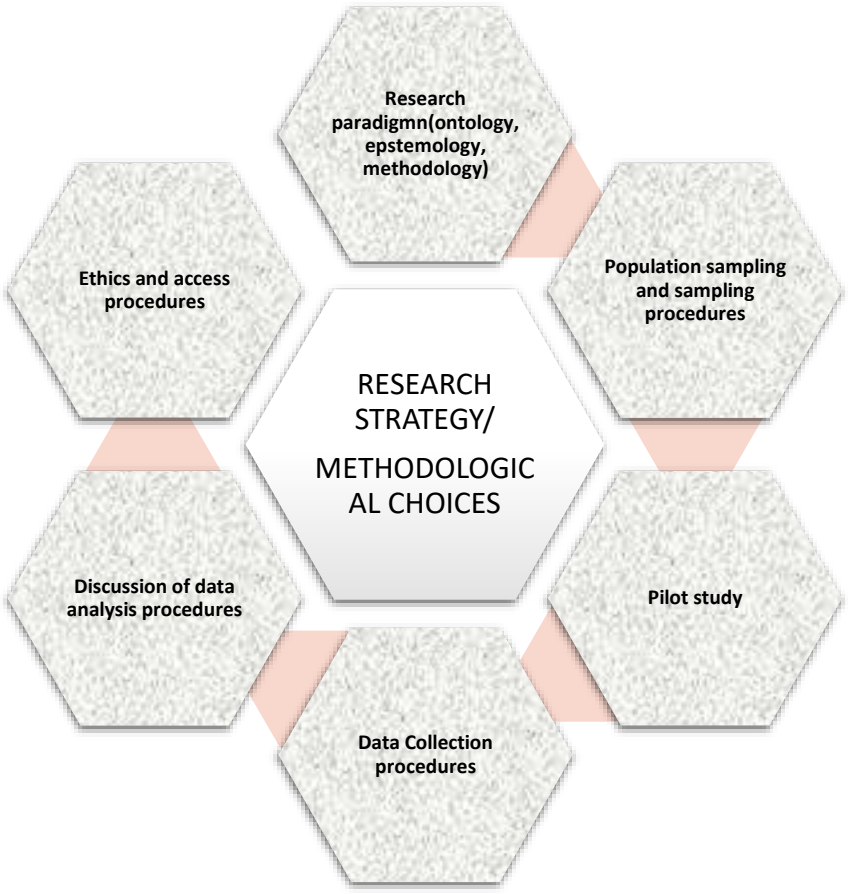

Figure 4.1: Chapter 4 layout

4.2 Research strategy

A case study research strategy was adopted for this study, as it involves an in-depth investigation of a contemporary phenomenon within its real-world context (Yin, 2018), making it particularly appropriate for exploring the complex dynamics of subject selection among MoPSE A-Level mathematics learners, teachers and school heads in Bulawayo Province. Rather than seeking broad generalisation, the case study prioritised depth of understanding, which closely aligned with the interpretative paradigm guiding this research (Paudel, 2024). By examining the phenomenon from the perspectives of different stakeholders within Bulawayo Province, the researcher was able to construct a holistic and contextually grounded understanding of the factors influencing subject selection in A-Level mathematics within the Zimbabwean education system, with the selected schools in the province serving as bounded systems in which the interplay between policy, teacher practice and learner experience could be closely explored.

In addition to the qualitative case study strategy adopted for the data collection and analysis phases, the framework development phase of this study is informed by Educational Design Research (EDR). EDR is an iterative, theory-driven research methodology in which researchers design, implement, evaluate and refine educational interventions within authentic educational contexts (McKenney & Reeves, 2019; Plomp & Nieveen, 2007). EDR is distinguished from purely descriptive research by its dual purpose: it generates both a practical educational solution in this case the VENE framework, and generalisable theoretical knowledge about the design and validation process itself (McKenney & Reeves, 2019). The quality of any framework developed through EDR is evaluated against three criteria established by Nieveen (1999): validity (the framework is empirically grounded and theoretically coherent), practicality (it is usable by practitioners as intended) and effectiveness (it produces intended outcomes for learners).

4.2.1 Interpretive Research paradigm

This study is grounded in an interpretive paradigm (Lincoln & Guba, 2013). Ontologically, the study adopted the view that reality is not singular or objective, but is multiple, socially constructed and shaped by the subjective experiences and meanings of participants. Epistemologically, the study adopted an interpretivist stance, which holds that knowledge is produced through the researcher's empathetic engagement with participants' meaning-making processes rather than through the neutral measurement of objective facts (Lincoln & Guba, 2013). This epistemological commitment justifies the use of qualitative data collection methods as instruments designed to surface participants' subjective understandings rather than to generate statistically generalisable findings.

A paradigm provides the framework within which knowledge, learning capacity and techniques for acquiring knowledge are embedded. According to Denzin (2011), interpretivism emphasises the specifics of the circumstance and the underlying reality. The information is comprehensive and provides a thorough understanding of the situation. He maintains that interpretivism requires not just descriptions but also justifications for them.

Ontology, epistemology and methodology are closely related to a research paradigm, as Daniel et al. (2024) pointed out. According to Kaukko and Wilkinson (2023), ontological convictions lead to epistemological presumptions, which in turn shape the choice of data collection techniques. The ontological framework of inquiry limits the epistemological explanation, while the ontological and epistemological frameworks of research also require the methodological

explanation (Lincoln & Guba, 2013). According to this reasoning, different approaches are required for the ontologies and epistemologies adopted by different researchers (Cohen, Manion & Morrison, 2000). The researcher explains interpretivism in terms of the three aspects of the research process or philosophical underpinnings: ontology, epistemology, and methodology in the following subsections.

1. Ontology

The nature of existence, social phenomena and reality are the topics of ontology, which has sparked many scholarly discussions (Parkinson, 2023). Additionally, Cohen et al. (2000) posed a crucial question about whether social reality arises from individual consciousness or exists independently of people, pushing itself upon their awareness. According to Ngulube (2021), ontology is the process by which scientists create concepts of reality and truth. Woodward (2021) investigated basic questions such as what is knowable about life and what constitutes reality. Examining what is known regarding A-Level mathematics topic selection was crucial to the current investigation.

2. Knowledge

The nature and reliability of knowledge are topics covered by epistemology (Grey, 2014). "Is knowledge something that can be acquired or is it something that has to be personally experienced?" is one of the epistemological questions (Kuyini & Kivunja, 2017). It has been said that epistemology is the process via which the researcher discovers reality and truth, or, to put it another way, how we know what we know. Therefore, the relationship between the inquirer and the enquired into is examined in epistemology (Modrek, 2022). If subject choice is dynamic, the researcher needs to delve deeper to understand how learners personally select these subjects and develop strategies that schools can use to promote comfortable, fair selection of these A-Level mathematics subjects.

3. Methodology

While Sensing (2022) conceptualises methodology as the framework for investigating reality, Sangwa (2021) defines it as the investigative approach used in research. According to Oliver (2021), the primary methodological issue is how knowledge is produced. Crucially, research technique must show that it is consistent with the ontological and epistemological foundations of the study. The interpretivist paradigm is predicated on the idea that reality is varied, composed of distinct realities that result from processes of interaction. This point of view necessitates analytical approaches that prioritise the examination of interpretive and sense-making processes (Lincoln & Guba, 2013).

4.3 Research approach

This study adopted a qualitative research approach. A qualitative approach was chosen because the study sought to understand the lived experiences, perspectives and meaning-making processes of learners, teachers and school heads in relation to A-Level mathematics subject selection phenomena that are inherently subjective and context-dependent and therefore, best explored through qualitative means (Merriam & Tisdell, 2016; Creswell, 2018). The goal of qualitative research, according to Merriam and Tisdell (2016), is to understand the significance of an event to those involved. According to Amir, McCarthy and Tong (2021), qualitative research employs an iterative methodology in which researchers continuously review data obtained at every stage of the study to inform their subsequent actions. Denzin and Lincoln (2017) argues that open-ended questions are not suitable for quantifying data collected through qualitative research methods. Denzin and Lincoln (2017) claim that by exploring the background of the issues and the personal values of those connected to them, this study's approach helped the researcher understand them.

The approach used enabled the researcher to understand the motivations behind learners' MOPSEA-Level subject selections. Since the study was qualitative and explanatory by design, it enabled the researcher to go beyond statistical results by qualifying meanings in the context of their realities through focus group discussions. In this regard, the study gathered in-depth explanations of the selection of A-Level mathematics subjects, with the aim of developing a framework to help A-Level learners make informed choices. To adopt a qualitative research approach, the researcher began by identifying the gap, formulating the research questions, selecting the appropriate method to answer them, choosing methodological techniques, and finally designing data collection and analysis procedures.

The qualitative approach was helpful because, as Zlatic (2021) notes, it is linked to methods that provide study participants' voices, concerns and practices a chance to be heard. Additionally, qualitative research allowed for the exploration of unforeseen problems and produced rich, in-depth descriptions (Vanover et al., 2021). It was imperative to have explanations from the learners, mathematics teachers and school heads in a bid to understand the dynamics of A-Level mathematics subjects offered by MoPSE. Their views were useful in informing the development of guidelines for selecting useful A-Level mathematics subjects. The researcher consulted the end users, who are the learners and teachers. This helped clarify any misconceptions regarding the four MoPSE A-Level mathematics selections. This indicates

that qualitative research seeks to understand phenomena through the meaning's individuals attribute to them.

4.4 Population, sampling and sampling procedures

This section discusses the population, sample and sampling techniques used for the study, Dynamics of subject choices: A framework toward the selection of Advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE). The discussion is presented in the following sections.

4.4.1 Population of interest

The population of interest comprised all schools offering MoPSE mathematics at the Advanced level in the Bulawayo Metropolitan Province of Zimbabwe, as well as teachers, school heads and A-level mathematics learners. The main group that the research is focused on is the population of interest, which is defined as the people, organisations, groups, or other entities that one aims to comprehend and to whom or to which the study results may be generalised or transferred (Casteel & Bridier, 2021)

4.4.2 Target population

The target population for this study comprised all A-level learners, all mathematics teachers and all school heads in high schools in the Bulawayo Metropolitan Province of Zimbabwe. According to the Bulawayo Metropolitan Province Education Office (2023), there are approximately 50 high schools across the province's five districts, with an estimated 8 500 A-level learners, approximately 420 mathematics teachers and 50 school heads. These figures constitute the broader target population from which the purposive sample of five schools, 30 A-level learners, five mathematics teachers, and five school heads was drawn for this study. For this study, three related but conceptually distinct terms are defined: (a) population of interest: all high schools offering MoPSE A-Level mathematics in the Bulawayo Metropolitan Province; (b) target population: the subset meeting the study's specific criteria; and (c) sample: the five purposively selected schools and their participants. It is also important to clarify that parents and career guidance officers, discussed extensively in Chapter 3, were deliberately excluded from the target population. This was grounded in the qualitative, school-based focus of the research, and their influence was captured indirectly through participants' accounts (Chapter 5).

To gather desired data from the five secondary schools, the researcher considered one focus group (per school), each with six A-Level learners studying mathematics subjects at lower and upper sixth forms, five teachers (one teacher from each school) teaching A-Level mathematics and five school heads, one from each of the five respective schools.

The decision to select one mathematics teacher per school was based on purposive sampling guided by the criterion of expertise. The teacher selected from each school was identified by the researcher as the most experienced and knowledgeable A-Level mathematics teacher at that school. In schools where multiple teachers taught A-Level mathematics, the researcher purposively selected the teacher most familiar with the full range of MoPSE A-Level mathematics subjects. One teacher per school was, therefore, considered methodologically sufficient given that the study's focus was on institutional subject selection dynamics rather than on the diversity of individual teacher opinions within a single school (Prior & Richardson, 2020).

It is important to clarify why parents and career guidance officers, both of whom are discussed extensively in Chapter 3 (Sections 3.2.4 and 3.3, respectively) as key stakeholders in A-Level mathematics subject selection, were not included in the target population of this study. This decision was made deliberately and is grounded in the research's qualitative, school-based focus. The study was specifically designed to explore the dynamics of A-Level mathematics subject selection from the perspectives of those directly involved in the school-based teaching, learning and administrative processes, namely, learners, mathematics teachers and school heads. These three groups were best placed to provide direct, first-hand accounts of the subject selection dynamics within the school environment, which was the primary unit of analysis. Parents were excluded from the target population because the study sought to understand how the school system itself guides and structures subject selection, rather than to examine the broader home environment.

While parental influence emerged as a significant theme in the literature and in the findings (as evidenced in Chapter 5), it was captured indirectly through the perspectives of learners, teachers and school heads, who reported on parental involvement as part of their own experiences. A decision to include parents would have significantly altered the scope, scale and methodological design of the study. Similarly, career guidance officers were not included because most of the participating schools in the Bulawayo Metropolitan Province do not have dedicated career guidance offices or formally designated career guidance personnel, making

this a structurally absent category in the study's context. The study acknowledges this limitation and recommends that future research explicitly include parents and career guidance personnel as primary participants to obtain a more complete picture of the subject selection ecosystem.

4.4.3 Purposive sampling technique

The process of selecting a sample from a large population or a group of people for a particular type of research is known as sampling (Bhardwaj, 2019). Purposive sampling was used because, according to Poth (2023), qualitative sampling designs are created by the researcher based on the study's goals. By aligning participants with research goals and objectives, purposeful sampling enhances the study's rigour and data reliability. Therefore, the researcher employed purposive sampling to select individuals with extensive expertise in the subject matter, namely A-Level mathematics teachers, learners, and school heads at high schools in Bulawayo Province, Zimbabwe.

From the five purposively selected schools, 30 A-level mathematics learners, five mathematics teachers and five school heads participated in the study. The five schools do not constitute the entire population of interest but represent a purposively selected sample drawn from the target population. Additionally, using purposive sampling, the researcher selects participants who can provide the necessary information based on their knowledge or experience, after determining what needs to be documented in the data (Prior et al., 2020). In this context, the researcher employed purposeful sampling to select a sample exclusively comprising persons and schools with experience in MoPSE A-Level mathematics subjects and the criteria for their selection. To reiterate, the study's focus was on the dynamics of subject choices in an endeavour to develop a framework that will guide A-Level mathematics learners when selecting MoPSE A-Level mathematics subjects.

4.4.4 Description of site

According to Kulhari, et al. (2024), a research site is the area set aside for researchers to carry out their studies. It is furnished with the infrastructure and physical space required to support a variety of research activities, including data collection and the observation of natural phenomena. The specific features of a research site are tailored to the nature of the research. There are ten provinces in Zimbabwe, of which over 50 high schools are listed in the six

districts of Bulawayo Province. The study encompassed five government high schools in the Bulawayo Metropolitan Province, Zimbabwe, all of which offer MoPSE A-Level mathematics. Schools in Bulawayo Province were intentionally chosen for the study as the researcher could engage with learners who were uncertain about their A-Level mathematics subject selections. The researcher was not teaching at any of the included schools.

Different factors influenced the selection of A-Level mathematics subjects in these schools, such as school provisions, teachers' willingness to teach certain A-Level mathematics subjects , academic self-perception, peer influence and parental influence. Anonymity was ensured by assigning the schools pseudonyms.: School 1 (S1), (S2), (S3), (S4), and (S5).

Following is a description of the schools:

- ***S1*** -This is a government high school located in Bulawayo, Zimbabwe. It was founded in 1910, with A-Level classes introduced in 1975. Two teachers could teach mathematics up to A-Level at this school. The school had an enrolment of 780 learners, with 74 A-Level learners and 39 learners studying pure mathematics at A-Level.
- ***S2-*** This government-run high school was established in 1950. It follows the Zimbabwean curriculum, offering subjects from Form 1 to Form 6. There are 996 learners from Form 1 to 6, 94 A-Level learners and 26 learners studying mathematics at A-Level. Four teachers can teach mathematics up to A-Level at this school. The school offers only pure mathematics at A-Level.
- ***S3 -*** This Zimbabwean high school was established in 1984 and offers mathematics as a subject from Form 1 to Form 6. It provides both pure mathematics and statistics at A-Level, with A-Level classes introduced in 2009. Three teachers could teach mathematics up to A-Level at this school. The school had an enrolment of 750 learners, with 22 A-Level learners and 09 learners studying pure mathematics and statistics at A-Level.
- ***S4*** - This high school was opened by the then Zimbabwe Minister of Education, A.P. Smith, on 23 October 1971. It is a public high school that provides education to learners in Forms 1 to 6 and is in the Bulawayo Metropolitan Province. A-Level classes were introduced at this school in 1992. Two teachers could teach mathematics up to A-Level at this school. With an enrolment of 693 learners from forms 1 to 6, 37 A-Level learners and 06 learners studying mathematics at A-Level. Two teachers could teach mathematics up to A-Level at this school. Only A-Level pure mathematics was offered at this school.

- ***S5***-This high school in Bulawayo was officially opened in 1983. A-Level classes were introduced in 2005, and A-Level mathematics classes were introduced in 2008. The school dropped statistics as an A-Level subject in 2023 owing to low student uptake. The school enrolled 1685 learners, with 206 A-Level learners and 81 learners studying pure mathematics at A-Level. Four teachers could teach mathematics up to A-Level at this school.

4.4.5 Teachers information

The study included only mathematics teachers who teach MoPSE A-Level mathematics. The teachers completed the open-ended questionnaires and helped the researcher gather willing learners for focus group discussions. In total, five teachers from different schools took part in the main study. The teachers hold the following qualifications:

- **Teacher 1**: Bachelor of Education Degree in Mathematics is male and is aged between 51 to 55 years.
- ***Teacher 2:*** Master of Education in Mathematics is female and is aged between 31 to 35 years.
- ***Teacher 3:*** Postgraduate Diploma in Education and is aged between 36 and 40 years.
- ***Teacher 4:*** Postgraduate Diploma in Education and is aged between 36 and 40 years.
- ***Teacher 5:*** Bachelor of Education in Mathematics and a Master's in Operations Research and Statistics. He is aged between 36 to 40 years.

The decision to select one mathematics teacher per school was deliberate and methodologically grounded. In each of the five schools, the researcher purposively selected the mathematics teacher most knowledgeable in A-Level mathematics subject selection at that school. This expertise-based purposive selection ensured that the data collected from each school reflected the perspective of the practitioner best positioned to provide informed, comprehensive responses, rather than generating multiple responses from a single site that might introduce inconsistency or redundancy into the data set. In schools where several teachers were qualified to teach A-Level mathematics, for example, S2 and S5, each of which had four such teachers, the process was explicitly guided by the criterion of familiarity with the full range of MoPSE A-Level mathematics subjects. One teacher per school was, therefore, considered methodologically sufficient because the study's focus was on institutional dynamics and school-level subject selection practices, not on the variation

of individual teacher opinions within a single school. This approach aligns with the purposive sampling rationale applied throughout the study. The aim was to select participants who could provide the richest, most informative data in relation to the study's objectives (Prior et al., 2020).

4.4.6 School Heads information

It was necessary to include the school heads, as they are the ones accountable for the subjects offered in schools. Given the broad curriculum with various options, it was of paramount importance to hear the school heads' justifications for including selected A-Level mathematics subjects in their curricula. Five school heads were included, all from selected schools. The information about the school head:

- ***School Head 1:*** was the age range of 56 years and above, holds a master's degree in education management and a postgraduate diploma in education.
- ***School Head 2:*** is a holder of a Master's in Education Management and is in the age range of 56 years and above.
- ***School Head 3:*** has a Master's in Education Management and is in the age range of 51 to 55 years.
- ***School Head 4:*** holds a Master's of Education in Biology and is in the age range of 51 to 55 years.
- ***School Head 5:*** has a Bachelor of Education in English and is in the age range of 46 to 50 years.

4.4.7 Description of learner participants

The study included A-Level mathematics learners studying the MoPSE curriculum. A total of 30 learners participated, namely 17 girls and 13 boys. Each of the five schools contributed six learners to participate in the research study. Of the 30 learners, six were studying both pure mathematics and statistics, while the remaining 24 were studying only pure mathematics. Five learners were between 16 and 17 years old, and the remaining 25 were 18 years old and above. It was presumed that all learners were equally situated in terms of educational standards and situational expertise. This suggests that the learners were enrolled in government-operated schools and were subjected to the MoPSE A-Level mathematics curriculum, with all learners having completed and passed their O-level mathematics with a C or better before pursuing their A-Level mathematics studies.

4.5 Pilot study

Pilot studies provide important information for the development and potential success of a subsequent, larger study (Kunselman, 2024). A pilot study calls for proper planning. The researcher ensured that the instruments were put to the test, as explained briefly in section 5.2.

4.6 Data collection procedures

The researcher utilised a mix of questionnaires, focus groups and document analysis to gain a solid understanding of the topic under study.

4.6.1 Questionnaire development

The researcher undertook a literature review (see Chapter Three) to identify key focus areas and developed a draft questionnaire. This questionnaire (see Appendices M and N), created in English, consisted of two sections. Section A of the questionnaires included biographical variables for A-Level teachers and school heads. This allowed the researcher to gain an overview of the professional qualifications of these education specialists entrusted with guiding learners as they transition from O-level to A-Level mathematics and delivering the broad MoPSE A-Level mathematics curriculum. The biographical variables included gender, age and professional qualification(s). Section B included the items formulated from the main research question: What informs the mathematics subject choices for learners at A-Level?

Informed by the main research question, the teacher questionnaire had ten questions, whereas the school heads' open-ended questionnaire had 11 questions about issues related to:

- The A-Level mathematics subjects offered at respective schools.
- Considerations made by learners when choosing mathematics subjects to study at the MoPSE A level.
- Influence of teachers, peers and the role of parents when learners select MoPSE A-Level mathematics subjects.
- How the school and teachers assist when learners select MoPSE A-Level mathematics subjects.
- Possible suggestions for fair MoPSE mathematics A-Level subject(s) selection

The researcher kept the questionnaire concise to facilitate ease of completion and understanding. To ensure validity and reliability, a senior mathematics teacher from School 1

reviewed the questionnaire's content and clarity during a pilot study. The questionnaire was designed to be self-administered, with participants instructed to provide their responses in the provided spaces at their own convenience.

4.6.2 Advantages of using a Self-administered open-ended questionnaire

Open-ended questions allowed participants to openly express their opinions without worrying about prejudice. Open-ended questions allow participants to explore their natural responses, avoiding the possibility of bias that arises from providing planned answers (Turner, 2017). An open-ended questionnaire was used to understand participants' views on MoPSE A-Level mathematics subject selection. The use of open-ended questionnaires enabled school heads and teachers to respond in their own words, resulting in more meaningful responses. Because there were no restrictions on their choice of words, participants answered in ways the researcher had not otherwise considered.

4.6.3 Challenges of using the self-administered open-ended questionnaires

Self-administered surveys are unsuitable for illiterate participants, according to Bhattacherjee (2012), because open-ended questions need sophisticated writing skills. All participants were degree holders who could express their opinions in writing. Owing to the self-administered nature of the questionnaires, the researcher was unable to observe the body language of the school heads and teachers and therefore had to follow up on certain responses to obtain clarifications where necessary.

4.6.4 Learners' focus group discussion

To complement data collected from school heads and teachers, the researcher also collected data from learners through focus group discussions. This allowed the researcher to prove more. This allowed the researcher to ask students to clarify their answers when they seemed ambiguous. Robinson (2023) asserts that by using verbal cues that elucidate, clarify, exemplify or explain a participant's previous response to an interview topic, probing offers access to a deeper level of information and insight. Focus groups are defined by Busetto, Wick and Gumbinger (2020) as group interviews intended to investigate participants' knowledge and experiences, especially in comprehending how and why people behave in particular ways. The researcher aimed to explore the reasons behind learners' selection of A-Level mathematics subjects and the process by which they chose the MoPSE A-Level mathematics subjects. This method enabled the researcher to gather insights and suggestions from learners, which were

integrated into a framework to guide stakeholders in selecting MoPSE A-Level mathematics subjects.

4.6.5 Developing Questions for focus group discussion with learners

To gather information on the A-Level mathematics subjects learners are studying and how they chose them, the researcher organised and conducted a focus group discussion. The researcher carefully prepared 11 questions for the focus groups; these were developed based on the study's research objectives (see Appendix P).

4.6.6 Preparing to collect data through focus groups

Before travelling to the schools for the focus group discussion, the researcher contacted the teachers two weeks in advance. This became easier as these teachers assisted in assembling the learners and notifying the researcher of the learners' most convenient time to engage. All learners involved in the study were provided with an information sheet and consent forms to take home for their parents' signatures. These were signed and returned to the teacher, who later handed them to the researcher. The researcher visited the designated schools where the focus discussions took place. These interviews were conducted during lunchtime to avoid disrupting teaching and learning. The maximum time allocated for each focus group discussion was 50 minutes (inclusive of 15 minutes for introductions and the collection of signed assent and confidentiality forms). Table 4.1 shows the duration of the focus groups.

Table 4.1: Duration of focus group discussions

Name of Focus Group	**Duration**
FG1	43 minutes 27 seconds
FG2	48 minutes 05 seconds
FG3	44 minutes 01 second
FG4	40 minutes 17 seconds
FG5	43 minutes 20 seconds

Table 4.1 shows that, on average, the interviews lasted 48 to 50 minutes. Although the learners had read the information sheet, the researcher used the first 15 minutes of each focus group to physically introduce herself and provide an overview of the study. Within the first 15 minutes,

the researcher ensured that every participant had returned the consent and confidentiality forms before beginning to answer questions.

4.6.7 Collection of data through focus group discussions

In educational research, focus groups can be used to seek information from participants (Hornsby, 2022). For instance, the researcher used focus groups to explore learners' perceptions of MoPSE A-Level mathematics subject selection. After communicating with the teachers, the researcher travelled to conduct focus group discussions with the learners who had previously submitted signed consent forms. The researcher asked questions that guided the discussion, and the learners took turns responding, keeping it flowing smoothly.

4.6.8 Advantages of focus group discussions

Focus group discussions offered a more in-depth understanding of learner participants' perceptions, thereby providing potential answers to the reasons behind the selection of certain MoPSE A-Level mathematics subjects. Focus groups do not discriminate against people who cannot read or write, and they can encourage participation from people reluctant to be interviewed on their own or who feel they have nothing to say (Gundumogula, 2020).

4.6.9 Disadvantages of using focus group discussions

Katz-Buonincontro (2022) posits that the information acquired may reflect individual feelings and thoughts, yet it can also be shaped by phenomena such as 'groupthink', wherein individuals align with the beliefs of others. Focus groups can inadvertently exclude some individuals, particularly those who lack confidence in speaking, struggle with articulation or face communication challenges. Moreover, Gundumogula (2020) notes that all research methods have drawbacks. In focus group settings, dominant participants may unduly influence discussions, potential bias can emerge, and it becomes challenging to separate personal opinions from collective perspectives. The researcher-maintained control throughout the discussions, ensuring that all participating learners expressed their views without fear of judgment. Learners took turns to respond as they had planned with the researcher on the order of the discussion in the initial 15 minutes of the discussion.

4.6.10 Audio recording

To facilitate transcription, the researcher ensured that the focus group interviews were audio-recorded. The researcher used a smartphone with a recording app and a laptop as a backup.

These were placed in the middle desk where the participants were seated. Audio recording saved the researcher time by allowing them to write down what the learners were saying during the discussion. This suggests that the researcher invested more time in the conversations, enabling a more thorough understanding of the issues being studied. This claim is supported by Ngozwana (2018), who believes that focus groups allow for more interaction between the participants and the researcher. Each of the five focus group talks was captured on tape. As advised by Ruslin et al. (2022), the researcher saves the recorded audio files on the computer's hard drive, and after five years, they will be permanently erased using the appropriate software.

4.7 Document analysis schedule

This approach enables academics to conduct investigations they might not otherwise be able to complete in the analysis of pre-existing texts (Hani, 2022). The main reason why this was used is that the researcher wanted to verify some of the teachers, school heads and learner responses regarding the provision of all MoPSE A-Level mathematics subjects. The researcher had access to MoPSE websites, where curriculum policies and updates are regularly posted. The documents that were analysed included the Zimbabwean Ministry of Primary and Secondary Education (MoPSE) curriculum development framework (for the Competence-Based Curriculum 2015-2022), the MoPSE Advanced Level Mathematics syllabi and the MoPSE guiding documents on A-Level subject registration. What follows is an explanation of why it is necessary to examine each of these documents.

4.7.1 Curriculum framework for Ministry of Primary and Secondary Education (2015-2022)

An analysis of the curriculum development framework provided an overview of the roles of the key actors involved in the delivery of the A-Level mathematics subjects offered by MoPSE for registration (pages 44 to 48). It highlighted the role of stakeholders, such as parents, school heads and teachers, in supporting learners as they select and study different MoPSE A-Level mathematics subjects. This analysis helped to identify connections and disconnections between the framework and the stakeholders directly involved. For instance, the framework was meant to effectively guide parents, teachers, school heads and learners in what is expected of them to succeed in chosen A-Level mathematics subjects. The document analysed in this section is Ministry of Primary and Secondary Education [MoPSE]. (2015), Curriculum development framework for Zimbabwe (Competence-Based Curriculum 2015–2022) (https://www.mopse.co.zw).

4.7.2 MoPSE A-Level mathematics syllabi

The four A-Level mathematics syllabi helped the researcher verify that the A-Level mathematics subjects were unique. This was necessary to gain an informed view of how A-Level learners choose A-Level mathematics subjects to study during the lower and upper 6th forms. The syllabi should serve as a guide to determining which subjects learners should take, in a simplified and justifiable manner, considering future studies and career pathways. The following elements were investigated in the syllabi: preamble aims, objectives and time allocated to cover concepts in respective syllabi, which are pure mathematics (6042), statistics (6046), Additional Mathematics (6002) and Mechanical Mathematics (6021). Numbers in brackets represent the codes. The researcher had access to the soft copies of the syllabi through the MoPSE website as they are uploaded for public consumption. Hence, it was easy for the researcher to scrutinise these documents without any challenges and to relate to justifications that were given by school heads, teachers and learners for not considering all A-Level mathematics subjects in their curriculum. The documents analysed in this section are Advanced Level Mathematics syllabi: Pure Mathematics (6042), Statistics (6046), Additional Mathematics (6002), Mechanical Mathematics (6021). Government of Zimbabwe. (https://www.mopse.co.zw).

4.7.3 MoPSE A-Level subject registration guiding document

The MoPSE A-level subject registration guiding document is a key document for the learners, parents and school administration as well as the industry and tertiary institutions. Subject registration and how they are organised are what MoPSE is responsible for doing. Therefore, such a guiding document should not be vague but clear to the learners so that they select and register what will better position them when enrolling in tertiary institutions and when following various career pathways. Hence, the researcher needed to examine the MoPSE A-level subject registration guiding document to determine if it contained any anomalies that might reveal a gap that the study aimed to address. The document analysed in this section is: Ministry of Primary and Secondary Education [MoPSE], A-Level subject registration guiding document. Government of Zimbabwe. (https://www.mopse.co.zw)

4.8 Data analysis procedures

The information gathered from focus group discussions and open-ended surveys was examined and used to inform both document and participant response coding (Braun & Clarke, 2021).

Transcribing data from questionnaires

This was handled by de-identifying the participants (see Table 4.2) and transcribing the data, which is considered the first step in presentation and analysis (Stuckey, 2014). All responses from the five teachers and five school heads were compiled into comprehensive Word documents, facilitating easier coding and comparison of the feedback gathered from each participant. The transcripts were then uploaded into Atlas.ti for manual coding.

The researcher listened to the audio recording and transcribed the learners' responses into a Word document. The first step was to get everything in writing with a verbatim transcript. After the transcription, the transcriptions were uploaded into Atlas.ti to start the coding process. It is important to highlight that, while Atlas.ti was used for data analysis, the concept of thematic analysis was conceptualised within the framework provided by Braun and Clarke (2021), who outline the stages as follows:

4.8.1 Use of Atlas.ti

The researcher used Atlas.ti for its analytical capabilities to facilitate a systematic approach to data interpretation, enabling the triangulation of findings across diverse stakeholder perspectives, including teachers, school heads and learners (Quispe-Calderon et al., 2024). In other words, this implies that the researcher did not have difficulties with the manual tasks of cutting out narrative pieces, forming a collage of papers and posters, or developing spreadsheets to systematise qualitative data.

Atlas.ti offered features that centralised all the necessary information for organising data collected, enabling coding performed in the software itself, mediated by the researcher, who continued to play the leading role in the analysis process as the critical thinker (Flick, 2009; Friese, 2014). Although Atlas.ti is easy to understand and simple to follow, researchers must undertake preparatory steps, including getting familiar with the Atlas.ti guidebook and seeing training videos from the UNISA M&D Training Workshops YouTube channel, accessible at https://www.youtube.com/watch?v=SzHDEFF3ww4&t=83s.

4.8.2 Coding the data

Qualitative coding is always a necessary part of the qualitative data analysis process. A code in the context of qualitative data analysis is a summary of a larger segment of text (Wa-Mbaleka & Rosario, 2022). Furthermore, coding provides a way to make the meaning of the data clear to the researcher and to the research audience. Berthet et al. (2023) acknowledge that coding serves as a method for structuring and organising data, and deriving meaning from it, such as by recognising patterns. Elliott (2018) asserts that coding is a crucial subject because it facilitates the comprehension of data related to research questions and objectives, thereby establishing a solid foundation for interpretation.

The primary goal of using codes in qualitative data analysis was to establish relationships among data by classifying them into relevant themes. For example, the combined perspectives from SCCT and RCT suggest that teacher influence operates alongside other factors, highlighting that good teaching can motivate learners to select subjects with confidence, thereby shaping their grassroots career goals.

4.8.3 Developing themes

During this process, the focus was on the desired data guided by the objectives, while ignoring what did not meet them. In this regard, Creswell (2018) argues that researchers need to code data, focusing on some of the data and eliminating unnecessary data that to fulfil the objectives of the study. In building a guidance framework for A-Level mathematics subject selection under MoPSE, the researcher primarily used information gathered from learners, educators and school heads. These insights collectively deepened understanding of the challenges involved and fostered a more complete understanding of A-Level mathematics subject selection. During thematic analysis, all statements were meaningful, either illuminating individual concepts or revealing themes common across multiple responses. Figure 4.2 depicts the category, academic self-perception and/or peer influence, with codes linked to the teacher, school heads and learner responses. The codes include academic workload, teacher influence, misguidance, information seeking, peer influence, parental influence and lack of subject selection guidance.

Consistent with Braun and Clarke's (2021) six-phase thematic analysis framework, the following stages guided the data analysis process in this study:

Phase 1: Familiarising yourself with the data. This involved immersing the researcher in the data by repeatedly reading and re-reading the transcripts from focus group discussions and open-ended questionnaires. Notes on initial ideas were recorded during this phase. The

researcher listened to audio recordings and read the transcribed data from all five focus groups and ten questionnaires (five teachers and five school heads) multiple times to gain a thorough understanding before formal coding commenced.

Phase 2: Generating initial codes. The data were coded systematically using Atlas.ti. The researcher highlighted relevant features of the data and assigned codes that captured meaningful information. As described in section 4.8.2, codes such as academic workload, teacher influence, misguidance, information seeking, peer influence, parental influence and lack of subject selection guidance were generated. Each code summarised a segment of data relevant to the research questions.

Phase 3: Searching for themes. After generating all initial codes, the researcher sorted different codes into potential themes and collated all data relevant to each potential theme. Atlas.ti was used to group the codes into categories and potential themes. The researcher considered how different codes could be combined to form broader themes that captured the patterns of meaning in the data in relation to the research questions on mathematics subject selection.

Phase 4: Reviewing themes. This phase involved checking that the themes worked in relation to the coded extracts and the entire data set. The researcher refined the themes by re-reading all the data extracts associated with each potential theme to determine whether they formed a coherent pattern. Some codes were merged, and others were separated to produce well-defined, distinct themes that accurately represented the data.

Phase 5: Defining and naming themes. The researcher defined and refined each theme, and produced a detailed analysis of each. Each theme was given a name that clearly communicated the essence of what the theme was about. The themes were directly linked to the four research questions guiding the study and informed the discussion of findings presented in Chapter 5.

Phase 6: Producing the report. The final phase involved producing the scholarly report. The researcher wove the analytic narrative and the data extracts into a coherent, scholarly and compelling account of the data relevant to the research questions. The themes were reported with supporting verbatim quotations from participants to substantiate the interpretations made, as presented in Chapter 5 of this thesis (Braun & Clarke, 2021).

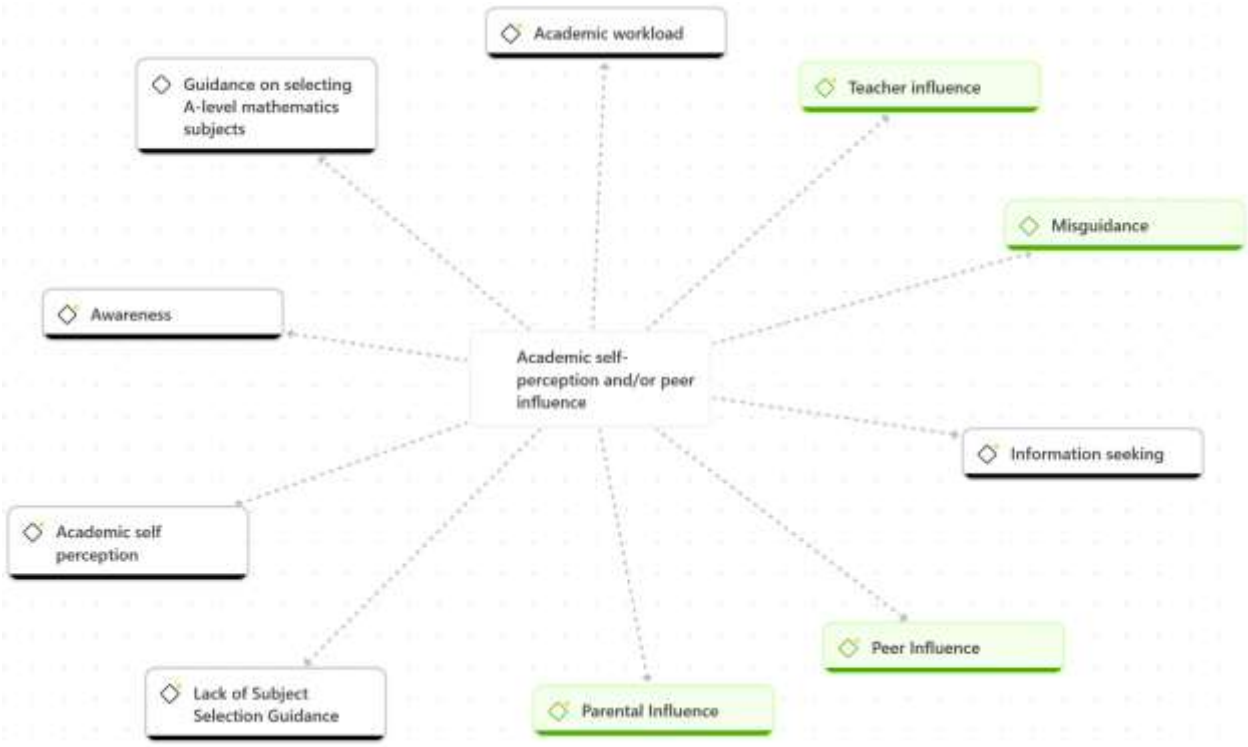

Figure 4.2: Atlas.ti view showing codes associated with a category, academic self-perception or peer influence

The stages which were involved in thematic analysis are explained in detail in the next paragraphs:

1. Data Reduction

This type of analysis is used to filter, classify, sort and concentrate data to derive and validate findings (Attri, 2023). Reducing and transforming data into qualitative research can be achieved in various ways, such as selection, summarising, paraphrasing, or subsuming into a larger pattern. The next section outlines and explains the various stages of data reduction, specifically how data from focus group discussions and open-ended questionnaires were coded.

The first phase of data reduction

After applying the codes and tagging the qualitative insights, the data were ready to be grouped into themes linked to the relevant categories. To facilitate familiarisation with the text through repeated interaction with the data, Blann (2018) argues that, in theme analysis, the data should be evaluated at least twice. Reviewing the data many times after identifying the codes and themes was advantageous for several reasons:

• It enabled comprehending the comprehensive context and establish correlations among the participants' perspectives, concepts, and the data obtained via document analysis.

• Preliminary reading before the analysis facilitated understanding and allocating additional

time for data analysis, thereby preventing premature conclusions.

1. ***The second phase of data reduction***

During this stage, relevant sentences from each participant were identified and marked. Through data reduction, the researcher was able to discern precise codes and categories aligned with objectives, thereby facilitating the systematic development of themes discussed in Chapter 5.

2. ***The third phase of data reduction***

This stage included using the highlighted phrases and later partitioning the data into smaller segments called categories. The researcher examined the transcribed data to compare, contrast and identify any omissions (Ryan & Bernard, 2003).

3. **Data display**

In this step, data were retrieved utilising an ATLAS.ti data display (Sakaji et al., 2021). The process aimed to analyse the acquired information. Data visualisation makes it easier to arrange concepts and ideas, and arranges information. In the form of categories under themes, each piece of data provided an opportunity to better explain the data. To support the interpretation of data for certain claims, direct quotations were used throughout this step in the data presentation (Gerbing, 2023).Some of the responses from the participants enlightened on important issues. For example, the researcher was able to link responses from teachers, school heads and learners and check for convergence in the data, which assisted in coming up with a meaningful discussion of the results.

4. ***Data drawing and conclusions***

The final stage in Miles and Huberman's (1994) methodology is drawing conclusions based on the evidence. One strategy used to glean insights from the data was to look for recurring themes and patterns; another was to group similar or dissimilar statements into meaningful categories; and a third was to determine the importance of individual statements based on their similarities or differences. Because of their interdependence, data reduction and data presentation were treated as a single process rather than two distinct steps. The researcher analysed the data meaningfully and identified convergent meanings that showed similar viewpoints among learners, teachers and school heads, while presenting results from questionnaires and focus groups.

4.9 Ethics and negotiating access

Tolich and Tumilty (2021) adumbrate that ethical researchers must carefully consider how their findings will be received, comprehended and used by external audiences. There was more on protecting participants, ensuring their interests and rights, and on assessing risks and protecting confidentiality, among other issues. The next subsection describes the ethical considerations adhered to during the study.

4.9.1 Gaining access/ Permission

Upon approval of the research proposal from the University of South Africa, the researcher applied for ethical clearance from the university, which was granted under the certificate reference number 2024/03/13/19674112/45AM (see Appendix A). The researcher also obtained permission to collect data in schools from the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe (see Appendix C). The researcher was advised to notify the provincial education director of Bulawayo Metropolitan Province regarding the plan to visit schools for data collection. After the presentation of the approval letter issued by the MoPSE, the Bulawayo Provincial Schools Inspector for Strategic Policy Planning, Research and Statistics issued an additional authorisation letter. This letter was required to be endorsed by the respective district inspectors of the selected schools before the researcher could be granted final permission to access the schools and collect data (see Appendix E). This letter was subsequently used to gain access to five schools, where it was presented to the school heads, along with a letter for school heads (see Appendix G), which permitted data collection in their respective schools. School heads from school two requested that a copy of the letter be retained, which was photocopied and provided to the respective school head.

4.9.2 Voluntary participation

Learners who took part in the study did so voluntarily after reviewing the information sheet (see Appendix F). Given the established norms in research regarding confidentiality and anonymity, the researcher outlined the measures taken to ensure these principles were maintained.

4.9.3 Anonymity

To ensure anonymity, pseudonyms were used in place of real names (Besen-Cassino & Cassino, 2017). The following identifiers were used: **P** for participants. The other identifiers are shown in Table 4.2.

Table 4.2: Pseudonyms

	Pseudonym		**Pseudonym**		**Pseudonym**
Focus Group from School 1	**FG1**	Teacher from school 1	**T1**	School Head from school 1	**SH1**
Focus Group from School 2	**FG2**	Teacher from school 2	**T2**	School Head from school 2	**SH2**
Focus Group from School 3	**FG3**	Teacher from school 3	**T3**	School Head from school 3	**SH3**
Focus Group from School 4	**FG4**	Teacher from school 4	**T4**	School Head from school 4	**SH4**
Focus Group from School 5	**FG5**	Teacher from school 5	**T5**	School Head from school 5	**SH5**

This is in line with Wang, Ramdanib, Sun, Bose and Gao (2024), who highlight that to de-identify participants and protect their privacy, researchers are expected to remove participants' names and assign them pseudonyms. To further ensure anonymity, participants' data were pseudonymised in the data presentation. Teachers were labelled using the format P1_T1, denoting Participant 1, teacher from the first school visited, followed by P2_T2**,** P3_T3**,** P4_T4**,** and P5_T5. School heads were identified using the format P6_SH1, indicating Participant 6, the school head from the first school visited by the researcher. Learner participants from the focus groups were coded as P11_FG1**,** representing Participant 11 from focus group 1 at the first school visited.

4.9.4 Privacy and Confidentiality

Bos (2021) and Mayan (2023) define confidentiality as the protection of research information from disclosure to third parties. Participants are more likely to give truthful answers when they have confidence that confidentiality will be maintained, especially when it comes to delicate subjects (Creswell, 2014; Ruel, 2019). As a result, answer authenticity can be improved by

using secrecy. The confidentiality clause states that although the researcher keeps some participant identifiers and may link participants to their data, they promise not to reveal these relationships to the public (Bos, 2021). Therefore, although participants were identifiable to the researcher, their identities remained undisclosed to individuals external to the study.

Wilson (2014) recommends that researchers and participants sign a confidentiality agreement to prevent unnecessary information sharing by either party. For instance, two weeks before the focus group discussions, the researcher distributed the information sheets to participants to read and understand the study's scope. The researcher preserves physical documentation of participant responses in locked storage units at both work and home offices for a period of five years. Electronic data is secured on a password-protected computer system. At the end of the five years, hard copy materials will be destroyed, while electronic records will be permanently deleted from the computer's storage using designated deletion software.

4.9.5 Informed consent

A key subject of research is ensuring that participants fully understand the study and its possible risks, including the researcher's actions during fieldwork, through informed consent (Klykken, 2021). According to Pietila, Nurmi, Halkoaho and Kyngas (2019), getting study participants' informed consent is a legal and ethical need for any research involving human subjects. This was averred to the participants through the research information sheet. Accordingly, the researcher ensured that all school heads and teacher participants consented to the study's requirements by signing consent forms.

As the majority of learners taking A-Levels were under 18, classified as minors under the Zimbabwean constitution, each was provided with a consent letter to present to their parents or guardians for approval to participate in the study. The researcher informed all participants about the nature of the study, the specific reasons for conducting the study, how the information obtained from participants would be used and the purpose of the study (Quan-Haase & Sloan, 2022). In this instance, the participant was advised that the study was intended to develop a guiding framework for selecting MoPSE A-Level mathematics subjects, which are regarded as unique subjects.

4.10 Validity considerations

One advantage of qualitative research is validity, which is assessed by evaluating the accuracy of results from the perspectives of participants, researchers, or readers of an account (Creswell, 2018). Study validity is defined by Ferreira and Patino (2017) as the degree to which results from a sample of people adequately reflect the experiences of similar populations that did not take part in the research. The inclusion of multiple groups in the current study established the research's validity (Chetty & Thakur, 2020). The research included data gathered through focus group discussions with learners, teacher questionnaires and school head questionnaires. The inclusion of diverse groups helped the study avoid bias towards a single type of outcome, creating a foundation for valid results.

4.11 Reliability considerations

According to Creswell (2014), the consistency of a researcher's methodological approach across different researchers or study situations is a subject of qualitative reliability. Reliability in qualitative research concerns whether different researchers would obtain comparable data (Creswell, 2018). The researcher ensured the reliability of the research instruments by providing participants with well-prepared questions aligned with the research questions, which were tested through a pilot study. The researcher also transcribed the collected data in Word documents, which provided an overall assessment and comparison of the data from learners, teachers and school heads. Transcribing the data provided a quick way to interpret results for each individual participant and to identify convergence across the data collected from the three groups.

4.12 Transferability

Korstjens and Moser (2018) highlight that transferability is a process in which the researcher provides a thick description of the participants and the research process. The researcher gave sufficient and understandable information about the research procedure, including the data collection procedures and study participants (Chetty & Thakur, 2020).

4.13 Credibility

One method to guarantee credibility is triangulation (Chowdhury, 2015). Giving participants pertinent information before the interview is another way to increase credibility (Saunders, Lewis & Thornhill, 2012). Participants received the information sheet (see Appendix F), which provides details about the present study. Upon data collection, the researcher identified prevalent themes across data instruments, namely focus group discussions and questionnaires administered to teachers and school heads. Gathering data from different sources allowed the researcher to evaluate the information and identify and exclude any discrepancies. This is termed methodological triangulation.

4.13.1 Methodological triangulation

During analysis and interpretation, the results from the three instruments were compared to enhance credibility or dependability. This aligns with Grey (2018) and Phil (2022), who contend that triangulation can offer a more persuasive argument concerning the reliability of findings, as consistent results from diverse data sources or collection methods are likely to more effectively demonstrate the integrity of the research conclusions. In addition to employing three data-gathering instruments, the researcher adopted two theories to enhance the depth and complexity of the study.

4.13.2 Theoretical triangulation

This involves applying different theoretical frameworks to the same data (Squitieri, Russell, & Ko, 2019). The Rational Choice Theory (RCT) provided a framework for understanding how individuals, that is, learners, make decisions and choose A-Level mathematics subjects based on self-interest. Conversely, Social Cognitive Career Theory (SCCT) explained how learners' interest in selected MoPSE A-Level mathematics subjects is influenced by their expectations and other social influences such as peer, teacher and parental influence.

4.14 Dependability

This involves transparently describing the research steps from the start of a research project through the development and reporting of the findings, with records of the research path kept throughout the study (Korstjens & Moser, 2018). Scharp and Sanders (2018) agree that dependability is a method where researchers clearly explain how they arrived at their conclusions. The research procedure was made transparent and auditable through the use of data transcription and audio recording (Amir, McCarthy & Tong, 2021). Section 4.6.10 details how the researcher recorded the focus group conversations.

4.15 Confirmability

According to Nyirenda et al. (2020), it is crucial to ensure that research findings are free of bias, including social-desirability bias, which may be inherent in the researchers' tool design and implementation. They also emphasise the importance of staying reflexive to effectively manage bias. As advised by Korstjens and Moser (2018), the researcher provided the supervisors with comprehensive information on decisions made during the research process, reflective thoughts, the research materials used, the emergence of the findings, and data management to ensure confirmability and minimise bias.

4.16 Limitations

According to Montgomery (2023), study limitations represent weaknesses within a research design that may influence the outcomes and conclusions of the research. In this case, researchers have an obligation to the academic community to present complete and honest limitations of a presented study. Since the focus group discussions were organised well in advance and liaised with teachers, the learners had read the information sheet; hence, they were likely to have an idea of what the study was all about. Participants' awareness that they are part of a research study can also influence outcomes and limit the external validity of findings (Sedgwick & Greenwood, 2015). Regarding finding a convenient time to conduct focus group discussions, the researcher had to cancel the initially booked dates because the teachers had overlooked the learners' schedules. For instance, the researcher visited School 2 four times; the

first three visits were overlooked by the teacher, as the learners who were supposed to be involved in the focus group were engaged in other extracurricular activities.

There was a threat to internal validity, for instance, changes in participants owing to school heads not being well-informed about the topic under study when learners select subjects to study at A-Level. Internal validity in qualitative research is the degree to which the findings of a study are authentic and truthful, and accurately reflect the experiences and perspectives of the participants (Suh et al., 2024). The initial plan was to have school head participants. However, only the school head from School 1 participated in the pilot study; the other participants in the school head questionnaires were the deputy school heads, who were involved when learners transitioned from O-level to A-Level and selected A-Level mathematics to study. The incorporation of participants with diverse experiences enabled the researcher to identify varied patterns and themes, hence strengthening the likelihood that the findings will be applicable to other contexts.

4.17 Chapter summary

The chapter discussed the criteria used for selecting the participants, the procedures for collecting data and the methods for analysing data. Additionally, the chapter discussed quality criteria and ethical considerations. The analysis of data from an interpretivist perspective has also been explained. The data were gathered utilising three instruments: a questionnaire, focus group discussions and document analysis. A total of 30 learners, five A-Level mathematics teachers and five school heads were involved. Data were coded using phrases derived from the collected data (inductive coding) and the reviewed literature. The research design and techniques employed to carry out the study have been explained in detail. The following chapter will present, analyse and discuss the study's findings.

CHAPTER FIVE
DATA PRESENTATION, ANALYSIS AND DISCUSSIONS

5.1 Introduction

The chapter began by outlining the presentation and summary of data collected in the pilot study, and then presenting the data collected for the main study. Thematic analysis was employed to identify recurring words, extracts and concepts within the qualitative data set.

The data were collected through document analysis, open-ended questionnaires and focus group discussions to address the following research questions:

- What informs the mathematics subject choices for learners at A-Level?
- How do teachers influence learners' mathematics subject choices?
- What role do parents play in their children's mathematics subject choices at A-Level?
- In what ways can learners be assisted to select suitable Advanced-Level mathematics subjects offered by MoPSE?

5.2 Summary of findings from pilot study

Aziz and Khan (2020) defined a pilot study as a small-scale, preliminary data-collection procedure conducted before the main study to assess its feasibility. This procedure enabled the researcher to refine the research questions, identify the most effective methods and estimate the time and resources required for the main study (Reynolds, 2023). In the context of this study, the pilot study played a crucial role in refining research instruments, involving topic-knowledgeable participants to anticipate challenges in data collection and analysis, and building confidence in conducting qualitative research.

5.2.1 Focus group questions

The discussion with the learners lasted for 44 minutes and seven seconds (inclusive of the 15 minutes of introductions and collection of signed assent and confidentiality forms). Hence, the 50-minute slot for each focus group was deemed adequate, with no adjustments required. The focus group discussion times were kept short to prevent fatigue among learners (Nyumba et al., 2018).

The learners gave a valuable insight for improvement. For example, they requested the researcher to explain to them what the *MoPSE subject registration guide* was, which emanated from the following research question: *How did the **MoPSE subject registration guide** assist you in making an informed decision while selecting your preferred A-Level mathematics subject?* The researcher clarified it in all the focus group discussions that followed.

5.2.2 School head questionnaires

The Head of School 1 recommended that deputy heads be included in the research since they have more specific and useful expertise about A-Level recruitment concerns. The researcher later incorporated deputy heads from other participating schools into the study to enhance the richness and depth of data. This aligns with Bulawa and Mhlauli (2018) assertion that school heads often delegate their duties to deputies owing to their engagement in external commitments.

5.2.3 Teacher questionnaires

The teacher who was not teaching A-Level had limited knowledge of most questions and advised the researcher to include teachers currently teaching A-Level. When consulted, the A-Level teachers answered the questions clearly without requiring any adjustments. Section 5.3 detailed the preliminary stages of data presentation, which involved generating codes in Atlas. Ti. The generated codes strengthened the theme development process. Section 5.4 presents the main study's data.

5.3 Generating codes in ATLAS.ti

To code, the researcher had to read the data line-by-line, applying codes in ATLAS.ti by identifying data segments represented by words or short phrases. ATLAS.ti's interface for viewing data made it easy to highlight data segments and apply new codes or existing codes quickly and efficiently. Figure 5.1 shows a sample of data from the teacher questionnaire uploaded in ATLAS.ti and the codes that were applied by the researcher immediately thereafter. This includes the questions asked by the researcher, teacher responses, and the far-right codes that emerged from ATLAS.ti.

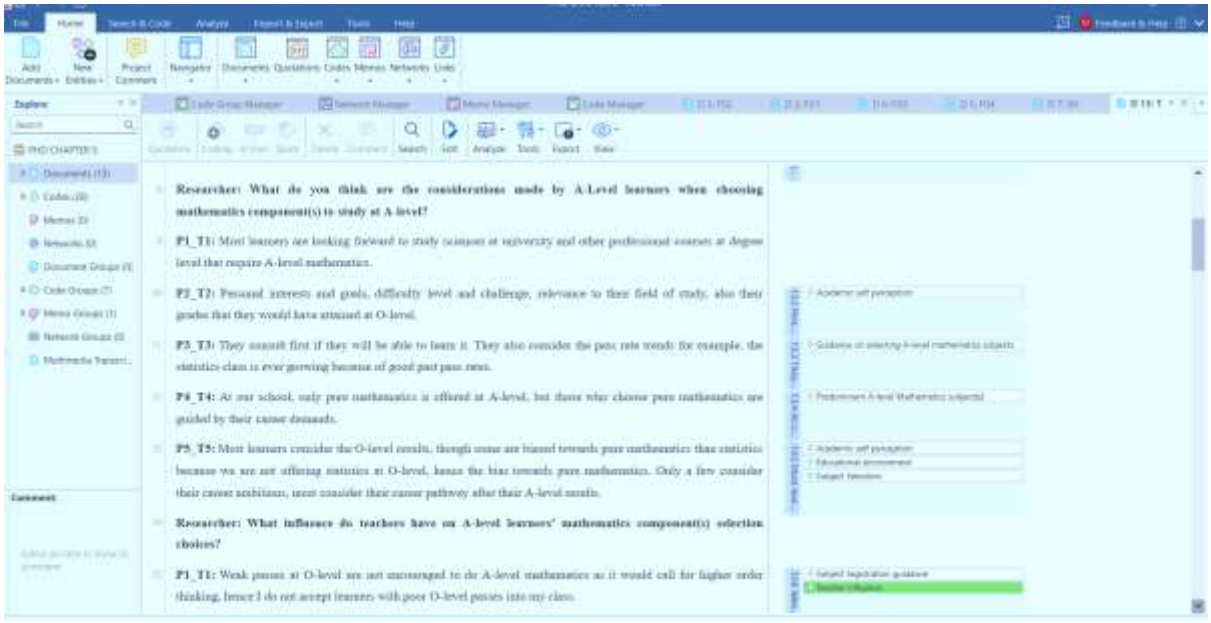

Figure 5.1: Transcribed teacher questionnaire views uploaded in ATLAS ti

By coding qualitative data, it was easier to identify consistency and scale within a set of individual responses. The data were coded inductively, which helped the researcher uncover unexpected insights. Inductive coding, also referred to as open coding, involves creating codes as the researcher progresses through the data, thereby maintaining an open mind about what the data reveal, even if they differ from preconceptions (Mayring, 2021).

The researcher developed the codes based on the collected data, guided by insights from the reviewed literature. For open coding, one of the focus groups responded as follows: *Personal interests and goals, difficulty level and challenge, relevance to their field of study, and their grades that they would have attained at O-level* (see Figure 5.1: P2_T2). Based on this response, codes such as 'academic self-perception' and 'mathematics difficulty' were created. During this process, initial codes were generated, fostering a close engagement with the data that allowed the researcher to uncover meaningful insights. Thematic analysis in this case advanced the process by clustering these codes into broader themes that capture the essence of the data. This dual approach not only streamlines the analytical process but also enriches the findings by highlighting interconnections among various data sources, such as the perspectives of A-Level mathematics teachers, school heads and learners from focus group discussions, as well as relevant MoPSE documents. Figure 5.2 illustrates a screenshot of ATLAS.ti showing the Code Manager with grouped data, as well as details of the uploader and coder (the name of the researcher).

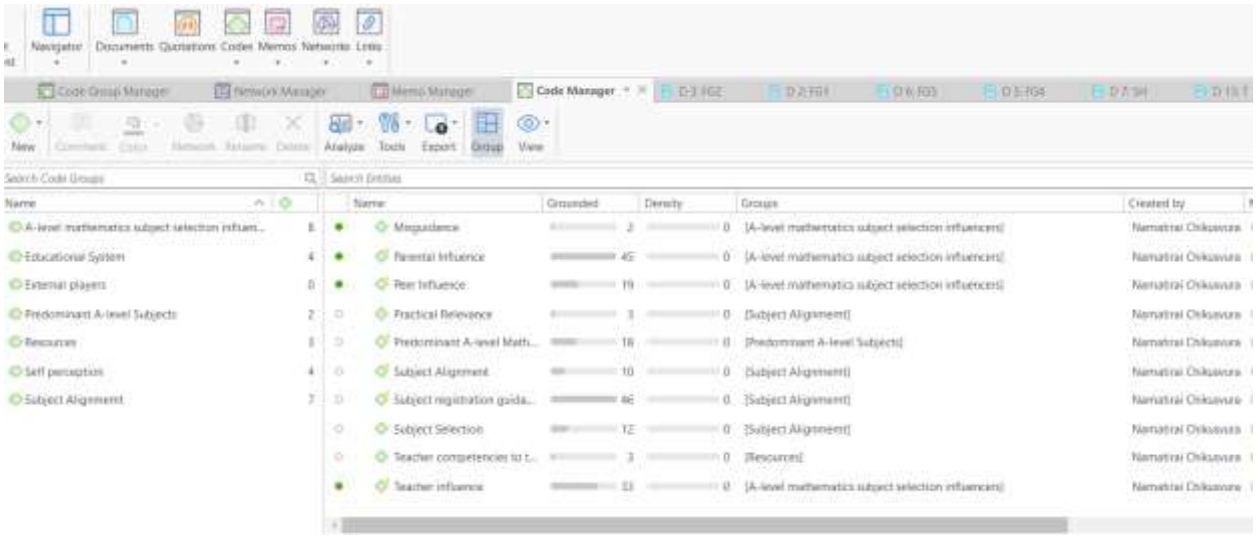

Figure 5.2: ATLAS.ti Code Manager Screenshot Showing Grouped Data and Coder Details (the name of the researcher)

Coding allowed the researcher to review the entire data by identifying its most significant meaning, in other words, what the data were trying to convey (Vanover et al., 2021). This process of categorising the different data pieces helped the researcher in identifying similar emerging patterns. For instance, data collected from similar questions asked to school heads and mathematics teachers emerged under the same themes. The purpose of including Section 5.3 is to enhance methodological transparency by illustrating how ATLAS.ti was used to systematically support the development of codes and themes, thereby strengthening the credibility, rigour and trustworthiness of the qualitative analysis.

5.4 Data presentation: Main findings

In this section, the researcher sought to gain a comprehensive understanding of the factors influencing learners' decisions when selecting A-Level mathematics subjects. This was achieved through focus group discussions with learners and open-ended questionnaires for teachers and school heads. Section 5.4 presents, discusses and analyses the themes that emerged from the coding, that is, the data collected through the questionnaire, focus group discussions and document reviews. The data were presented under emerging themes from participants' responses. To ensure that the analysis of findings is focused, transparent and directly addresses the study's objectives, these themes are structured and discussed in relation to the research questions. In other words, it shows that each theme has a clear purpose and contributes to the overall narrative of the study. For research question 1, the themes presented in Table 5.1 provided categories for interpreting and discussing the findings:

Table 5.1: Research question 1, emerging themes and categories linked to the themes

Research Question 1	Themes	Categories
What informs the mathematics subject choices for learners at A-Level?	• School provisions	• Pure mathematics • Complementary subjects
	• Expert teachers and digital platforms	• Extra lesson teachers • Checking the syllabi
	• Individual passion	• Personal passion • Peer influence • Sense of superiority • Parental pressure
	• Teachers' views on peer influence	• Peers' discouraging perceptions • Sense of belonging

5.4.1 Research question 1: What informs the mathematics subject choices for learners at A-Level?

To gain a comprehensive understanding of the factors that shape learners' decisions regarding the A-Level mathematics subjects they choose to pursue, the researcher conducted focus group discussions with the learners. Responding to the open-ended questionnaires also allowed teachers and school heads to provide their perspectives on the same matter.

Throughout the data collection process with school heads, A-Level mathematics teachers and learners, the researcher was able to articulate the specific influences that led learners to study their respective A-Level mathematics subjects. Participants reported that various factors influenced their decisions. Section 5.3.1.1 presents data on Theme 1, offering valuable insights into what informs learners' MoPSE A-Level mathematics subject selection.

5.4.1.1 School provisions

Of the five schools that participated in the study, four offered only pure mathematics, limiting learners' exposure to statistics and other mathematical subjects. The trend of offering only pure mathematics seemed common across all the schools. The offering of only pure mathematics suggested a systemic issue in high school curriculum design. The following findings from school heads' individual questionnaires were noted:

Researcher: *"Are you offering all A-Level mathematics subject(s) as per the MoPSE curriculum?"*
P7_SH2: *"We are offering pure mathematics only at this school; this has become the norm in the majority of schools."*
P10_SH5*: "We had very few learners for statistics for the past three years, about two candidates. Also, a critical shortage of teachers to teach the other subjects."*
P8_SH3: *"We are not offering all the A-Level mathematics subjects at this school; we only offer pure mathematics."*
P9_SH4: *"It is not feasible for us to offer all; it is pure mathematics only here."*

Taken together, the participants' responses suggest that pure mathematics was the most popular subject in schools' A-Level mathematics curricula. It was mentioned that offering pure mathematics was the norm. P10_SH5 mentioned statistics but was not provided as a stand-alone subject owing to low learner interest. The findings revealed that of 44 learners, only two selected statistics, leading to their exclusion from the school's A-Level mathematics curriculum.

When probed further regarding the reasons behind offering only pure mathematics in their school, school heads had the following to say:

Researcher: "*Could you please clarify why you chose to include the MoPSE mathematics subject(s) mentioned above in your school's curriculum?"*

P7_SH2: "*To help equip learners with the knowledge of advanced mathematics so that they can adapt well in tertiary institutions."*

P6_SH1: "*They are suitable for both industrial and higher learning as they link to subjects to be pursued."*

P8_SH3: "*It is good as it lays the foundation for many other science-related optional subjects."*

P9_SH4: "*Competent, as they fit well in the institutions of higher learning."*

P10_SH5: "*I think statistics should be incorporated as it prepares learners for research projects in their different programmes. Learners for engineering programmes need mechanics. Pure mathematics alone, which we are offering, is inadequate."*

A prevalent viewpoint was that schools offered selected A-Level mathematics subjects designed to prepare learners for their future academic pursuits (P10_SH5; P7_SH2), specifically pure mathematics. Although participants emphasise that the focus on pure mathematics is aligned with the needs of learners pursuing further studies in sciences and commercial fields**,** suggesting that the curriculum is tailored or customised to support these

pathways, P10_SH5 appears to acknowledge that additional mathematics subjects should be offered to prepare learners for engineering subjects when they further their studies. What the researcher has also observed is that in the subject registration guide, pure mathematics was mentioned as the first compulsory subject that MoPSE A-Level learners should study. This might also be why all the schools ensured they offered pure mathematics. The preparation learners receive in mathematics during their A-Level plays a crucial role in their readiness for the challenges of higher education. This is in line with P7_SH2, P6_SH1, P8_SH3 and P9_SH4, who argued that it lays the foundation for many other science-related optional subjects.

The school heads quoted above advocate this approach, noting that a deep understanding of mathematical concepts not only enhances problem-solving skills but also equips learners with the critical thinking skills necessary for tertiary studies. The teachers also revealed similar thoughts, which linked with what school heads had indicated. Their responses unfolded as follows:

Researcher: "*What can you say about the A-Level mathematics subject(s) offered at this school?"*

P1_T1: *"The reason why we are offering has a broad link to learners who would want to do further studies at the tertiary level in areas of science and commerce."*

P2_T2: "*Pure mathematics, which we are offering, can help learners develop a strong foundation which can be beneficial for further studies in fields such as engineering, physics, computer science and more."*

P3_T3: "*They are offered mainly depending on whether the available staff can teach those subjects. We offer pure mathematics and statistics."*

P4_T4: "*We only offer pure mathematics at A-Level; this is a good foundation for a university course."*

P5_T5: "*Basically, our school is offering two of the MoPSE subjects, that is, pure mathematics and statistics. However, this year we had to offer pure mathematics since learners selected pure mathematics (44 learners) rather than statistics (02 learners). We advised the two learners to choose another combination since we could not have a class of two learners."*

According to P2_T2, P3_T3, and P4_T4 above, learners were not offered a choice between pure mathematics and statistics, let alone between additional mathematics and mechanical mathematics, which may affect their engagement and satisfaction with the curriculum. The findings suggest that the school provisions restricted the uptake of complementary subjects. However, where learners had a choice to do statistics, they were disadvantaged because

enrolment was low (P5_T5). In school 3, they only offered statistics based on staff availability (P3_T3). From their responses, it appeared that teachers believed that the pure mathematics offered was a good foundation for university subjects. The findings seem to suggest that learners are advised based on the careers they want to pursue.

It was also found during the focus group discussion that 24 of the 30 learners indicated that pure mathematics alone was being offered. Only six learners were studying pure mathematics and statistics, that is, from one school. This indicates a strong consensus among learners that only pure mathematics is being taught, indicating a lack of variety in the curriculum. The decision to offer only pure mathematics is influenced by the number of learners selecting it, as alluded to by P5_T5 earlier, which may not reflect the actual demand for a more diverse curriculum, suggesting that the curriculum is reactive rather than proactive in meeting learner needs. Schools that offered pure mathematics (S1, S2, S4 and S5) limited learners' exposure to other mathematical subjects, such as statistics, additional mathematics and mechanical mathematics, which may hinder their overall mathematical education.

5.4.1.2 Expert teachers and digital platforms

To determine whether the learners had proactively prepared for their A-Level studies, the researcher asked them a perceptive question. The investigation specifically aimed to ascertain whether they had made the effort to become conversant with the topics that would be taught in their selected A-Level mathematics subjects. The researcher noted that checking the syllabus was a common action among learners, indicating a standard practice.

P14_FG1, P15_FG1, P19_FG2, P28_FG3, P25_FG3, P31_FG4, and P34_FG4 nodded in agreement, suggesting a consensus on checking the syllabus. From the following responses, it can be noted that learners actively sought information from various sources, including extra lesson teachers, their brothers, sisters and online research, showing a proactive approach to their learning. Learners felt overwhelmed by the number of topics in MoPSE pure mathematics, with 21 topics to understand, which they claimed not to have grasped.

Learners' responses are presented next:

Researcher: "*Have you thoroughly investigated the topics included in the mathematics subject(s)? If so, what kind of investigation have you done?"*

P32_FG4: *"We checked the syllabus on which topics are involved. By just checking the syllabus, you know."*

P12_FG1: "*We downloaded videos from the internet for the topics which seem hard, yooh."*

P16_FG1: "*My extra lesson teacher told me about it."*

P17_FG2: "*Wow, I researched how many topics are there in pure mathematics. I realised that there are 21 topics I should understand; by now I still do not understand them."*

P18_FG2: "*I asked the maths teacher what needs to be covered overall."*

P20_FG2: "*I checked the syllabus, the topics seem very challenging."*

P21_FG2: "*Our teacher told us the topics."*

P22_FG2: "*The teacher told us what we are going to cover, looks tough…"*

P23_FG3: "*Yes, I have investigated this."*

P24_FG3: "*I did online research, looks like pure maths is the trending one."*

P17_FG2: "*By investigation, do you mean we have to investigate the topics; of course, research from YouTube, learning other concepts… [laughs]."*

P26_FG3: "*I got some information from my brother; he emphasised that if I want something challenging, I should go for pure maths."*

Learners perceived statistics as an easy subject, which may influence their decision-making when selecting their MoPSE A-Level mathematics subjects. As a result, some learners opted for pure mathematics, despite experiencing difficulties with it. This choice may persist even when schools offer them the opportunity to explore alternative MoPSE A-Level mathematics subjects that may be better aligned with their interests or abilities. This behaviour suggests that learners often seek greater challenges in their studies, possibly driven by a desire to prove their capabilities or achieve a deeper understanding of complex concepts. These findings are supported by the results presented next:

P30_FG4: "*But if ma'am, if you had a company, would you hire someone who did statistics or pure mathematics; it's pure mathematics. That is why I prefer pure mathematics over statistics; pure mathematics stretches my mind."*

P27_FG3: "*I heard from my sister that pure mathematics is mostly needed at university as it is the most challenging one."*

P29_FG4: "*I enquired from those in the upper six; we asked for references, and most of them said statistics is easy; so, I can't do something not challenging."*

P20_FG2: "*Although I checked the syllabus, the extra lesson teacher has been assisting a lot in covering all topics."*

P21_FG2: "*Extra lessons, most schools do not finish the syllabus, but extra lessons, they ask if I had covered this and that, then they teach me."*

P22_FG2: "*I always check the syllabus and ask the extra lesson teacher to assist me in finishing the syllabus as at school we do not finish all the topics."*

The findings reveal that learners often sought additional lessons outside of their standard classroom hours to successfully navigate and complete the pure mathematics syllabus. This reliance on supplementary lessons highlights a potential concern. If complementary A-Level mathematics subjects were to be added, it could significantly increase the academic pressure on these learners, possibly overwhelming them with the added workload.

This finding has significant implications for the design and implementation of A-Level mathematics subject selection guidance. The structural conditions within which A-Level mathematics is taught, including large class sizes, limited resources and compressed timetables, may be insufficient to sustain learners who are already operating at the peak of their academic capacity. This raises questions about equity and access: learners from lower socio-economic backgrounds may not be able to afford private tutoring or extra lessons, placing them at a structural disadvantage compared to their more economically privileged peers. This concern must be factored directly into the VENE framework's Stage 4 (Engagement), which recommends that learners pursuing complementary A-Level mathematics subjects consider arranging external tutoring where necessary. Schools, parents and policymakers should, therefore, actively work to ensure that supplementary academic support is accessible to all learners.

5.4.1.3 Individual passion for mathematics

The study's findings revealed that the decision to pursue A-Level mathematics was mainly influenced by personal passion for the subject. This finding is exemplified in the conversation that follows between the researcher and the learners. The question was asked to determine whether learners were influenced by their peers in selecting the A-Level mathematics subjects they studied.

Researcher: "*To what extent did your peers' input guide your decision-making process in selecting the A-Level Mathematics subject(s)?"*

The following results are from the focus group discussions.

P11_FG1*: "Those who said maths is hard, leave it, but well, I did not because mathematics is my passion."*

P30_FG4*: "They never influenced me. I checked about what I want to do at varsity and mathematics has always been my passion."*

P31_FG4*: "They were not involved; they are now school leavers, those ones, I followed what I like."*

P13_FG1*: "They were involved in misguiding me; for example, advising me not to do mathematics."*

P15_FG1*: "They were never involved because they failed O-level maths; they had always failed the subject when we were at O-level. I was the only one who loved mathematics."*

The findings suggest that the learners choose mathematics because of their love for the subject. The researcher's question aimed to explore learners' self-perceptions of the selected A-Level mathematics subjects. The following interaction between the researcher and the learners attests to this finding.

Researcher: "*To what extent did your peers' input guide your decision-making process in selecting the A-Level Mathematics subject(s)?"*

P18_FG2: *"I thought about my own life before anything else; there is no way they were to influence me."*

P24_FG3: *"I can safely say I just influenced myself; my friends did not contribute."*

P28_FG2*: "Mathematics was always my choice; no one influenced me."*

P29_FG4*: "Not really. I only enquired after choosing the subject from the senior learners about how difficult pure mathematics is."*

P18_FG2: "*I thought about my own life before anything else; there is no way they were to influence me."*

P21_FG2: "*My friends did not take part; I chose mathematics by myself."*

P11_FG1: "*Those were saying 'maths is hard, leave it.'"*

P12_FG1: "*Most of my friends were saying, 'maths is hard, do not do it.'"*

The learners expressed that their decision to study mathematics was autonomous. However, their peers regarded the subject as challenging. The learner participants indicated that they made independent choices regarding which mathematics subjects to study at A-Level, as most of their friends were not particularly skilled in mathematics and viewed A-Level mathematics as difficult. When placed among high-ability classmates, learners are more likely to make less ambitious choices. However, this was not the case for P11_FG1, who indicated that their decision to study A-Level mathematics was driven by a personal passion. The findings suggest that being surrounded by peers who are less academically gifted can foster a sense of superiority and enhance a learner's academic self-concept.

Other learner participants had the following to say:

P26_FG3: *"When I was in form three, I discovered there was someone who wanted to do something like mine, but they did not influence me."*

P14_FG1*: "Before we went to lower six, what we did was gather with friends to hear their suggestions, some of them were saying mathematics is hard, and they are ready to take it."*

P14_FG1 explicitly stated that they assembled with peers to debate subject combinations, and the majority did not select the subject at A-Level due to its perceived difficulty. It appeared that consultations with peers helped some learners make informed decisions when selecting A-Level mathematics subject(s) to study. It also came to light that this was owing to parental pressure, as some learner participants had the following to say:

P27_FG3*: "For me, it was my parents and not friends."*

P20_FG2: "*Honestly, my friends were not involved, but my parents were involved."*

The responses from participants P27_FG3 and P20_FG2 indicate that their individual decisions regarding subject choices were primarily shaped by their parents rather than by their peers. Both individuals reported that their parents played a significant role in guiding them toward specific subjects, reflecting strong familial influence on their academic decisions. This suggests that peer pressure or friendship dynamics did not significantly influence their choices, underscoring the importance of parental input in shaping their children's career paths.

5.4.1.4 Teachers' views on peer influence

In this section, the five teachers involved in this study reported that peers discouraging perceptions of the subject's difficulty deterred other learners. Ultimately, the learners' choice to study mathematics stemmed from their genuine interest in the subject and their confidence in their ability to excel in it. Notable similarities were observed in the teachers' responses. The teachers expressed their views as follows:

Researcher: "*How does peer influence impact A-Level learners' choices of A-Level mathematics subjects they study at A-Level?"*

P1_T1: "*Some learners lose focus in their studies due to the influence of peers; hence, poor results due to loss of concentration."*

P2_T2: "*Peer influence creates a sense of belonging among learners, leading them choose similar mathematics subjects to study together. Peers can influence learners' choices through discussions, recommendations and shared experiences."*

P3_T3: "*I cannot answer this one as the learners would answer best for themselves."*

P4_T4: "*Peers can have a negative influence on the learners not to do A-Level mathematics as they believe that the subject is too difficult."*

P5_T5: "*Learners are also influenced by peers in their selection, especially former learners. They even ask for the results of their friends from Form four and choose a subject that the friend would have passed instead of making plain choices."*

P3_T3 believed that only the learners themselves knew what informed their subject choices. That the teacher was not comfortable commenting on subject selection suggests negligence in guiding learners to choose the right A-Level mathematics subjects. P1_T1 noted that the learners struggled to maintain focus in their studies, which may be a consequence of having chosen a subject that was too difficult for them. According to P4_T4, there is a similar idea that certain learners may discourage others from studying mathematics at A-Level because they believe the subject is difficult. A-LevelP2_T2 and P5_T5 shared the view that peers fostered a sense of belonging, leading some learners to select comparable A-Level mathematics subjects to study. This is evidenced in the preceding responses as P5_T5 believe that learners do not make simple choices but rather depend on discussions, recommendations and shared experiences from their peers, as stated by P2_T2. Teachers also believe that the influence is among the learners themselves.

5.4.1.5 Analysis of the MoPSE A-Level mathematics syllabi

Upon analysing the MoPSE A-Level mathematics syllabi, the researcher found that focusing solely on pure mathematics in schools restricts learners' academic options, as the mathematics subjects were unique. While schools are meant to guide learners toward their interests, it became apparent that learners expressed a desire to study more than one A-Level mathematics subject. However, owing to time constraints within the timetable, schools could not accommodate all the MoPSE A-Level mathematics subjects. This challenge stemmed from the difficulty of simultaneously fitting all the subjects within the curriculum. Each MoPSE syllabus had prescribed time allocations for covering all concepts. An analysis of the time allocations for completing each syllabus revealed the following:

1. **Additional mathematics**: Ten periods of 35 minutes each per week were to be allocated to cover 15 topics, including five pure mathematics topics, five mechanics topics, and five statistics topics.
2. **Mechanical mathematics**: Ten periods of 40 minutes each per week were allocated to cover 12 topics.
3. **Pure mathematics:** Ten periods of 35 minutes each per week were allocated to cover seven topics.
4. **Statistics**: This learning area was allocated ten 35-minute periods each week to cover ten topics.

Typically, an A-Level learner studies three subjects over two years. However, without proper guidance on which A-Level mathematics subject to pursue, learners might end up choosing options based on the school's preference, leading to confusion and limited exploration of other possible options. The time allocations indicated the challenge of fitting more than two A-Level mathematics subjects into an already packed timetable. However, it is worth noting that additional mathematics appears to be a well-rounded subject, as it encompasses all other mathematics subjects. Unfortunately, none of the schools in this study offered this to their learners. Of the five schools involved in this study, four offered pure mathematics, leaving the latter as the most preferred MoPSE A-Level mathematics subject. However, a comprehensive curriculum may strain teachers' capacity, which, according to this study, is why learners seek extra lessons outside school hours. With guided planning and timetabling, a comprehensive A-Level mathematics curriculum provides a strong foundation for learners' future mathematics-related studies. This is shown from the following findings, as provided by the school heads:

Researcher: "*Are you offering all A-Level mathematics subject(s) as per the MoPSE curriculum?"*

P6_SH1: "*We offer pure mathematics and statistics, and we are trying to manage. We wish to offer all four."*

P7_SH2: "*Only pure mathematics is offered here."*

P8_SH3: "*No, we are offering pure mathematics only."*

P10_SH5: "*No, we are now offering pure mathematics only."*

Researcher: "*If no, what hinders your school from offering all A-Level mathematics subjects as per the MoPSE curriculum to increase the selection choice of learners?"*

P6_SH1: "*The curriculum with all Mathematics subjects will be too wide for teachers to accommodate. More teachers will be required to take the subjects that are above the allocation by the Ministry."*

P7_SH2: "*Shortage of staff members, as so far only one teacher is taking A-Level Mathematics."*

P8_SH3: "*No qualified personnel and limited time allocation on the timetable."*

P6_SH1, P7_SH2, P8_SH3, and P10_SH5 noted a shortage of expert teachers to teach all A-Level mathematics subjects. P10_SH5 has highlighted the low enrolment in statistics, indicating a predominance of pure mathematics. These findings show that the school heads are well-informed about the available A-Level mathematics subjects but prioritise options they believe are best suited for most learners.

5.4.2 Discussion of findings in relation to Research Question 1

This study's core finding revealed that MoPSE A-Level subject selections are influenced by a complex interplay of institutional, individual and external factors. The emphasis on pure mathematics in schools has become predominant, largely due to contextual constraints such as a scarcity of specialised alternative-mathematics subject teachers, limited student interest, and inflexible curricular frameworks. This discovery corresponds with studies indicating that selections in advanced mathematics are frequently influenced by the organisational structure and capabilities of schools, rather than solely by learner desire (Noyes, Wake, Drake &

Murphy, 2020). This connection aligns with SCCT, which emphasises that the environmental influences shape individuals' interests and decision-making (Sellami, Al-Rakeb, & Tok, 2023).

Learners' perceptions of pure mathematics as challenging yet attractive demonstrate how views of academic prestige and future applicability shape the dynamics of subject choice. Although learners consider mathematics challenging, as according to Hine, Forlin and Chivers (2023), learners often choose advanced mathematics pathways not just owing to interest or ability, but also based on perceived prestige, utility and prospects. Subject selections result from the interplay of cognitive and subjective evaluations, indicating that perceived value might mitigate the impact of difficulty on uptake (Opstad, Toney & Arethun, 2023). The Rational Choice Theory (RCT) postulates that learners' preferences are often not feasible, making it difficult to make the best sensible decision (Dowding, 2019).

The noticeable focus on pure mathematics seems to influence learners' views of alternative subjects, especially statistics, which was frequently perceived as simpler or less challenging. This highlights a crucial dynamic in the subject selection process, that exposure to the curriculum affects learners' prioritisation of subjects based on perceived difficulty and significance (Noyes et al., 2020). Despite learners' desire for broad choices, restricted exposure hindered informed decision-making. School heads' remarks on subject provisions created a limited decision-making context in which institutional feasibility took precedence over learner voice. This dynamic illustrates studies suggesting that leadership decisions significantly influence the available subject pathways and, consequently, learners' options (Hine et al., 2023).

The learner responses indicated diverse perceptions of the subject difficulty and attractiveness, mirroring broader participation trends in A-Level mathematics. These trends align with research indicating that learners' subject selections are significantly affected by confidence, attitudes and the positioning of subjects within school cultures (Opstad et al., 2023). Teacher advice and institutional messaging serve as crucial mediating factors in the dynamics of subject selection. The preference for pure mathematics might create a difficult learning experience, hiding the benefits of studying complementary mathematics subjects. It is well understood that learners might want a wider range of A-Level mathematics options.

However, schools have limitations in their curriculum and mainly focus on subjects that appeal to most learners. Learners' career choices are mainly influenced by subject availability at high school, career guidance, access to work placements and experience, along with social persuasion from family, friends and role models (Kiernan, Walsh & White, 2023). This situation reveals a conflict between learners' motivations and the reality of an education system that does not adequately cater to diverse mathematical interests. Therefore, it is important to consider participants' views and offer better career advice to create a more inclusive educational environment. Although learners might choose pure mathematics for its academic challenges, this choice does not truly reflect their skills or future goals. This implies that subject choices are not rigidly determined by stable individual preferences and are therefore open to influence from new information, persuasion, and opportunities, as postulated by Davies and Ercolani (2019). Furthermore, the study indicates that learner motivation primarily comes from within, meaning that personal interest is often more important than peer influence in choosing subjects.

What also emerged as critical is that the subject school provisions (see Section 5.4.1.1) created a strict academic route that mainly develops skills suited to scientific and technical fields, but also overlooks other areas of mathematics, such as statistics, which other learners may need, especially those specialising in commerce. Worth noting is that while learners may start with an interest in the challenges of pure mathematics, the heavy content can make them feel less engaged and less connected, especially those who might gain from a wider mathematical education. It was noted that learners feel pure mathematics is too demanding (see subsection 5.4.1.4), yet their natural desire to learn pushes them to take it anyway.

While examining the complex situation of A-Level mathematics subject choices, teachers' views showed a clear understanding of how peers affected learners (see subsection 5.4.1.5). Teachers noted that peers' views on how hard mathematics is can put some learners off, but there is also a positive side: peer influence can help create a sense of belonging and encourage learners to choose certain A-Level mathematics subjects. As corroborated by Rehema et al. (2023), in the school setting, learners' perception of a subject usually depends on what they typically hear others say about it. This study found minimal sharing or advice on what learners should choose, which contradicts the fact that sharing is a key aspect of peer support (Zhang & Huang, 2018). To emphasise the importance of sharing, Salim et al. (2023) argue that this exchange is necessary to get the most up-to-date knowledge and anticipate possible issues in

the future labour market. This contrast shows that peer relationships can both provide support and create problems when it comes to selecting A-Level mathematics subjects. For example, the study findings show that, even though learners often felt stressed by pure mathematics, their desire to keep up with friends who regularly tackled these tough subjects pushed them to continue. These findings are in contrast those of Salim et al. (2023), who found that in Indonesia, relying solely on peer support was not sufficient for enhancing career adaptability. This is because peer support is an external subject that is insufficient. Mehmedova's (2017) study also concluded that peers had a helpful impact on learners' decisions about future career options during the last period of their education.

5.4.3 Research question 2: How do teachers influence learners' mathematics subject choices?

In this section, the researcher presents the findings from focus group discussions with learners and the responses from the open-ended questionnaire given to A-Level mathematics teachers and school heads.

Table 5.2 shows research question 2, themes for research question 2 and categories linked to the theme.

Table 5.2: Research question 2, themes for research question 2 and categories linked to this theme.

Research Question 2	Themes	Categories
How do teachers influence learners' mathematics subject choices?	• Confidence building	• Admiring the teacher • Motivational talks
	• Gatekeeping factors	• Teacher recommendations • Teacher subject preferences and competencies

5.4.3.1 Confidence-building

Building on the assumption that teachers play a crucial role in developing learner confidence, the researcher sought to validate this premise through direct inquiry. When learner participants were asked the question below, they offered the following insights:

Researcher: "*Your mathematics teacher must have played a critical role in selecting the mathematics subject(s) you are currently studying. Can you share more about their influence and how it has impacted your progress in the subject?"*

P17_FG2: "*Sometimes we get motivational talks that we must be serious."*

P20_FG2: "*When we are free, and she is also free, we can go to her and ask about topics that we do not understand."*

P23_FG3: "*My teacher is just very good in this subject. I could not just leave the subject; he explains concepts very well."*

P24_FG3: "*Our teacher is excellent; he will make you choose the subject*."

P27_FG3: "*Studying this subject was my choice but anyway I like how the teacher teaches."*

P28_FG3: "*I knew if I chose the subjects, I mean pure mathematics, I was going to pass because he explained the subject very well."*

These findings suggest that learners were motivated by teachers who offered guidance and motivational talks, indicating that encouragement plays a crucial role in their academic choices. Learners often relied on teachers for motivation and clarification on difficult topics, indicating a need for strong teacher-learner relationships. Learners expressed a strong appreciation for teachers who provided clear explanations and support, which positively influenced their subject choices and confidence in mathematics. Increased emphasis on relevance helped learners identify better with a range of subjects. This increases the likelihood that learners will opt for the selected subjects permitted to them.

Teachers encouraged learners to take complementary subjects, such as statistics alongside pure mathematics, to enhance their understanding and application of concepts. This was revealed through the following learner responses.

P11_FG1: "*The teacher selected pure mathematics and statistics for us, and these two perfectly link."*

P13_FG1: *"Yes, what he said is very true, the teachers said when we do pure mathematics and switch to statistics it will be easy."*

P14_FG1: *"They explained to me the link between pure mathematics and statistics; the teacher selected the mathematics subjects that link to each other."*

P15_FG1: *"They told us that in pure mathematics there is harder stuff hence the statistics will be too easy, it was our teacher who told us this."*

P15_FG1 perceived that transitioning from pure mathematics to statistics is easier owing to the foundational knowledge gained, indicating effective teaching methods. P11_FG1, P13_FG1 and P14_FG1 agree that there is a strong link between pure mathematics and statistics, highlighting that transitioning between the two is easy owing to this connection. Learners understood the connection between pure mathematics and statistics well, suggesting that curriculum design effectively highlighted relevant links between subjects.

5.4.3.2 Gatekeeping factors

When learners select subjects to study at A-Level, teachers tend to have their own expectations for the learners who enrol in their classes. The data revealed several dimensions of teacher influence on subject selection. P1_T1 identified a gatekeeping mechanism whereby learners with weak O-level performance are actively discouraged from pursuing A-Level mathematics owing to the higher-order thinking demands of the subject.

P1_T1: "*Weak passes at O-level are not encouraged to do A-Level mathematics as it would call for higher order thinking, hence I do not accept learners with poor O-level passes into my class."*

P1_T1 further noted the pedagogical interconnection between pure mathematics and statistics, emphasising that foundational concepts in pure mathematics facilitate comprehension in statistics. This disciplinary linkage informs teachers' recommendations, as they encourage pure mathematics learners to pursue statistics concurrently, thereby capitalising on conceptual transferability between the two subjects. The following is what they had to say:

P1_T1: "*Teachers usually encourage learners of pure mathematics to also learn statistics since some concepts learnt in pure mathematics are applicable in statistics."*

P2_T2 corroborated this advisory role, noting that teachers provide structured guidance to help learners recognise the relevance and applicability of various mathematics subjects within their broader academic and professional goals.

P2_T2: "*We offer guidance and support to help learners understand the relevance and importance of various mathematics subjects in their academic career and path, thus aligning with their interests and abilities."*

This alignment of subject selection with learner interests and aptitudes underscores the pivotal role teachers occupy in shaping learners' mathematical trajectories and, by extension, their educational outcomes. A critical observation emerged from P5_T5, who stated:

> *"Teachers do have influence. For instance, we are not offering mechanics as a subject because teachers are not willing to teach mechanics; hence, teachers influence mathematics subject selection."*

This response illuminates a systemic constraint whereby teacher willingness or lack thereof directly determines subject offerings. The absence of mechanical mathematics from the subject offerings exemplifies how teacher preferences and competencies shaped the institutional landscape of subject selection, effectively circumscribing learner choice irrespective of learner interest or aptitude. This institutional gatekeeping extends beyond individual advisory interactions to structural decisions that fundamentally limit the range of mathematical pathways learners can access. Contrary to their sentiment, P5_T5 indicated that they did not influence, as they were never involved in subject selection. They had the following to say:

Researcher: *"What influence do teachers have on A-Level learners' mathematics subject(s) selection choices?"*

P5_T5: *As a subject teacher, I am not allowed to assist when learners select their A-Level mathematics subject(s), since I am not part of the selection team. Learners are recruited by the admin based on their O-level passes, and they even suggest subjects for some learners.*

The teacher felt excluded from the A-Level mathematics subject selection process, limiting their ability to act as gatekeepers.

5.4.4 Discussion of findings in relation to Research Question 2

The findings revealed that teachers occupy a pivotal position in influencing learners' A-Level mathematics subject choices through confidence-building mechanisms. These findings are substantiated by Wang and Degol (2023), who demonstrate that teachers' motivational practices and affective support significantly predict learners' mathematics self-concept and persistence in STEM pathways, particularly during critical transition points such as subject selection. The findings further indicate that teachers play a crucial role in cultivating environments that enhance learners' self-confidence and self-belief, constructs central to SCCT.

Corroborating this theoretical perspective, Lent and Brown (2024) emphasise that academic self-perception, shaped by teacher feedback and encouragement, constitutes a primary determinant of academic persistence and career-related choices in mathematics-intensive fields. The integrated perspectives of SCCT and RCT demonstrate that teacher support operates synergistically with other influential factors, highlighting that effective teaching can motivate learners to approach mathematics with confidence, thereby shaping their subject selection.

Another finding emerging from the data concerns the gatekeeping factors, which reveal how teachers exercise selective control over subject access and availability. As illustrated in the findings, this gatekeeping manifests through two primary mechanisms: individual exclusionary practices based on prior attainment and institutional constraints on subject offerings determined by teacher preferences and competencies. The findings demonstrated that the relationship between O-level attainment and subsequent A-Level subject selection exerts considerable influence on learners' mathematical pathways. Consistent with this finding, Maulana, Helms-Lorenz and van de Grift (2023) observed that poor O-level performance creates learner reluctance towards STEM-related A-Level subjects, effectively excluding them from mathematics pathways. Moreover, Chmielewski (2023) argues that teacher-driven tracking and gatekeeping practices, while intended to ensure learner success, often perpetuate educational inequalities by limiting access to advanced mathematics for learners with inconsistent prior performance.

The findings suggested that O-level performance functions not merely as an assessment milestone but as a critical determinant of A-Level subject selection, profoundly influenced by teacher support. Moreover, the findings indicate that teachers' expectations and academic demands shape learners' self-perceptions of capability, increasing the likelihood of selecting subjects wherein they anticipate both success and enjoyment. Muenks, et al. (2020) demonstrate that teacher expectations significantly influence subject choices, with low teacher expectations creating self-fulfilling prophecies that discourage learners from pursuing challenging subjects. Gatekeeping factors, while potentially protecting learners from academic failure, simultaneously restrict opportunities for those who might benefit from additional support rather than exclusion.

5.4.5 Research Question 3: How do learners, teachers and school heads perceive the role of parents or guardians in the selection of A-Level mathematics subjects?

This section aimed to explore how parents or guardians assisted learners in selecting the A-Level mathematics subjects they studied. The researcher sought insights from school heads, teachers and the MoPSE A-Level mathematics learners.

Table 5.3 shows research question 3, themes for research question 3 and categories linked to this theme.

Table 5.3: Research question 3, themes for research question 3 and categories linked to the themes.

Research Question 3	Themes	Categories
What role do parents play in their children's mathematics subject choices at A-Level?	• Parental pressure on academic choices	• Sharing family success stories • Parental expectations
	• Parental influence as perceived by teachers and school heads	• background influencers
	• Financial support	• funding extra lessons and learning resources.

5.4.5.1 Parental pressure on academic choices

The findings of this study indicated that parents often pressure their children into choosing to study mathematics at A-Level by sharing success stories from family members. However, some learners reported having the freedom to choose their subjects, but this was often accompanied by parental expectations that could create internal conflict. Some learners felt pressured to choose subjects like pure mathematics owing to parental influence rather than personal interest, which can negatively impact their performance. Learners mentioned career-related discussions with parents, indicating that aspirations and future job prospects play a significant role in subject selection. For instance, P5_T5 had the following to say.

P5_T5: "*Yes, parents play a pivotal role in the selection; some learners choose pure mathematics not because it is their ambition to study pure mathematics, but because it is their parents' will, which also affects their performance. Parents should advise their children on career guidance to help them in A-Level mathematics subject selection."*

P5_T5 has observed that some learners opt to pursue A-Level mathematics under parental pressure, which can have a detrimental effect on their academic performance. The teacher also emphasised the importance of parental guidance in helping learners make well-informed decisions when selecting A-Level mathematics subjects to study.

P17_FG2: "*For example, they will ask which combination you want to do and I chose certain subjects and they said ah these subjects you will not get a place at university; so, choose this, this, that is a good combination so in a way they suggested mathematics."*

These findings from P17_FG2 suggest a notable trend where parents engage in supportive communication with their children about their academic interests and goals, which promotes wise A-Level mathematics subject selection. If there is a lack of parental involvement in the decision-making process regarding subject selection, it can lead to misalignment between learners' interests and their academic paths. The researcher enquired from learners how their parents support them in making sure that they successfully succeed in their A-Level mathematics. The evidence is given next.

Researcher: "*Could you please elaborate on how your parents support you in pursuing your A-Level mathematics studies?"*

P17_FG2: "*They do not know anything, but they try to help in terms of cheering me up for example if I have homework they always say (Yes, yenza wena, yinto yakho leyi)"*

P17_FG2 mentioned that parents do not understand the subjects or the requirements, which may hinder their ability to support their children effectively. Open communication about interests and career goals is also noted, with parents encouraging their children to choose subjects that align with their strengths. Supportive phrases and parental motivation are noted, even if they lack knowledge of the subject matter. For example, (*Yes, yenza wena, yinto yakho leyi)* meaning *Yes, do it, this is your thing.* Children's education depends on their parents' awareness and interest in knowledge about how to guide their children at home. An uneducated person will not be aware of the importance of mathematics in life (Tarteer & Ismail, 2020).

5.4.5.2 Parental influence as perceived by teachers and school heads

Teachers revealed that parents actively engage in discussions with their children about potential career paths and choices, providing tangible support by funding extra mathematics lessons,

covering school and examination fees, purchasing study materials, calculators, and even educational resources such as phones. Two teacher participants revealed the following:

Researcher: *"What roles do parents or guardians play during A-Level learners' selection of A-Level mathematics subject(s) for studying?"*

P2_T2: *"They encourage. Parents engage in open and supportive communication with A-Level learners about their interests, strengths and goals in mathematics."*

P3_T3: *"Parents or guardians usually support the choices made by learners by paying school fees and examination fees."*

Learners reported that their parents stressed the importance of choosing subjects that were not too challenging, and that their parents consistently supported their children's academic journey. This aligns with Javed's (2018) findings, which noted that while learners may make their own choices when selecting subjects, parents sometimes impose their preferences on their children without considering their children's interests. School heads revealed that parents are not directly involved in the selection of A-Level mathematics subjects. Instead, learners make these choices based on their discussions with their parents. Learners collaborate with their parents to determine their subject combinations (P2_T2). This suggests that parents are background influencers, indirectly shaping the selection of A-Level mathematics subjects.

Three school heads provided the following insights:

Researcher: "*How are parents involved when A-Level learners select A-Level mathematics subjects?"*
P7_SH2: *"Yes, they are involved; they are given forms to fill out with the help of their parents at home."*
P8_SH3: *"They are not involved. They are only given available options, in our case, which is pure mathematics."*
P10_SH5: *"They liaise with their children as they come up with subject combinations."*

These sentiments reveal that there is no standardised approach to how learners select A-Level mathematics subjects. School head P7_SH2 mentioned that they provide subject options forms to be completed with parental assistance, while other schools offer only pure mathematics without providing options. However, teachers expressed the belief that parents often compel their children to study A-Level mathematics, leading to struggles in mastering the subject. Two of the teachers explicitly had the following to say:

P5_T5: *"Yes, parents play a pivotal role in the selection. Some learners choose pure mathematics not because it is their ambition, but because it is their parents' desire, which also impacts their performance. Parents should offer career guidance to help their children select A-Level mathematics subjects."*

P1_T1: *"Most parents force learners to pursue A-Level mathematics even when they are not naturally inclined towards it, resulting in poor academic outcomes."*

According to RCT, the concept of the background hand refers to the underlying forces that influence learners' choices and may not be readily apparent to them (Bates, 1974). In the context of MOPSEA-Level mathematics subject selection, the reference group of background influencers, including parents, significantly influences the subjects that learners choose to study at A-Level.

5.4.5.3 Financial support

The findings suggest that parents actively support their children's education by funding extra lessons and providing essential study materials, demonstrating a strong support system for A-Level learners. Learners were asked to explain how their parents support them in pursuing their A-Level mathematics studies. This is how learner participants responded:

Researcher: "*Could you please elaborate on how your parents support you in pursuing your A-Level mathematics studies?"*

P11_FG1: "*They allow me to attend mathematics extra lessons with my friends."*

P17_FG2: "*Extra lessons, they pay for my extra lessons."*

P22_FG2: "*They pay for my extra lessons."*

P23_FG3: "*They are paying for my extra lessons."*

P24_FG3: "*I have been attending extra lessons and my parents have been paying for this."*

P25_FG3: "*If I tell you they have paid my school fee for the whole year, I will never miss any lesson."*

P27_FG3: "*I have been attending extra lessons; my parents have been paying and I am always ahead of the syllabus."*

P29_FG4: "*They are paying for my extra lessons, weekend and holiday lessons."*

P31_FG4: "*They buy data bundles for me for research; they also pay for holiday lessons."*

P19_FG2: "*Very supportive, they pay extra lessons, they even bought two calculators for me."*

These findings indicate that to excel in their chosen A-Level mathematics subjects, learners rely on extra lessons to fully understand all concepts. This financial support is crucial for accessing additional educational resources. However, it should be noted that even though learners were not studying all four A-Level mathematics subjects, they still depended on private tutoring, which raises questions about formal school topic coverage of the chosen A-Level mathematics subjects in the syllabus.

5.4.6 Discussion of findings in relation to Research Question 3

The findings suggest that parents and guardians played a key role in the mathematics choices their children make, particularly when it came to selecting subjects to study at A-Level. Findings from this study contend that involving parents can benefit learners by providing financial support and encouragement, though it can sometimes come with pressure. The involvement of parents led to pressure that limited how much freedom learners had in terms of selecting A-Level mathematics subjects they studied. The findings of this section supported the literature's notion that parents should always discuss their choice of study with their children rather than imposing their opinions (Sarkodie, Asare & Asare, 2020). A study by Kaneez and Medha (2018) found that parental influence significantly affects the career choices of grade 10 learners in Mauritius.

Good communication between parents and children greatly affects learners' choices of A-Level mathematics subjects, creating a supportive and understanding environment. Supportive conversations can boost learners' confidence, which is an important part of SCCT. Making a decision to study mathematics at the A-Level would be influenced by parents' or guardians' support (Han, 2019; Heddy & Sinatra, 2017). This helps learners select subjects that align with their career goals and personal interests. However, parental pressure can sometimes be helpful, but it may also hurt a learner's performance if it causes anxiety and limits their independence. Therefore, parents need to balance encouragement with honouring their children's unique preferences and educational goals, fostering an environment that supports better decision-making. According to Sarkodie, et al. (2020), parents should discuss subject choices with their children instead of imposing their opinions on them. However, this contrasts with the study by Seta, Voke, and Agi (2020), which found no significant relationship between parental influence and subject selection.

The findings revealed that parents provided financial support for extra lessons, which is very important for helping learners understand better and do well. This outside help fills learning

gaps and builds self-belief in the A-Level mathematics subject that learners choose to study. On the other hand, learners may feel pressured to meet their parents' expectations, which may diminish their interest in the subject. So, even though financial support for extra classes is crucial, parents need to provide help while also considering their children's interests, helping them make good choices about A-Level mathematics subjects. However, Ngwenya (2019) concluded that in Zimbabwean urban schools, most parents were struggling to financially support their children's education. Blakes and Mestry (2021) echoed this, noting that in Western Gauteng, South African parents without resources are left with little or no choice in their children's education. Responsibility is accorded to parents or guardians concerning education and career choice as children may rely on the affection and financial capacities of their parents in making this decision (Heddy & Sinatra, 2017).

Choosing subjects, especially A-Level mathematics, is heavily influenced by RCT. This theory posits that learners choose subjects based on weighing costs and benefits to maximise their gains. In education, learners consider their academic options, weighing their career goals and social pressures, often shaped by their parents' views. While RCT helps explain why learners choose certain subjects, the effects of parental influence highlight the need for a balanced approach that honours learner independence and promotes informed choices. However, the SCCT also points out that external factors, such as parental expectations and the school environment, can limit these choices, often pushing learners towards paths that meet family desires rather than their interests.

The stories families tell about their school and job successes strongly affect what learners like to study, especially in A-Level mathematics. These stories can inspire and help guide learners in choosing subjects to study at A-Level. As reported in this study, parents often talk about their school success and how they achieved it, which motivates children and gives them a sense of purpose. This kind of support can also have drawbacks. While it encourages ambition, it might pressure learners to choose subjects that do not interest them. These findings align with those of Sarkodie, et al. (2020), who alluded that learners' major choices can also be influenced by the occupation held by their parents.

Not knowing much about these subjects can make it harder for parents to assist their children, as pointed out. This problem worsens due to differing school expectations, leaving parents unsure about what information is most important for their children's future success. Also, the

social aspects discussed in SCCT and RCT theories show that parents often feel they need to guide their children's choices toward what is seen as normal or what their family wants, which can create tension between what parents want and what their children really want. This extends a study by Ngussa and Charles (2019), who recommended that parents continue to provide career guidance, as this practice has positive effects on learners' subject choices.

5.4.7 Research question 4: In what ways can learners be assisted to select suitable Advanced-Level mathematics subjects offered by MoPSE?

The researcher solicited participants' recommendations on the support mechanisms needed for informed subject selection. The following sections present stakeholder perspectives on enhancing guidance provision for A-Level mathematics subject choices. Table 5.4 shows research question 4, its themes, and the categories linked to each theme.

Table 5.4: Research question 4, themes for research question 4 and categories linked to the themes

Research Question 4	Themes	Categories
In what ways can learners be assisted to select suitable Advanced-Level mathematics subjects offered by MoPSE?	• Peer mentorship programmes	• Sharing experiences • Sustained exposure to career guidance • High teacher-learner ratios.
	• Early A-Level mathematics exploration	• Opportunities to investigate subject options.
	• Awareness programmes	• subject registration guide. • communication gap.

5.4.7.1 Peer mentorship programmes

Teachers and learners identified peer mentorship as a valuable mechanism for providing experiential insights into A-Level mathematics subjects. Such programmes would enable

current A-Level learners to share their experiences with prospective learners, fostering a collaborative approach to subject selection guidance. The sentiments echoed were as follows:

P2_T2: "*Peer mentorship programmes, implement peer mentorship programmes where current A-Level learners can share their experiences and insights about A-Level mathematics subjects with their peers."*

P25_FG3: "*At career guidance functions, we get to meet those who study the subject we want, hence career guidance on subject selection…; these are good topics to be discussed in Toastmasters clubs."*

However, P5_T5 emphasised the need for guidance to commence at earlier educational stages rather than being delayed until A-Level entry. This longitudinal approach would probably provide learners with sustained exposure to career guidance throughout their secondary education. Their perspective is illustrated next:

P5_T5: "*I would suggest that Guidance and Counselling consider career guidance so that learners at every level (Form 1 to Form 4) are taught career guidance rather than waiting for Careers' Day. This will help with the selection of A-Level mathematics subject(s)."*

Teachers further emphasised the importance of explicitly connecting A-Level mathematics subject choices to tertiary education requirements and career pathways, ensuring learners understand the relevance and implications of their selections.

P3_T3: "*Schools should make learners aware that all subjects are important and must be done since mathematics at higher levels involves all subjects."*

P4_T4: "*Learners should be asked about what programmes they want to do at the tertiary level as this will help in guiding them on which A-Level mathematics subject(s) to study."*

However, school heads identified structural barriers that limit the quality and scope of guidance provision. High teacher-learner ratios and shortages of qualified personnel constrain schools' capacity to offer comprehensive subject guidance and diversified mathematics options.

***Researcher Question**: "What improvements would you suggest helping guide A-Level learners when making mathematics subject(s) choices?"*

P6_SH1: "*A-Level teacher-learner ratio, if reduced, could go a long way in accommodating more teachers; hence, all subjects could be taken up."*

P8_SH3: "*Career guidance at the end of the Ordinary Level course to expose learners to what is expected of them at A-Level and Tertiary Level. More qualified personnel (teachers) who would approve and guide learners in the choice of subjects or options."*

5.4.7.2 Early A-Level mathematics exploration

Learners expressed a desire for dedicated spaces where they could explore A-Level mathematics subjects, examine their respective advantages and disadvantages, and make informed decisions. This exploratory approach would provide learners with opportunities to investigate subject options before committing to their choices.

P34_FG4: "*There should be a room, sort of a movie house, where learners can go and choose their A-Level mathematics subjects. In this room, A-Level mathematics subjects should be displayed, explaining the advantages and disadvantages of choosing each subject."*

P25_FG3: "*At career guidance functions, we get to meet those who study the subject we want, hence, career guidance on subject selection…; these are good topics to be discussed in Toastmasters clubs*."

Learners expressed dissatisfaction with the narrow focus of existing guidance services, which prioritised social and health issues while neglecting academic subject selection. The guidance provision inadequately addressed the critical link between A-Level mathematics subject choices and career pathways.

Researcher Question: *"What suggestions do you have to guide A-Level learners in choosing their mathematics subject(s)?"*

P23_FG3: "*I think career guidance, guidance and counselling is there, but they don't talk about subject selection."*

P24_FG3: "*Sometimes the career guidance is there but it is not enough in terms of subject selection."*

P18_FG2: "*They should offer guidance and counselling; they do offer but it's all about drugs, life problems, etiquette, and HIV; it's never about subject selection."*

P21_FG2: "*They should offer proper career guidance."*

P19_FG2: "*This is guidance and counselling, nothing to do with subject selection; they should include that guidance."*

Learners also noted resource constraints that limit their access to information about mathematics subjects and career pathways.

P30_FG4: "*They can also search on the internet for the trending A-Level mathematics subjects, but the problem is that we do not have much access to the internet."*

Learners emphasised the importance of aligning subject choices with personal interests and career aspirations, recognising that intrinsic motivation is crucial to academic success.

P20_FG2: "*Those yet to choose to do A-Level mathematics should only choose mathematics if they like it.*"

Learners presented divergent views regarding the necessity of teacher guidance in subject selection. While some advocated for autonomous decision-making, others recognised that many learners lack clarity about their interests and require active teacher intervention.

P27_FG3: "*Some people don't even know what they want; so, teachers should stand in to guide them.*"

P26_FG3: "*But as learners, we should decide on what we want. This will make it easy when we are focused.*"

P28_FG3: "*There is no need for guidance here, when selecting a subject, they should choose what they are good at. But wait, teachers here at school should go around telling people about these subjects.*"

P22_FG2: "*Can the whole department like A-Level teachers, explain to these learners about these subjects, especially those who will be taking maths at A-Level.*"

P29_FG4: "*When choosing A-Level mathematics, they should be decided according to their career paths; they should know their passion.*"

Learners suggested input from university representatives to clarify tertiary education requirements and establish explicit connections between A-Level subject choices and higher education pathways.

P11_FG1: "*They should explain that we should include A-Level Mathematics subjects because it is unclear. It would be better if they could invite university representatives to explain it to us.*"

Learners advocated for earlier intervention in the guidance process, suggesting that subject selection support should be provided before O-level examinations and extended to lower secondary forms. This timing would enable learners to make informed preliminary decisions about their A-Level pathways.

P16_FG1: "*Before the O-level learners write they should be guided by prepared charts with different mathematics subjects because in the current guidance and counselling they only talk about future jobs, but they do not mention which A-Level mathematics subjects we need to get these jobs.*"

P19_FG2: "*Career guidance facilities should be made available to lower forms.*"

5.4.7.3 Awareness programmes

The findings revealed that the MoPSE subject registration guide was designed to assist candidates registering for examinations from November 2018 onwards. However, learner awareness of this guide proved non-existent across all focus groups, revealing a significant communication gap regarding available subject selection guidance materials. Table 5.5 shows the MoPSE A-Level mathematics subjects which were available for learners to register under ZIMSEC.

Table 5.5: MoPSE A-Level mathematics subjects available for registration (2015-2025)

MATHEMATICS

Subject Name	Subject code	Notes
7. Pure Mathematics	6042	Candidates can register Pure Mathematics and one option; Statistics (6046), Additional Mathematics (6002) or Mechanical Mathematics (6021).
8. Statistics **OR** Additional Mathematics **OR** Mechanical Mathematics	6046 6002 6021	

This study found that learners trusted the school's offerings; hence, they did not have the option to choose but to study whatever the school offered. This was done to accommodate all subjects on the examination timetable without infringing on their teaching time. The requirement for candidates to choose only one additional subject alongside pure mathematics limited their options, potentially leading to dissatisfaction among those interested in multiple subjects.
P32_FG4 expressed doubt about the usefulness of the guide, preferring to seek information from peers taking similar A-Level Mathematics subjects. They revealed the following results:

Researcher: "*How did the MoPSE subject registration guide assist you in making an informed decision while selecting your preferred A-Level mathematics subject?"*

P32_FG4: "*I do not think that guide is useful; we always inquire from those who are doing the same subjects as ours."*

Given the critical role of informed decision-making in educational trajectories, concerns have been raised regarding the MoPSE subject registration guide. The reliance of learners on peer advice, largely owing to the perceived inadequacies of the guide, raised significant uncertainty about its usefulness. These dynamics highlighted the need for a structured framework that

aligns with RCT and SCCT, facilitating informed decision-making considering learners' mathematics self-perceptions. Such a framework may incorporate tailored support mechanisms to navigate the complexities of A-Level mathematics, ultimately promoting enhanced engagement and performance among learners. For instance, the study revealed that many learners lacked awareness of the MoPSE subject registration guide, indicating a gap that could be addressed through tailored feedback channels. Integrating insights from RCT and SCCT helps teachers better understand and anticipate learners' needs. This approach fosters a more responsive educational environment that continually evolves based on collective feedback.

From the findings, there was a consensus among learners that they had not been exposed to the MoPSE subject registration guide, indicating a gap in communication regarding available resources for subject selection. Feedback from participants regarding their awareness and understanding of the MoPSE subject registration guide indicates they are unaware of it. This finding highlights the information that learner has about MoPSE subject registration, which may influence their subject selections when enrolling for A-Level. The results below provide evidence supporting this assertion:

Researcher: "*How did the MoPSE subject registration guide assist you in making an informed decision while selecting your preferred A-Level mathematics subject?"*

P11_FG1: "*I do not know about this one."*

P12_FG1: "*I do not even know it."*

P13_FG1: "*I do not know anything about this guide."*

P26_FG3: "*A, guide ooh really…. I was never informed about this."*

P27_FG3: "*I did not check anything concerning this."*

P29_FG4: "*I do not know about it."*

P33_FG4: "*Was never exposed to such."*

P18_FG2: "*I have never heard of such a thing even though I research a lot."*

P17_FG2: "*I can safely say we all here do not know that guide."*

P17_FG2 response indicates assurance that all learners were never informed about the MoPSE subject registration guide; so, it did not affect their choices. Participants P17_FG2, P23_FG3,

P24_FG3, and P15_FG1 demonstrated strong trust in their school and its decisions regarding A-Level mathematics subject selection. They preferred seeking guidance from their teachers and the school administration rather than relying on the registration guide. This suggests that they have confidence in the school authorities to deliver a suitable A-Level mathematics education. The learners offered the following insights:

Researcher: "*How did the MoPSE subject registration guide assist you in making an informed decision while selecting your preferred A-Level mathematics subject?"*

P17_FG2: "*The school is doing the right thing; so, I believe them."*

P24_FG3: "*The school, I mean, the deputy head said what we are doing is okay."*

P15_FG1*: We confirmed with our class teacher, who told us that our subjects are stable and very good."*

The findings indicate that learners trust their schools' provisions and therefore tend to overlook opportunities offered by the MoPSE curriculum. Participants generally agreed that they relied on the school's guidance rather than seeking outside sources. For example, during the researcher's inquiry, participants P19_FG2 and P25_FG3 nodded in agreement with their peers' statements.

On the contrary, the Zimbabwe Ministry of Primary and Secondary Education Curriculum Framework for Primary and Secondary Education (2015-2022) outlined the roles and responsibilities of various stakeholders in the education system, emphasising collaboration among teachers, parents and industry to enhance educational standards and learner outcomes. However, the findings suggest that learners were never exposed to the subject registration guide, indicating that the various stakeholders meant to guide the learners did not act as expected by the framework.

The framework marked the first time the MoPSE reviewed the curriculum, which was introduced in 2015 alongside four A-Level mathematics subjects. Regardless of the MoPSE shifting to the Heritage-Based Curriculum (HBC) framework 2024-2030, the stance of the dynamics of the MoPSE A-Level mathematics curriculum remained unchanged, with now five A-Level mathematics subjects.

As indicated in the curriculum framework, learners were expected to demonstrate significant self-awareness of their progress and areas for improvement, reflecting a commitment to ongoing improvement in their academic pursuits. The self-awareness may be ascribed to the learners' self-perception, since learner participants in this study indicated that they chose to pursue mathematics at A-Level owing to their confidence in the subject. Teachers were expected to provide helpful evaluations and comments, fostering a positive self-perception and motivating learners to excel.

School heads are responsible for providing diverse learning opportunities, which are crucial for addressing varied learner subject selections. Nevertheless, the findings of this study indicated that only pure mathematics was being offered (see subsection 5.3.1.1), leaving learners without alternatives. This highlighted a deficiency in school leadership, as administrators appeared to prioritise a singular MoPSE A-Level mathematics subject, thereby restricting learners' opportunities to pursue their preferred A-Level mathematics subjects.

5.4.8 Discussion of findings in relation to Research Question 4

Peer mentorship emerged as a valued mechanism for guiding A-Level mathematics subject selection across all three stakeholder groups, with findings indicating that structured peer support bridges gaps, particularly in subjects offering multiple alternatives. This is consistent with SCCT's emphasis on peer influence in shaping career aspirations, and is corroborated by Ahn et al. (2023), who demonstrate that structured peer support enhances academic self-concept, persistence and achievement in mathematics, and Rask et al. (2021), who show that peer mentorship fosters social integration and reduces anxiety in challenging subjects. Hughes et al. (2023) further establish that near-peer mentors are particularly effective during transitions such as the move from O-Level to A-Level. However, Collier (2020) cautions that poorly structured initiatives may perpetuate misconceptions, underscoring the need for careful design and monitoring.

A striking finding was learners' overwhelming trust in school authorities despite their lack of awareness of official MoPSE guidance materials, with learners preferring institutional guidance over peer mentorship. Bates et al. (2023) confirm that institutional support enhances self-efficacy when school heads communicate transparently and exhibit competence. However, Hemsley-Brown and Foskett (2020) caution that excessive reliance on institutional authority

without independent information-seeking may result in inappropriate subject choices. The concurrent finding that learners lacked awareness of the MoPSE subject registration guide exposes a systemic breakdown in guidance dissemination, which Kashefpakdel et al. (2022) argue requires multi-channel communication strategies combining digital platforms, printed materials and interpersonal guidance. Existing guidance and counselling services were identified across all stakeholder groups as focused on personal and social issues while neglecting academic subject selection, a misalignment that Watts and Sultana (2024) attribute to the artificial separation of personal development from academic planning. Stakeholders agreed on the need for earlier and more sustained guidance, with teachers advocating for continuous support from Form 1 to Form 4, school heads emphasising O-Level exit intervention, and learners requesting guidance before O-Level examinations. Salmela-Aro and Upadyaya (2020) confirm that early career guidance significantly enhances decision-making self-efficacy, while Ng et al. (2023) establish that just-in-time guidance is most effective only when preceded by foundational career awareness built through earlier interventions.

Learners expressed a desire for dedicated exploratory spaces where they could examine A-Level mathematics subjects interactively and engage with university representatives about tertiary requirements, suggesting a preference for active experiential guidance over passive information delivery. In the same vein, Kassan et al. (2023) confirm that interactive exploratory interventions significantly enhance engagement and decision-making quality, while Barker and Schmidt (2024) demonstrate that direct engagement with university representatives improves learners' understanding of qualification requirements.

Soresi et al. (2020) caution, however, that such activities must be monitored to prevent information overload, particularly for learners from disadvantaged backgrounds. The analysis of the MoPSE Curriculum Framework (2015–2022) revealed persistent gaps between policy expectations and implementation realities, with systemic constraints directly limiting schools' capacity to provide individualised subject selection support. Spaull and Taylor (2023) note that curriculum documents frequently articulate aspirational visions exceeding available resources, while Schweisfurth (2023) demonstrates that learner-centred reforms often fail due to insufficient teacher training and large class sizes. A comprehensive approach incorporating peer mentorship, early intervention, experiential exploration and expert input is, therefore, essential, as Mulvey et al. (2021) demonstrate that multi-mechanism career guidance interventions yield significantly better outcomes than isolated single-component approaches.

5.5 Chapter summary

This chapter presented the findings aimed at establishing a framework to effectively assist in selecting A-Level MoPSE Mathematics subjects. The study delved into the factors influencing learners' choices of A-Level mathematics subjects. Understanding the support received by learners from their schools, including teachers and peers, in selecting appropriate A-Level mathematics subjects was deemed crucial. Data collected through document analysis, open-ended questionnaires and focus group discussions were utilised to address the research questions. It was noted that although teachers were selective in the A-Level mathematics subjects they taught, they did not determine which subjects' learners would choose. Nevertheless, they served as background influencers, much like parents, in the context of the MoPSE A-Level mathematics subjects that learners study. The researcher argues that when provided with guidance, learners can make better decisions in selecting A-Level mathematics subjects, facilitating a smoother transition to tertiary education. However, school heads expressed concerns about the lack of resources, particularly noting that teachers lacked expertise in offering complementary A-Level mathematics subjects like mechanical mathematics, statistics and additional mathematics. The RCT and SCCT, together with the data presented under objectives one to four, informed the development of the framework for selecting MoPSE A-Level Mathematics subjects discussed in Chapter 6.

CHAPTER SIX
DEVELOPMENT OF A FRAMEWORK TO GUIDE MoPSE A-LEVEL MATHEMATICS SUBJECT CHOICES

6.1 Introduction

Drawing from the insights gathered through the detailed exploration and analysis of learners, teachers and school heads' perspectives on MoPSE A-Level mathematics subject choices, as well as the challenges faced by learners in choosing the selected A-Level mathematics subjects, a framework in Figure 6.1 was designed to guide learners when they choose mathematics subjects to study at A-Level. Essentially, the framework aimed to build upon or incorporate RCT and the SCCT into its structure or approach. Furthermore, to achieve this, the patterns in the data were analysed to adapt and extend the theories in a more relevant and practical way, based on the current study's findings. Since introducing the MoPSE competence-based curriculum in 2015, learners in Zimbabwean public government schools have selected Advanced-level mathematics subjects without adequate guidance or elaboration on this aspect. Given the broad MoPSE A-Level mathematics curriculum, with five A-Level mathematics subjects for learners to choose from, it is crucial to provide support in helping learners choose the right subject that aligns with their career aspirations. Various stakeholders, including teachers, parents and school heads, are involved in this decision-making process (Lopez & Bauyot, 2025). If these stakeholders are not well-informed, they may struggle to advise learners on which A-Level mathematics subjects are essential for their careers.

The study's findings indicate that teachers opted to teach specific MoPSE A-Level mathematics subjects based on their willingness. As a result of not offering all A-Level mathematics subjects, learners may be disadvantaged in choosing subjects that align with their aspired careers. Schools should be able to offer learners the opportunity to select from all the A-Level mathematics subjects provided by the MoPSE. Moreover, peers can influence the subjects that learners choose to study, highlighting the need for informative sessions to educate learners about the different mathematics subjects available through MoPSE.

As mentioned earlier in Chapter One, the Zimbabwe MoPSE A-Level mathematics is divided into five subjects: pure mathematics, statistics, mathematics (which includes pure mathematics, statistics, and mechanics), mechanical mathematics, and additional mathematics. Two years

before entering university, learners may choose one of these subjects to study alongside two other commercial or science subjects. The challenge lies in determining which mathematics subject best suits their intended university course, as many learners lack the necessary knowledge to make informed choices. Additionally, schools may not offer all subjects, often selecting only those that the available teachers are comfortable teaching, as revealed in the current study.

The framework is designed as a cyclical, iterative process. All four stages must be engaged; no stage should be omitted.

Stage 1 (Verification) establishes the learner's academic readiness;

Stage 2 (Exploration) expands subject knowledge;

Stage 3 (Navigation) formalises the decision; and

Stage 4 (Engagement) sustains commitment.

If Stage 1 is bypassed, a learner may proceed without confirming academic foundation; if Stage 2 is omitted, they may commit without adequately understanding the subject; if Stage 3 is skipped, formal decision-making is incomplete; and without Stage 4, the learner lacks ongoing support and commitment structures.

Testing of the VENE Framework: Validation was conducted with mathematics teachers from different schools. One teacher had participated in the original study (confirming contextual fit); the second worked at a different school (assessing initial transferability). Both independently corroborated that the framework accurately captures the decision-making complexities faced by learners in the Zimbabwean MoPSE context. The testing constitutes the first step in the iterative validation process envisaged by Nieveen (1999) and Plomp and Nieveen (2007), and is consistent with the first cycle of Educational Design Research (McKenney & Reeves, 2019).

VENE is linked to the Shona term ‘varidzi ’, which carries rich cultural and conceptual significance in the Zimbabwean context. In Shona, varidzi literally means 'owners' or 'those who possess', and is commonly used to denote rightful custodianship, responsibility and belonging. In the context of this framework, the term is used to convey the idea that learners should be the true owners of their subject selection decisions: not passive recipients of choices made for them by parents, teachers or school administrators, but active, informed agents who take responsibility for and pride in the subjects they choose to study. The use of a Shona-

derived term deliberately anchors the framework within Zimbabwe's linguistic and cultural heritage, reflecting the Heritage-Based Curriculum (2024-2030) emphasis on affirming indigenous identity and local knowledge systems in education. Furthermore, varidzi implies stewardship: just as owners are expected to care for and develop what they possess, learners who own their subject choices are expected to commit to, engage with and take responsibility for succeeding in those subjects.

6.2 VENE framework: Guide to making subject choices

When choosing A-Level mathematics, the VENE provides a comprehensive decision-making framework. This structured framework not only aids learners in verifying their choices but also provides them with an opportunity to explore various A-Level mathematics subjects, navigate the complexities of subject requirements, and engage with the subject coverage before committing to a two-year study programme. By applying the VENE framework, learners can make informed choices that align with their academic goals and personal interests in mathematics. The proposed framework emphasises the following key aspects:

6.2.1 Stage 1: Verify

- **Checking prerequisites**

The findings revealed that learners' experiences with mathematics at O-level significantly influenced their decisions; those who performed well were often more eager to take pure mathematics, despite its challenges. Some of the learner participants had the following to say:

P26_FG3: "*Studying mathematics at O-level was interesting, so I decided to continue with it. I feel like I am made for this subject."*

P32_FG4: "*I have always been good at mathematics, which helped guide my decision to choose A-Level mathematics."*

The teachers confirmed that although they were not involved in assisting the learners, they wished they could enrol only those with strong O-level mathematics passes in their classes. One of the participant teachers mentioned that the authorities responsible for enrolling learners in A-Level mathematics were suggesting subjects of their own choice, leaving learners without an option but to take the proposed subjects. Moreover, the teachers also mentioned that as an A-Level mathematics teacher, they were not involved in enrolling the learners at the stage of choosing subjects:

P5_T5: *"As a subject teacher, I am not allowed to assist when learners select their A-Level mathematics subjects(s), since I am not part of the selection team. Learners are recruited by the deputy head, assisted by the senior master and the senior lady. They will be considering their O-level passes, and they even suggest combinations for some of the learners."*

Another teacher argued that they do not accept learners with poor O-Level passes into their A-Level class, which means they were more worried about the capability of the learners at the start:

P1_T1: *"Weak passes at O-level are not encouraged to do A-Level mathematics as it would call for higher order thinking; hence, I do not accept learners with poor O-level passes into my class."*

However, the other teacher revealed that it was the learners who chose the subjects they passed best at O-level for them to study them further at A-Level:

P8_SH3: "*Very little influence. Learners choose subjects best passed at O-level."*

With the VENE framework, learners will manage to verify that they meet the prerequisites for taking A-Level mathematics, such as achieving a good grade in O-level mathematics. The learners will have to follow what is detailed below:

- ***Understanding the subject requirements***

At this stage, learners are expected to verify the specific requirements of the A-Level mathematics subjects, including the topics covered, assessment methods and any specific skills or knowledge needed. They are also expected to take charge of their own choices and avoid external factors, such as peer and parental influence, which do not play a part in their subject selection. The learners may inquire and gather information from their parents and peers based on specific subject requirements. At this stage, the school heads are required to arrange for peer mentorship workshops and invite post-A-Level learners who would have passed the different unique A-Level mathematics subjects.

There is a need to include knowledgeable individuals to guide the process, with a clear outline of how the recommended subjects would assist post A-Level studies. Temel et al. (2025) warn that not having enough details about subject requirements or assessment methods can lead to badly informed decisions and even a drop in engagement. Success in A-Level mathematics and optimal engagement with the course material are intrinsically linked to a student's

comprehension of the subject's demands. Moreover, Idnay et al. (2025) and Emino et al. (2025) emphasise the crucial role of transparent curriculum details in guiding student choices and promoting effective learning strategies. This aligns with the broader consensus, as articulated by Sagyi et al. (2025) and Temel et al. (2025), that a clear understanding of the scope and expectations of A-Level mathematics enables learners to make informed decisions and establish realistic, achievable goals. The 2025 A Level Math syllabus places an increased focus on real-world applications and problem-solving.

The emphasis on knowledgeable individuals in this context resonates strongly with Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD). The ZPD refers to the space between what a learner can accomplish independently and what they can achieve with the guidance of a more knowledgeable other (MKO), typically a teacher, mentor, parent or peer with greater expertise. In the context of A-Level mathematics subject selection, learners are often operating within their ZPD, with a basic awareness of available subjects but lacking the specialist knowledge to independently evaluate their demands, content, and post-school implications. The VENE framework explicitly operationalises this ZPD dynamic: Stage 1 (Verification): teacher as MKO confirms academic readiness; Stage 2 (Exploration): teacher scaffolds engagement with the syllabus; Stage 3 (Navigation): guidance meetings extend decision-making capacity; Stage 4 (Engagement): ongoing support sustains the learner within their ZPD as they consolidate their subject commitment (Vygotsky, 1978).
Findings from the present study reveal a significant preference among learners for peer mentorship and career guidance, indicating a latent demand for structured support mechanisms in navigating the complexities of A-Level mathematics. This preference, elaborated in section 5.5.1, highlights the importance of direction in making informed choices about specific subjects within the A-Level mathematics curriculum. The implications of these findings suggest a need for educational interventions that prioritise curriculum clarity, increase peer mentorship programmes and integrate robust career guidance initiatives.

More on this implication is evidenced in the following responses:
Researcher : "*What improvements would you suggest to help guide A-Level learners when making mathematics subject(s) choices?"*

P2_T2: "*Peer mentorship programmes- Implement peer mentorship programmes where current A-Level learners can share their experiences and insights about A-Level mathematics subjects with their peers."*

However, learner participant P29_FG4 revealed that they enquired from upper six senior learners.

P29_FG4: *"Not really. I only enquired after choosing the subject from those in Form Six about how difficult pure mathematics is."*

The foregoing response means that P29_FG4 consulted with senior learners in Form 6 on how difficult the subject was after choosing it. The learners revealed that they consulted with learners who had finished their A-Level studies. According to P2_T2, peer mentorship programmes were needed, which could provide valuable insights and support for learners considering A-Level mathematics. Suggesting peer mentorship programmes reflected a collaborative and strategic approach to education, ensuring that learners are well-prepared for their future studies.

There are negative implications of consulting how a subject is after choosing it, as this may result in unnecessary anxiety and stress, doubts and uncertainty, as learners may begin to question their subject choice, potentially leading to decreased motivation. Also, there is a possibility of limited flexibility, as changing subjects might not be feasible owing to curriculum constraints. By being informed and prepared, learners can navigate challenges and make the most of their academic experience; hence, the need for learners to verify their subject selection before fully committing to studying a certain subject. The first process of verification is necessary, which is then followed by the second element, which is the exploration stage.

6.2.2 Stage 2: Explore

Exploring a subject is all about diving deep to truly understand its essence and complexity. It is like embarking on a journey to uncover all the layers that make up the subject, gaining a genuine feel for what it encompasses. Guided by subject teachers, learners are encouraged to explore the topics covered in A-Level mathematics, such as pure mathematics, statistics and mechanical mathematics. Teachers, parents/guardians and school heads may guide the learners as they explore the subjects that best suit them. Getting prior information on the subject's content can be achieved as the learners check the syllabi of different subjects to see if they can grasp the content in various syllabi. This aligns with the findings of the study, as some learner participants revealed next:

P22_FG2: "*The teacher told us what we are going to cover, looks tough […]"*

P26_FG3: "*I got some information from my brother; he emphasised that if I want something challenging, I should go for pure maths."*

P32_FG4: *"We checked the syllabus on which topics are involved by just checking the syllabus, you know."*

P17_FG2: "*Wow, I researched how many topics there are in pure mathematics. I realised that there are 21 topics. I should understand by now I still do not understand them."*

Learners may engage in various independent activities, such as consulting with family members and independently reviewing the syllabus, to inform their understanding and expectations regarding their chosen A-Level mathematics subject. Furthermore, some learners reported receiving guidance from their teachers, which contributed to shaping their anticipations about the subject content and demands. A disparity in learners' pre-A-Level guidance has been observed, with some learners independently consulting family members and syllabi, while others rely on teacher insights, suggesting a lack of standardised support during subject selection. This highlights a potential gap that could be addressed by formal schoolteachers, particularly in explaining how different topics align with learners' aspirations for university subjects. This aligns with Islam, Akhi and Akhi's (2024) findings in Bangladesh, which emphasise the importance of learners possessing clear concepts, aptitude, motivation and curiosity for successful mathematics learning. The study revealed that learners seek clarification from extra lesson teachers rather than their formal school instructors. These extra lessons played a significant role in helping learners understand the syllabus structure. This is an opportunity for formal schoolteachers to adopt the VENE framework and fulfil this important role effectively.

Indeed, when examining the actual subject content, a deep understanding of the curriculum can empower learners, giving them a sense of ownership over their learning journey (Kenayathulla et al., 2024; Aseljevic, 2024). This idea aligns well with studies on learner engagement, which point out that clarity and relevance in the subject matter are crucial for maintaining motivation and commitment (Capraro, 2024; Pinsky et al., 2024).

- ***Considering self-interests and strengths***

Learners are encouraged to explore how A-Level mathematics corresponds with their interests, strengths and career aspirations. Learner participants indicated that their decision to pursue

mathematics stemmed from a desire for autonomy, even as their peers perceived the subject to be challenging.

P28_FG2: "*Mathematics was always my choice; no one influenced me."*

P12_FG1: "*Most of my friends were saying, 'Maths is hard; do not do it.'"*

P13_FG1: "*They were involved in misguiding me; for example, advising me not to do mathematics as they thought it is difficult."*

The preceding responses align with the RCT, which posits that self-interest drives individuals to select subjects that serve their own interests. In relation to this study, it can be inferred that schools were the ones responsible for choosing the A-Level mathematics subject which learners should study; hence restricting learners' drive towards studying their own A-Level mathematics choice. Furthermore, the idea of the "background hand" suggests that the market mechanism helps individuals make choices that benefit both themselves and society (Krstic, 2022). According to Liu et.al (2023), the interplay between personal strengths, perception of abilities, and subject choice suggests that learners who recognise their competencies in mathematics tend to gravitate towards challenging subjects, ultimately achieving higher results. The alignment fosters motivation and nurtures a deeper understanding of mathematical concepts (Liu et al., 2023). Similarly, RCT serves as a valuable framework for understanding how individuals, including learners, navigate among various educational alternatives based on their self-interests (see subsection 5.2.4). The VENE framework builds upon these concepts, as learners at this stage are expected to reflect on their self-interests and strengths when choosing A-Level mathematics subjects to study. This stage aligns with the study findings as one learner participant explicitly revealed that*: "I thought about my own life before anything else, there is no way they were to influence me"* (P18_FG2). This indicates that learners were mature enough to take responsibility for their own choices.

6.2.3 Stage 3: Navigate

At this stage, learners are expected to thoroughly assess both the advantages and disadvantages of enrolling in A-Level mathematics. They should consider several critical factors, including the availability of skilled and qualified teachers who can teach the specific MoPSE A-Level mathematics subjects, the proximity of schools which offer the subjects of their choice. The study revealed a notable shortage of teachers who can provide support for the study of A-Level mathematics subjects such as mechanical mathematics, statistics and additional mathematics

(see subsection 5.3.4). Additionally, learners must evaluate the level of challenge presented by the subject material, as this can significantly impact their learning experience and academic success. Moreover, it is essential to consider the time commitment required to excel in this subject, as A-Level mathematics often demands extensive study and practice (Meletiadou, 2022). By carefully weighing these factors, learners can make an informed decision about which A-Level mathematics subjects to pursue (Baker, 2024).

- ***Considering complementary subjects***

Learners have the opportunity to explore a range of mathematics subjects, including additional mathematics, pure mathematics, ,mechanical mathematics and statistics, to identify which subjects best suit their needs. The findings of the study suggested that the transition from pure mathematics to statistics is relatively seamless owing to the foundational knowledge acquired in pure mathematics. Participants P11_FG1, P13_FG1, and P14_FG1 agreed that there was a significant connection between pure mathematics and statistics, which facilitates an easier transition between the two disciplines. At this stage, learners may also consider studying more than one A-Level mathematics subject, a decision that can be guided through discussions with teachers as well as parents. However, selected learner participants expressed that they were not adequately informed about the MoPSE subject registration guide (P11_FG1, P13_FG1, P14_FG1), revealing a communication gap regarding available support for subject selection. Taking into consideration the findings of this study, alternative options further deepen the decision-making process that allows learners to choose from different subjects. Ordanovska et al. al (2025) advocate for a holistic approach where learners consider subjects that align with their future aspirations and innate talents, which can be achieved with the help of teachers and parents.

- ***Seeking advice from teachers or parents***

This aligns with Dost (2024), who highlights the importance of fostering a supportive and welcoming STEM environment, enabling learners to feel at home while also ensuring a safe and comfortable space for individuals with diverse cognitive levels. During this stage, learners are encouraged to navigate the decision-making process with the support of experienced teachers or mentors who can offer valuable guidance and insights (refer to subsection 5.5.6). One of the learner participants suggested that: "*Some people don't even know what they want; so, teachers should step in to guide them" (*P27_FG3).

Dost (2024) avers that although individuals are driven by intrinsic motivation and personal incentives in STEM fields, social determinants also play a crucial role in influencing their course selection. Kirkham, Chapman and Wildy (2019) also found that in Australia, family influences, teacher and peer advice were reasons given by learners who chose intermediate and advanced mathematics subjects. The trust and harmonious relationship of the parents and the school create a good influence, a source of motivation and the success of their child. However, at this stage, parents are encouraged to engage in open discussions with their children for them to choose A-Level subjects of their choice. One of the teacher participants had the following to say:

> *"Yes, parents play a pivotal role in the selection. Some learners choose pure mathematics not because it is their ambition, but because it is their parents' desire, which also impacts their performance. Parents should offer career guidance to help their children select A-Level mathematics subjects"* (P5_T5).

6.2.4 Stage 4: Engage

Learners are expected to fully engage with the A-Level mathematics chosen subjects by dedicating themselves to the workload and attending classes consistently. At this stage, the school may encourage all prospective A-Level mathematics learners to attend classes while awaiting their examination results. Once results are released, learners will have the opportunity to select the mathematics subjects they believe they can manage effectively. Abrahams (2024) posits that learners' A-Level choices were similarly restricted by a timetable-blocking system. This aligns with the findings of this study as schools only chose MoPSE A-Level mathematics subjects, which can fit into their timetable, as it was not feasible to fit in all four A-Level mathematics subjects.

- ***Seeking Help When Needed***

Learners are encouraged to reach out to teachers, peers and parents when they encounter challenges or require additional support. At this stage, they may begin attending extra lessons with teachers after making a definitive decision about which A-Level mathematics subject to pursue. Those who feel confident at this point are less likely to revert to their initial decision-making process. However, they may revisit it if they choose to explore a different subject. According to RCT, it is not always feasible to make the most rational choice in every situation

(Dowding, 2019). Learners' interests in specific A-Level mathematics subjects can be influenced by their expectations regarding the potential benefits of studying those subjects.

The decisions learners make when selecting subjects can be shaped by the guidance and support they receive from their immediate environment, including parents, peers and teachers (Suparmanto, 2021). This guidance often involves assisting learners in evaluating their options, providing pertinent information, discussing alternative mathematics subjects and reaffirming their choices once a decision has been made (Suprehatin, Widaninggar, & Kartika Sari, 2024). Ngussa and Charles (2019) emphasise the significant role teachers play in helping learners foresee their future careers, as learners need comprehensive information about the content and structure of the subjects they wish to pursue. Teachers are instrumental in influencing these subject choices (Makori, Maobe, & Nyangeri, 2019). The findings of the current study suggest that schools recognise and utilise the vital role that teachers play in guiding learners toward better choices in mathematics, thereby influencing their academic and career trajectories.

By applying the VENE framework, learners can make informed decisions about the specific A-Level mathematics subjects they wish to study, thereby setting themselves up for success in the chosen MoPSE A-Level mathematics subject, therefore ensuring a strong and comprehensive mathematics foundation for tertiary education. Figure 6.1 shows the cyclical VENE framework proposed by the researcher.

6.2.5 Testing of the VENE Framework

To ensure the validity of the VENE framework, testing was conducted in two institutions, with feedback gathered the teachers. Selected for their extensive experience guiding learners through the transition to Advanced Level Mathematics, the teachers reviewed the completed framework stage by stage and were asked to assess its practicality within the Zimbabwean MoPSE context and suggest improvements. Both confirmed that the framework accurately reflects the complexities of A Level Mathematics subject selection. As Teacher Testing 1 noted:

The framework clearly reflects what learners go through when deciding which A Level Mathematics subject to study. It follows the not formalised process we observe in schools and provides the guidance that many learners need.

Teacher Testing 2 agreed:

I find the stages logical and practical. They represent the realities of subject selection because learners often need time, guidance and repeated discussions before they finally make a decision.

The feedback also produced four refinements to the framework. On timing, Teacher Testing 1 noted that some learners start discussing subject choices before the O Level results are released. This prompted the clarification that Verification (Stage 1) may begin while results are still awaited. On movement between stages, Teacher Testing 2 observed that learners often revisit earlier decisions after talking to teachers, parents or career guidance counsellors, which sharpened the explanation of the iterative movement across Stages 1 to 3. On post-selection support, Teacher Testing 1 stressed that teachers continue monitoring, encouraging and supporting learners throughout the A Level programme, leading to explicit inclusion of ongoing teacher led support in Stage 4. Finally, both endorsed a short reconsideration window, with Teacher Testing 2 explaining that some learners only realise after attending classes whether they have made the right choice, which informed the addition of a three-week grace period allowing learners to revisit earlier stages before committing.

This testing offered an important check on researcher bias and represents a first step in the iterative validation process described by Nieveen (1999) and Plomp and Nieveen (2007), consistent with the first cycle of Educational Design Research (McKenney & Reeves, 2019).

Stages 1 to 4 form a cyclical process unfolding over roughly one month, during which learners revisit earlier stages as new information and reflection emerge, for example returning to Verification after Exploration reveals unmet prerequisites. On reaching Stage 4 (Engagement), learners enter a three-week grace period allowing a final return to any earlier stage before committing fully and proceeding to examination. Each stage builds on the last: Stage 1 establishes academic readiness, Stage 2 expands subject knowledge, Stage 3 formalises the decision, and Stage 4 sustains commitment. Skipping a stage carries consequences, from an unconfirmed academic foundation to misaligned expectations, to incomplete administrative processes, to a lack of ongoing support.

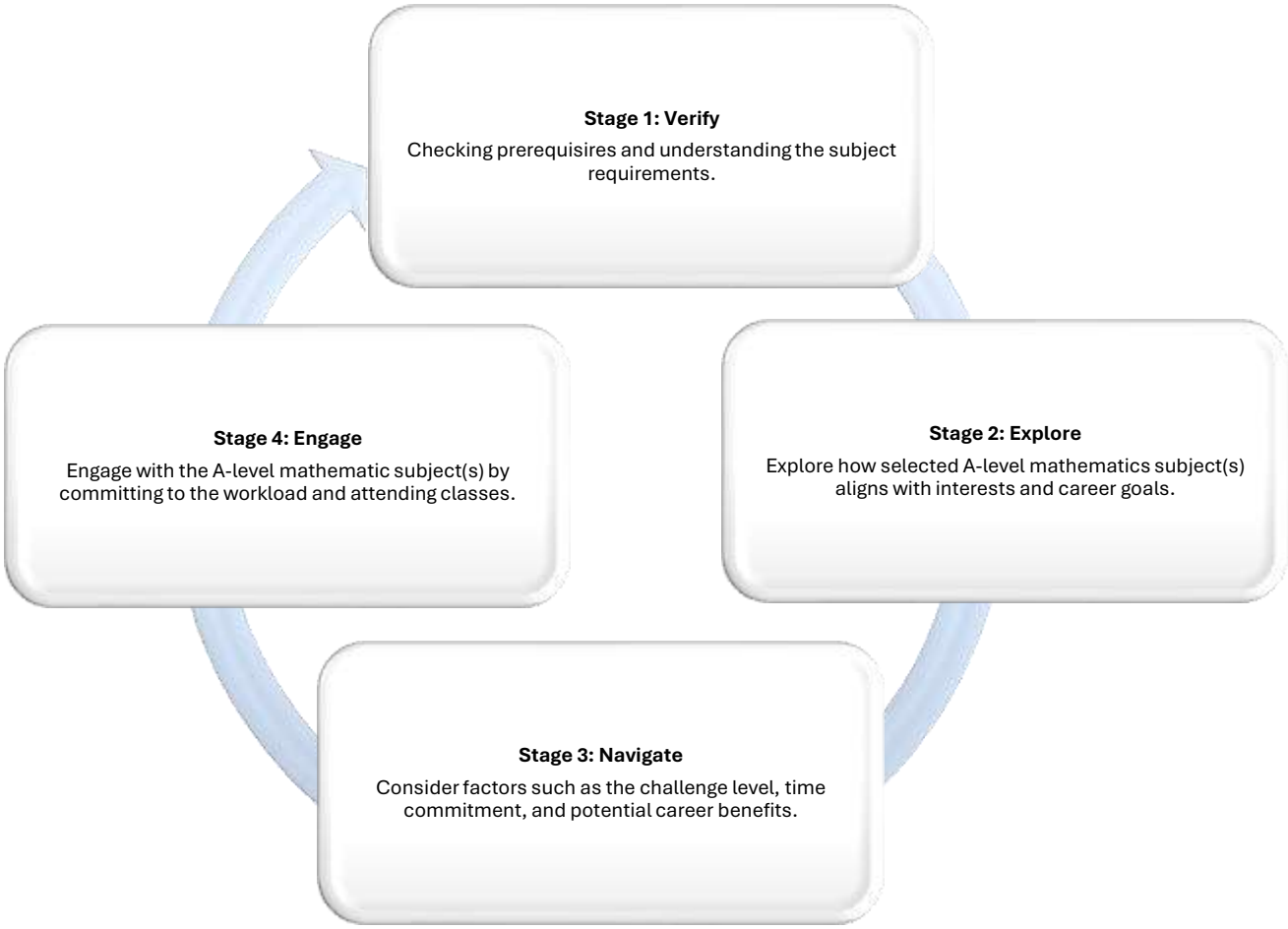

Figure 6.1: VENE framework (Researcher, 2025)

6.3 The VENE Framework Stages after testing

This section presents a structured guide to the stages of the VENE framework, to support learners through A-Level mathematics subject selection. VENE is an acronym for the framework's four stages: Verification, Exploration, Navigation and Engagement. The guide covers the process from initial readiness to sustained engagement with the chosen subject, and incorporates four refinements arising from testing of the framework with two teachers from two different institutions (Section 6.2.5). These are an earlier starting point for Verification, explicit recognition of iterative movement between the first three stages, sustained teacher-led support during Engagement, and a brief reconsideration window before final commitment.

6.3.1 Stage 1: Verify

Verification establishes whether a learner has the academic foundation necessary for A-Level mathematics. A grade C or higher at O-Level is generally regarded as a reliable indicator of readiness. This should, however, be considered alongside the personalised judgement of the learner's O-Level mathematics teacher. Teachers are familiar with a learner's performance and understanding, and this offers a more nuanced assessment of potential than examination results alone. Testing of the framework indicated that this stage need not wait until O-Level results are released. Many learners begin discussing subject choices informally with teachers beforehand. Schools should be prepared to accommodate such preliminary consultations. This allows the process to begin earlier and proceed more smoothly once results are confirmed.

6.3.2 Stage 2: Explore

Having confirmed their readiness, learners should engage closely with the official syllabus for their prospective subject. This involves examining its topics, learning objectives and assessment structure to develop a realistic understanding of its demands. Where possible, learners should arrange introductory lessons with subject teachers while O-Level results are still pending. This allows them to begin building familiarity with foundational content ahead of formal enrolment. Testing confirmed that Exploration does not always proceed smoothly from Verification. Where it reveals gaps in a learner's foundation, such as unmet prerequisite knowledge, learners should return to Stage 1 to revisit their readiness with their teacher. This iterative movement between the two stages reflects the cyclical character of the framework rather than a departure from it.

6.3.3 Stage 3: Navigate

Navigation translates the understanding developed in the preceding stages into a formal decision. Learners select their preferred A-Level subject or subjects and communicate this choice to the relevant school administration. This allows for appropriate planning and resource allocation. A further consultation with the subject teacher at this stage helps learners clarify remaining questions about the subject's demands. Where a learner intends to pursue more than one mathematics subject, such as Pure Mathematics alongside Statistics, the relevant examination board's registration requirements should be confirmed. Both the school administration and the subject teacher should be informed of this intention. Testing revealed that decisions made at this stage are not always final. Learners frequently reconsider their choices following further discussion with teachers, parents or career guidance counsellors.

Navigation should therefore be understood as provisional rather than irreversible. Learners remain free to return to Verification or Exploration should new information or concerns emerge.

6.3.4 Stage 4: Engage

Engagement sustains the learner's commitment once a subject has been formally selected. Regular attendance and active class participation are essential to developing the depth of understanding A-Level mathematics demands. Where a school cannot offer all of a learner's chosen complementary subjects, additional support should be arranged. This may take the form of external tutoring or supplementary guidance from the subject teacher, arranged with the involvement of the school and parents. Testing of the framework underscored that teacher support should not end at the point of selection. Continued monitoring, encouragement and guidance throughout the A-Level programme were identified as essential to sustaining learners' commitment. Testing also informed the inclusion of a three-week grace period at the outset of Engagement. During this period, a learner who discovers, once classes have begun, that the subject is not the right fit may return to an earlier stage before committing fully.

Taken together, the four stages form a cyclical, iterative process rather than a strictly linear one. Verification, Exploration and Navigation are typically completed within a month. Learners may move between them as reflection and new information demand. A three-week grace period then follows at the start of Engagement, offering a final opportunity for reconsideration. Each stage builds on the one before it: Verification establishes academic readiness, Exploration expands subject understanding, Navigation formalises the decision, and Engagement sustains commitment. Skipping a stage therefore carries consequences. These range from an unconfirmed academic foundation to incomplete understanding of subject demands, to an unformalised decision, to an absence of ongoing support. Learners who enter A-Level mathematics with strong O-Level results tend to carry that confidence forward, easing the transition (Poompavai, Poongothai, & Divya, 2025; Idnay et al., 2025). Yet the framework's emphasis throughout is that support must be tailored rather than uniform. As Sharma (2024) argues, schools should calibrate support to learners' prior experiences and any anxieties they hold about mathematics. A balance of awareness and robust support systems is what ultimately allows every learner to engage confidently with the subject (Steele & Whitaker, 2019; Sari, Yaniawati, Supianti, & Indriani, 2025). Once all stages, including the grace period,

have been completed, learners are positioned to settle into their chosen A-Level mathematics subjects in preparation for tertiary education.

6.4 Chapter summary

The decision on which A-Level mathematics to take on in the MoPSE curriculum is far from a simple, one-step process. It weaves together the need for strong groundwork, an honest weighing of advantages and disadvantages, exploration of other subject paths, and an in-depth look at subject details. Using the VENE framework, educational stakeholders are encouraged to take these insights on board and put in place the right kind of support so that learners can make choices that align with both their ambitions and the modern job market's demands. The VENE framework, which enables the verification and exploration of self-interests and strengths in selecting MoPSE, not only underscores the imperative of aligning educational practices with individual learners' mathematics foundations but also paves the way for future inquiries that may help enhance educational equity and effectiveness in Zimbabwe's mathematics education landscape. The framework suggested in this chapter may also be adopted by other examinations and educational boards that offer broad A-Level mathematics alternative subjects, which can lead to confusion for learners when selecting these subjects. The framework suggestions are important because they do not just add to the understanding of MoPSE A-Level mathematics choices; they also feed into a global conversation about fairness in education and the dynamics of subject choices. The next chapter, the last of this study, will present a summary of key findings and recommendations.

CHAPTER SEVEN

SUMMARY OF THE FINDINGS, RECOMMENDATIONS, AND CONCLUSION

7.1 Introduction

This chapter presents a summary of the study's findings, which explored the dynamics of subject choice to develop and propose a framework for selecting A-Level mathematics subjects in Zimbabwe (MoPSE). Building on the findings presented and analysed in Chapters 5 and 6, this summary chapter aims to summarise the key findings of the study, and offer actionable recommendations to assist learners, teachers, school heads and parents in the selection process of MoPSE Advanced Level mathematics subjects. The motivation for this study arose from the recognition that learners often lack the support to exercise their preferences in choosing MoPSE A-Level mathematics subjects, a limitation that can disadvantage them in pursuing tertiary education opportunities. By addressing this critical gap, the study's findings seek to empower teachers, school heads, parents and learners to make informed decisions in assisting the learners regarding the selection of the Zimbabwe MoPSE mathematics subjects. The main findings of the study are summarised under the four main research questions. This chapter also presents the study's recommendations and discusses its limitations, including a summary of key findings. The chapter ends with concluding remarks.

7.2 Summary of main findings

This section synthesises the key findings of the study, articulating their significance for educational policy, practice and theory. Drawing upon the empirical evidence presented in Chapter 5 and the VENE framework developed in Chapter 6, the findings are presented as follows:

7.2.1 Research Question 1: What informs the subject choices for learners at A-Level?

One of the main focuses of this study was to determine the factors that influence mathematics subject choices at A-Level. The study revealed the following key findings, which are presented in Sections 7.2.1.1 to 7.2.1. 6.

7.2.1.1 School provisions

The study findings revealed that learners had to study pure mathematics because it was the only one offered at the schools they attended. These study findings align with those of Thomson et al. (2018), who posit that while high school learners are expected to make choices about the subjects they study, these choices are not entirely open and are guided by what is offered to them. A systemic trend was observed across participating high schools in offering pure mathematics at A-Level, with minimal or no provision for other subjects such as statistics, Additional Mathematics, or mechanical mathematics, despite these being part of the official MoPSE curriculum. School heads and teachers cited reasons such as low learner enrolment, shortage of specialised teachers and a belief that pure mathematics offers the best preparation for tertiary education in science and commercial fields. This belief was reinforced by the positioning of pure mathematics as the first option subject in the MoPSE subject registration guide, making it the default offering across most schools.

Findings from the focus group discussions confirmed this limited curriculum variety, with 24 out of 30 learners indicating that pure mathematics was the only option offered at their schools. Even in cases where learners showed interest in subjects like statistics, they were often denied access owing to low numbers, as seen in one school where only two learners had selected it. These findings suggest that the curriculum is largely responsive to enrolment trends and institutional constraints, rather than being proactively designed to meet diverse learner needs.

Consistent with Kurnia et al. (2023), who argue that limited exposure to statistics hinders learners' statistical literacy, a situation reflected in the current study. Weiland (2023) also found that statistical content is often marginalised in teaching materials, even when present in the curriculum. Also, Zhao and Perez-Felkner (2022) demonstrate that restricted access to diverse mathematics subjects in high school affects learners' preparedness and participation in STEM fields at the tertiary level, paralleling the curriculum limitations as per findings of the current study. These findings point to a narrow and constrained A-Level mathematics curriculum, dominated by pure mathematics, which may limit learners' broader mathematical development and academic readiness for a variety of tertiary and career pathways.

7.2.1.2 Expert teachers and digital platforms

The study results revealed that learners used various strategies to find out what the A-Level mathematics syllabi would cover prior to engaging with the full content. These strategies

included consulting the official syllabus documents, watching online videos for difficult topics, seeking assistance from expert teachers, engaging in online research and obtaining guidance from siblings or learners who had covered the topics before (post A-Level learners). Learners expressed feeling overwhelmed by the large number and complexity of topics. For instance, one learner recognised that there were 21 pure mathematics topics they had not yet fully understood. Despite these challenges, some learners still preferred pure mathematics over alternatives such as statistics or mechanical mathematics, driven not by ease but by the subject's perceived prestige and relevance for university admission.

The observed patterns across different contexts highlight a broader theoretical implication that learners' perceptions of topic difficulty are not merely cognitive judgments but are deeply intertwined with decision-making processes regarding subject selection and career trajectories This aligns with results by Nuutila (2021) who postulates that perceived difficulty have a distinctive role in the dynamics of task-specific motivation, and on-task changes to be relatively independent of more general motivation and competence. Drawing on RCT, learners' choices can be interpreted as utility-driven decisions aimed at maximising academic success while minimising perceived risk. Learners may rationally opt for alternatives perceived as less demanding, thereby reducing the likelihood of failure. This aligns with Bichi et al.'s (2018) finding that 65% of mathematics topics were considered difficult, suggesting that perceived cognitive load influences cost-benefit analyses in subject choice.

Complementing this perspective, SCCT provides a lens to understand how self-efficacy beliefs and outcome expectations mediate these decisions. Hamukwaya's (2022) observation that learners feel anxious and overwhelmed by the pace and volume of mathematics content indicates diminished self-efficacy, which SCCT posits as a critical determinant of persistence in challenging domains. When learners anticipate negative outcomes such as poor grades or increased stress, they are less likely to pursue mathematics-intensive pathways, even if these align with long-term career aspirations. The reliance on extra lessons highlights a strategy to balance low self-efficacy with high performance expectations, despite additional financial and time costs.

7.2.1.3 Individual passion for mathematics

The study sought to explore the extent to which learners' A-Level mathematics subject choices were influenced by their own individual choices or by peer input. The findings revealed that

most learners made independent decisions, with some stating that their choice to pursue A-Level mathematics was primarily driven by personal passion rather than peer influence (see Section 5.4.1.4). Participants noted that their peers often discouraged them by characterising mathematics as a difficult subject, but this did not deter their decisions. Instead, some reported that their friends lacked the academic strength or interest in mathematics, making their opinions less credible. Some learners engaged in group discussions when selecting subjects; yet, these interactions were largely informal and did not significantly alter their choices. These findings stand in contrast to a study by Pu, Yan and Zhang (2021), who found that peer groups often shape academic choices, especially when learners are surrounded by high-achieving classmates. However, the present findings align with Xie (2023), who explains this through the Big-Fish-Little-Pond Effect, where learners in lower-achieving peer groups tend to develop higher academic self-concept and confidence, leading to more ambitious academic choices.

7.2.1.4 Teachers' views on peer influence

Several learners identified parents as key influencers in guiding their subject selection, suggesting a strong role for familial influence in educational decisions. The influence of parental guidance in this study is further supported by Wang and Wei (2024), who found that parental involvement has a significant positive effect on learners' educational decisions. Additionally, Asare, Welcome and Arthur (2024) report that parental support and internal motivation strongly influence learners' interest in mathematics, which resonates with the present study's findings that learners who chose A-Level mathematics did so from intrinsic motivation and familial encouragement, rather than peer conformity.

7.2.1.5 Analysis of the MoPSE A-Level mathematics syllabi

The results also showed that time constraints within the timetable limited the ability to accommodate all MOPSEA-Level mathematics subjects. The time allocations for each syllabus created challenges in fitting multiple subjects into the curriculum. Additional mathematics, which includes all other subjects, was notably absent from the offerings of the schools included in the study. Concerns exist that offering all subjects would overload teachers and exceed ministry allocations. The study's findings agree with Famuagun et al. (2024), who found that inadequate time allocation negatively affects overall mathematics learning. Curley (2020) also observed that learners missed mechanics in school owing to scheduling issues and struggled later in university subjects that required it. Similarly, Munro (2015) notes that modular A-Level structures, combined with timetable constraints, often leave gaps in essential mathematical

preparation. Together, these findings in tandem with the current findings, highlight how timetabling issues can limit subject access and weaken learners' readiness for advanced study

7.2.2 Research Question 2: How do teachers influence learners' subject choices?

The study also sought to determine how teachers influence learners' subject choices. This was important since teachers play a strategically crucial role in the educational system, having the ability to hugely influence learners' subject selections. The findings of the current study revealed that teachers played an important role in improving learners' confidence and encouraging them to pursue complementary A-Level mathematics subjects such as statistics. The findings also revealed the gatekeeping role which was played by teachers.

7.2.2.1 Confidence Building

Teachers are pivotal figures in A-Level mathematics subject selection, shaping learner confidence, motivation and subject choices through their pedagogical guidance and personal approachability. These findings align with Pizon and Ytoc (2021), who identify motivation, attitude and teaching strategies as key influencers of learners' decisions to study mathematics. Critically, however, this study found that mathematics teachers were excluded from the formal subject selection process, creating a disconnect between administrative decision-making and pedagogical expertise that led learners to make choices misaligned with their interests, abilities and career aspirations. This resonates with Norris' (2024) study, which found that administrators lacking subject-specific understanding tend to prioritise logistical considerations over learners' long-term academic needs. This structural failure is directly addressed by the VENE framework, which positions teachers as central guides throughout all four stages of the selection process.

A further key finding is that teacher encouragement leads learners to consider complementary subject combinations, fostering an understanding of mathematics as a cohesive, interconnected body of knowledge rather than a collection of isolated topics. Leyva et al. (2022) confirm that when learners understand the relevance and interconnections between mathematical subjects, they are more likely to pursue them concurrently, while Eccles and Wigfield (2020) demonstrate that perceived utility and self-confidence are central drivers of subject choice. Within the RCT framework, such encouragement improves learners' cost-benefit analyses by increasing perceived value and reducing uncertainty. Within SCCT, it functions as a

psychosocial catalyst that boosts self-efficacy, shapes positive outcome expectations and strengthens academic persistence. The theoretical implication across both frameworks is that balanced encouragement, one that informs without coercing and motivates without inflating expectations, is most effective in promoting thoughtful, self-directed selection of complementary mathematics subjects.

7.2.2.2 Gatekeeping Factors

The study revealed that mathematics results from the Ordinary Level exerted a significant influence on learners' subsequent A-Level choices, with weak passes potentially discouraging learners from pursuing A-Level mathematics. This finding aligns with Seyum's (2023) observation that learners' earlier mathematics performance strongly predicts their later success in mathematics. These findings reveal that the quality of O-level results acts as a gatekeeper, indicating the requirements for learners who wish to pursue A-Level mathematics.

However, according to other findings of this study, teachers indicated that an over-reliance on O-level passes may result in a self-fulfilling prophecy, in which learners are steered away from challenging subjects based on past performance rather than their potential for growth and development. This study also found that teachers' attitudes towards mathematics and expectations of learners significantly influenced learners' self-efficacy and willingness to pursue challenging subjects. This finding aligns with that of Sabitu (2024), who found that learners are more likely to pursue advanced mathematics when their teachers demonstrated enthusiasm, clarity and confidence in teaching the subject. Lomibao (2023) similarly concluded that learners are inspired to continue with mathematics when teachers create supportive and engaging classroom environments.

From an RCT perspective, learners' decisions about whether to select mathematics reflect their perceived benefits and likelihood of success, which are significantly shaped by teachers' attitudes and guidance. Teachers, therefore, serve as informational gatekeepers who influence learners' rational evaluations of subject choices. From the lens of SCCT, teachers also act as psychological and social gatekeepers, shaping learners' self-efficacy, outcome expectations and career goals. Consequently, gatekeeping in mathematics education is not merely a matter of subject selection; it represents a broader social process through which teachers influence learners' access to future academic and occupational pathways.

7.2.3 Research Question 3: How do learners, teachers and school heads perceive the role of parents or guardians in the selection of A-Level mathematics subjects?

This study sought to determine the type of support learners received from parents or guardians in selecting A-Level mathematics subjects of their choice. The summary of the findings is discussed next.

7.2.3.1 Parental pressure on academic choices

The study's findings demonstrated that parental participation in learners' A-Level mathematics choices included both support and pressure. This is because parental expectations can put unnecessary pressure on learners, causing them to choose subjects based on perceived parental aspirations rather than real personal interest. These findings are consistent with those of Hidayat et al. (2023), who argue that learners who choose to study advanced-level mathematics typically face significant academic pressure because of parental expectations, leading to anxiety, fear of failure, and emotional stress.

7.2.3.2 Parental pressure as perceived by teachers and school heads

The study findings revealed that parents actively engaged in discussions about potential career paths and choices, thereby suggesting the mathematics subject that their children study at A-Level. According to this study's findings, parents were not directly involved in selecting A-Level mathematics subjects. Instead, learners selected subjects based on their discussions with their parents. This finding is in tandem with the finding of Cabigas and Cabalquinto (2025), that learners who regularly discuss academic options with their parents tend to feel more supported and confident in their subject choices, including mathematics. The findings are also in line with those of Wang and Wei (2024), who found that parental expectations, rather than direct control, strongly shape learners' attitudes toward mathematics, suggesting that indirect influence through dialogue plays a key role. Similarly, Tang (2023) observed that open communication between parents and learners enhances motivation and clarifies subject relevance, even if the final decision lies with the student.

According to RCT, learners' decision-making reflects an independent and reasoned appraisal of subject possibilities, informed but not influenced by parental opinions. SCCT deduces that parental discussions provide social and contextual support for learners' self-efficacy, result expectancies and mathematical aspirations. As a result, learners' subject choices are socially mediated while remaining rational, balancing individual passion and social impact.

7.2.3.3 Financial Support

Financial support from parents emerged as a significant enabler of A-Level mathematics subject selection, covering study materials, calculators, school fees and extra lessons. However, financial constraints also restricted access, with some learners opting for fewer mathematics subjects owing to higher tuition costs. This finding is consistent with that of Katsinde (2024), who documented how economic instability in Zimbabwe limits subject choices in government high schools.

Importantly, however, financial constraints do not exclusively determine learner participation in mathematics. Ayalew and Haile (2020) found that motivation and perceptions of difficulty were more strongly correlated with subject choice than tuition costs, while Mok and Tan (2019) demonstrate that institutional support systems such as fee exemptions and scholarships effectively reduce financial barriers. Sikhakhane (2021) further established that teacher influence and professional goals take precedence over financial limitations in shaping learner decisions. The implication is clear: while financial support matters, motivational and contextual variables are equally, if not more, decisive in determining learners' engagement with advanced mathematics.

7.3 Contribution

The study contributes to the literature on A-Level mathematics subject selection in sub-Saharan Africa by providing one of the first empirical investigations of this phenomenon in the Zimbabwean MoPSE context. Also, it advances theoretical understanding by demonstrating how RCT (Bates, 1974; Dowding, 2019) and SCCT (Lent et al., 1994; Lent & Brown, 2019) can be applied jointly to explain the multidimensional factors shaping A-Level mathematics subject selection. The study also produces the VENE framework, an original, empirically grounded framework that operationalises these theoretical insights into a practical guide for learner decision-making, bridging the gap between theory and practice in mathematics education guidance.

7.4 Limitations

A primary limitation of this study is the dynamic nature of the MoPSE A-Level mathematics curriculum. At the time of data collection (2022-2023), the Competence-Based Curriculum

(CBC) was operative; however, the Heritage-Based Curriculum (HBC, 2024-2030) was formally introduced during the period in which the thesis was being completed. This temporal disjuncture constitutes a genuine methodological limitation: the data collected, the participants' responses, and the institutional structures described in this study reflect the CBC context, yet the policy environment within which the VENE framework will be applied is increasingly the HBC context. Applying Lincoln and Guba's (2013) criterion of transferability, the generalisability of the study's findings to post-reform school environments must therefore be approached with appropriate caution. It is important to argue, however, that this limitation does not render the study's findings or the VENE framework obsolete: the framework's four stages are deliberately process-based and subject-agnostic, meaning they address the learner's decision-making journey rather than the specific content of any particular curriculum iteration. This study was subject to certain limitations acknowledged, which provided context for interpreting the findings and highlighted areas for future research. The sample size, while representative of the participating schools, may not have been fully generalisable to all A-Level mathematics learners in Zimbabwe. Further research with a larger and more diverse sample would be beneficial to confirm the findings and enhance their generalisability. Future studies could incorporate multiple data sources, such as tertiary education records, to explore how entry requirements relate to subject selection and to mitigate biases in subject selection, thereby providing a more comprehensive assessment of the factors influencing A-Level mathematics subject selection. The study's focus on five schools from five districts may not have captured the full diversity of experiences and perspectives within the Zimbabwean education system.

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7.5 Conclusion

In essence, this study established that A-Level mathematics subject selection in Zimbabwe is not a neutral or administratively straightforward act, but a socially mediated, resource-constrained and guidance-dependent process that shapes learners' academic and professional futures in consequential ways. The dynamics driving this process, encompassing learners' self-efficacy beliefs, teachers' advisory roles, parental aspirations, institutional constraints, and curriculum complexity, are multifaceted and insufficiently addressed by the current guidance infrastructure in Zimbabwean high schools. The VENE framework, grounded in RCT and SCCT and validated through practitioner engagement, is offered as a theoretically informed and practically applicable response to this challenge. It places learner agency, informed choice and structured institutional support at the centre of the subject selection process. The framework's significance lies not only in its practical utility but in its status as the first empirically derived, Zimbabwe-specific guidance tool for A-Level mathematics subject selection.

The study adopted a qualitative approach within an interpretive paradigm, gathering perspectives from learners, school heads and teachers to build a solid understanding of the subject selection process. An important finding was that although schools had mathematics teachers available, many of them did not have the specialised knowledge needed to teach all A-Level mathematics options effectively. This suggests that while the Ministry of Education may have created a well-rounded curriculum intended to serve different types of learners, some mathematics subjects were being overlooked because teachers lacked the expertise to teach them effectively. This raises serious concerns about how well the curriculum was being implemented in practice.

School heads cited time constraints as a major reason their schools could not offer all available mathematics subjects. Meanwhile, some learners explained that they chose to take only one mathematics subject because enrolling in additional subjects meant paying significantly higher tuition fees. Teachers, however, noted that studying subjects such as pure mathematics and statistics together could give learners considerable advantages when applying to university programmes. These findings show that although MoPSE designed a curriculum with learners' best interests in mind, the lack of strong implementation measures has limited its potential benefits. Drawing from these insights, the researcher developed the VENE framework as a tool

to help more learners engage with different mathematics subjects based on their individual abilities and interests.

If schools adopt the VENE framework, many A-Level mathematics learners stand to benefit through having better information to guide their subject choices. The study's results align well with RCT and SCCT, both of which recognise that while learners make their own decisions, these choices are inevitably influenced by the people around them, including peers, teachers, parents and school administrators. The VENE framework proposed in this study offers a structured approach to improving learners' navigation of mathematics subject selection.

7.6 Recommendations to policy makers (MoPSE), schools and parents

Based on the study findings, specific and actionable recommendations are offered to improve A-Level mathematics subject selection within the MoPSE curriculum, targeting key stakeholders and addressing identified challenges.

7.6.1 Recommendations to the Ministry of Primary Education (MoPSE, Zimbabwe)

The study found that learners were unaware of the MoPSE subject registration guide, which was available for them to review before registering for the A-Level mathematics subject. Instead, the guide was used internally by schools rather than disseminated to parents and their children. Based on these findings, the study recommends that the MoPSE subject registration guide be widely disseminated to ensure that learners and parents are aware of the available A-Level mathematics subject options. To reduce the language barrier in understanding, the guide can also be translated into all local languages so that parents can request one in the language they understand best.

Through the MoPSE, schools should incorporate this guide into their career guidance programmes and may also adopt the VENE framework proposed in the current study. This aligns with Aikens and Rizvi (2023), who found that learners who had access to detailed information about the importance of the subject, career linkages and university requirements were significantly more likely to choose mathematics-rich pathways earlier at A-Level.

7.6.2 Recommendations to Schools

The study recommends that schools strengthen career guidance programmes, providing learners with comprehensive information about A-Level mathematics subjects and their relevance to various career pathways. This should include access to qualified academic career counsellors. These programmes may also be combined with peer mentorship programmes. Schools should also facilitate parental involvement through workshops and communication channels by introducing parent-child subject selection days for A-Level mathematics. In cases where a learner comes from a family where parents or guardians do not understand the dynamics of subject choices, school heads may assign expert teachers to handle such situations and assist the learner in making informed decisions.

7.6.3 Recommendations to parents

The study recommends that parents engage in open communication with their children, providing encouragement and support to foster a positive attitude towards mathematics and promote informed decision-making. Given the study's findings, parental support will play a significant role in shaping learners' A-Level mathematics subject selection. This aligns with Javed's (2018) findings, which noted that while learners may make their own choices when selecting subjects, parents sometimes impose their preferences on their children without considering their children's interests.

7.7 Recommendations for further research

To build on the findings of this study and further advance understanding of A-Level mathematics subject(s) selection within the MoPSE curriculum, specific avenues for future research were identified to address limitations and expand the scope of inquiry. The study found that there were no clear guidelines for helping learners choose an A-Level mathematics subject that aligns with their career aspirations.

The study explored the perspectives of schools located in urban areas of Bulawayo Metropolitan Province, Zimbabwe. Following initial testing, the VENE framework proposed in Chapter 6 is recommended for broader implementation across a wider range of institutions, including urban, rural, and private schools, as well as institutions in other countries within the

region, to establish its applicability and identify best practices for guiding A-Level mathematics subject selection.

7.8 Chapter summary

Research questions 1 through 3 were summarised in this chapter, while research question 4 informed the development of the VENE framework, which was presented in Chapter 6 and served as its summary. The chapter presented recommendations to parents, schools and MoPSE. The chapter also included recommendations for further research and concluded with a summary, indicating the completion of the entire study.

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APPENDIX A: UNISA ETHICAL CLEARANCE

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2024/03/13

Ref: **2024/03/13/19674112/45/AM**
Name: Ms N Chikusvura
Student No.:19674112

Dear Ms N Chikusvura

Decision: Ethics Approval from 2024/03/13 to 2029/03/13

Researcher(s): Name: Ms N Chikusvura
E-mail address: 19674112@mylife.unisa.ac.za
Telephone: +263 774 483 600

Supervisor(s): Name: Dr SM Kodisang
E-mail address: kodissm@unisa.ac.za
Telephone: 0124293964

Title of research:

Dynamics of subject choices: A Framework towards the selection of Advanced-level mathematics components offered by Zimbabwe School Examination Council.

Qualification: PhD Mathematics Education

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2024/03/13 to 2029/03/13.

*The **medium risk** application was reviewed by the Ethics Review Committee on 2024/03/13 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
8. No field work activities may continue after the expiry date **2029/03/13.** Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2024/03/13/19674112/45/AM** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,



Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za



Prof Mpine Makoe
EXECUTIVE DEAN
qakisme@unisa.ac.za

University of South Africa
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APPENDIX B: LETTER TO THE MINISTRY OF PRIMARY AND SECONDARY EDUCATION

23 March 2024

The Permanent Secretary

Ministry of Primary and Secondary Education

P.O Box CY 121

Causeway

Harare, Zimbabwe

Dear Sir/Madam

Subject: Request for permission to collect data for research purposes in Bulawayo Metropolitan Province high schools

My name is Chikusvura Namatirai. Currently, I am pursuing a PhD in Mathematics Education with the University of South Africa (UNISA). To fulfil the program requirements, I need to conduct a relevant research project. For this purpose, I am seeking permission to collect data from high schools in the Bulawayo Metropolitan Province. The title of my research project is

Dynamics of the subject choices: A Framework towards the selection of Advanced-level mathematics subjects offered by the Zimbabwe School Examination Council.

I want to clarify that my research project will be used solely for academic purposes. The findings of this research will be instrumental in developing a framework that can guide students in selecting advanced-level mathematics subjects offered by the Zimbabwe School Examination Council (MoPSE). To gather the necessary data, I will use a qualitative design, conducting individual focus group discussions for lower 6 and upper 6 students who are studying mathematics at A-Level, and I will use open-ended questionnaires for school heads and teachers from schools that offer MoPSE A-Level mathematics. I want to assure you that I will conduct this research project with the utmost respect for ethical considerations. I have attached to this letter my ethics approval from UNISA, my certified national ID and a set of questions to be asked to learners, teachers, and school heads. Once the research project is complete, I plan to make it available no later than 2029. Your help in this matter would be greatly appreciated.

Yours faithfully

Chikusvura Namatirai

UNISA student number: (19674112) Signature:

Email: 19674112@mylife.unisa.ac.za or nchikusvura@gmail.com

Cell number: +263 774 483 600

APPENDIX C: LETTER FROM THE MINISTRY OF PRIMARY AND SECONDARY EDUCATION

All communications should be addressed to the Secretary for Primary and Secondary Education
Telephone: +263 242 794 509
Toll Free: 317

ZIMBABWE

Ministry of Primary and Secondary Education
88 Kwame Nkrumah Avenue
Queen Lozikeyi House
P O Box 121
Causeway, Harare

Reference : C/426/3

27 March 2024

Namatirai Chikusvura

RE: PERMISSION TO CARRY OUT A RESEARCH IN BULAWAYO METROPOLITAN PROVINCE

Reference is made to your application to carry a research from the above mentioned district schools on the research title:

"DYANMICS OF CHOICES: A FRAMEWORK TOWARDS THE SELECTION OF ADVANCED-LEVEL MATHEMATICS COMPONENTS OFFERED BY ZIMBABWE EXAMINATION COUNCIL. "

Permission is hereby granted. However, you must liaise with the Provincial Education Director of Bulawayo Metropolitan Province, who is responsible for the schools which you want to involve in your research. You should ensure that your research work does not disrupt the normal operations of the schools. Where students are involved, parental consent is required.

You are also required to provide a copy of your final report to the Secretary for Primary and Secondary Education.

MINISTRY OF PRIMARY AND SECONDARY EDUCATION
22 APR 2024
P.O. BOX CY 121, CAUSEWAY
HARARE, ZIMBABWE

Moses Mhike
SECRETARY FOR PRIMARY AND SECONDARY EDUCATION

@MoPSEZ

APPENDIX D: LETTER TO BULAWAYO METROPOLITAN PROVINCE

29 April 2024

The Provincial Education Director
Ministry of Primary and Secondary Education
Bulawayo Metropolitan Province
Zimbabwe

Dear Sir/Madam,

RE: APPLICATION FOR PERMISSION TO CARRY OUT RESEARCH IN SCHOOLS UNDER BULAWAYO METROPOLITAN PROVINCE

I am a postgraduate student at the University of South Africa, currently pursuing a Doctor of Philosophy in Mathematics Education. I am writing to request permission to conduct research in educational institutions under the jurisdiction of Bulawayo Metropolitan Province.

Permission to conduct this research has been granted by the Ministry of Primary and Secondary Education (see attached letter).

RESEARCH DETAILS

Title: Dynamics of Subject Choices: A Framework Towards the Selection of Advanced-Level Mathematics Components Offered by Zimbabwe School Examination Council

Research Objectives:
This research aims to investigate factors influencing students' subject choices at the Advanced Level, particularly in mathematics, and develop a framework to guide learners, parents, and teachers in making informed subject choices.

Target Population:
- Advanced Level learners (Form 5 and 6)
- A-level mathematics teachers
- School Heads

Research Methodology:
The study will employ questionnaires, focus group discussions, and document analysis.

I assure you that all ethical protocols will be strictly adhered to, including obtaining informed consent, ensuring voluntary participation, maintaining confidentiality and anonymity, and minimising disruption to school activities. Ethical clearance has been obtained from the University of South Africa.

Upon completion, I will provide the Bulawayo Metropolitan Province with a final copy of the research report containing information that may be useful to the development of education in the province.

I look forward to your favourable consideration of this application.

Yours faithfully,

NAMATIRAI CHIKUSVURA
Student Number: 19674112 Email:19674112@mylife.unisa.ac.za

APPENDIX E: LETTER FROM BULAWAYO METROPOLITAN PROVINCE

all communications should be addressed to
"The Provincial Education Director"
Telephone: 09-69511
Telegraphic: "SCHOLASTIC"
Telex: 50531 MPSEMN ZW
Fax: 09-77027

ZIMBABWE

REF NO198876H
Ministry of Primary and Secondary Education
Bulawayo Metropolitan Province
P O Box 555
Bulawayo
Zimbabwe

2 MAY 2024

NAMATIRAI CHIKUSVURA

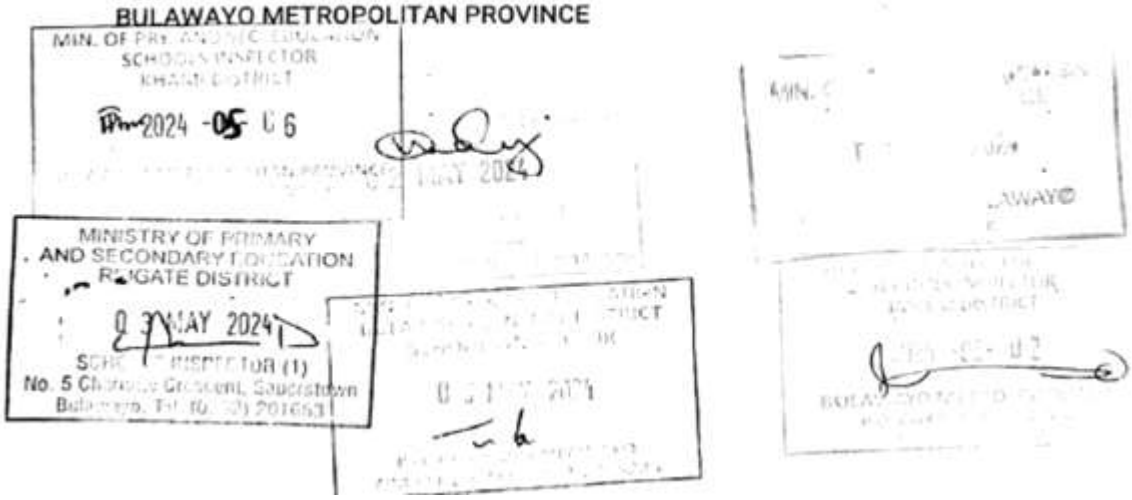
UNIVERSITY OF SOUTH AFRICA

RE: PERMISSION TO CARRY OUT A RESEARCH ON: DYNAMICS OF SUBJECT CHOICES: A FRAMEWORK TOWARDS THE SELECTION OF ADVANCED-LEVEL MATHEMATICS COMPONENTS OFFERED BY ZIMBABWE SCHOOL EXAMINATION COUNCIL

With reference to your application to carry out research on the above mentioned topic in the Education Institutions under the jurisdiction of the Bulawayo Province, permission is hereby granted. However, you should liaise with the District Schools Inspector for the concerned districts and Heads of the Institutions/Schools for clearance before carrying out your research.

It will also be appreciated if you could supply the Bulawayo Metropolitan Province with a **final copy** of your research which may contain information useful to the development of education in the Province.

M.B Chilufya
Schools Inspector – Strategic Policy Planning, Research and Statistics
For: PROVINCIAL EDUCATION DIRECTOR
BULAWAYO METROPOLITAN PROVINCE



APPENDIX F: PARTICIPANT INFORMATION SHEET

Date: _____

Title: **Dynamics of subject choices: A framework towards the selection of advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe**

Dear prospective participant

My name is **Namatirai Chikusvura,** and I am doing research under the supervision of Dr S.M. Kodisang, a senior lecturer and Prof MG Ngoepe a full professor in the Department of Mathematics Education and Prof towards a PhD in Mathematics Education at the University of South Africa. We are inviting you to participate in a study entitled: Dynamics of subject choices: A framework towards the selection of advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect important information that could assist in coming up with a framework towards the selection of Advanced-level mathematics subjects offered by MoPSE.

WHY AM I BEING INVITED TO PARTICIPATE?

You are invited because the MoPSE A-Level Mathematics curriculum is being offered at your school. Your school head referred me to you.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

The study involves structured interviews which shall be audio recorded (for learners) and giving responses in writing to open-ended questions (for teachers and school heads). The face-to-face focus group discussion will last no longer than 50 minutes. The focus group discussion will take place as per arrangement by the researcher, this will be during normal school days, for example during the lunch hour break or any other time recommended by the school head and the selected teacher. The teachers and school heads may respond in writing to the open-ended questions within the two weeks before the arranged focus group discussion for selected schools.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and

be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

This study is expected to collect important information that could assist in coming up with a framework towards the selection of Advanced-level mathematics subjects offered MoPSE.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

Negative consequences are not expected if you participate in this study.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research. Your name will not be recorded anywhere, and no one will be able to connect you to the answers you give. Your answers will be given a code number or a pseudonym, and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings. Otherwise, records that identify you will be available only to people working on the study, unless you permit other people to see the records. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

For Focus group: While every effort will be made by the researcher to ensure that you will not be connected to the information that you share during the focus group, I cannot guarantee that other participants in the focus group will treat the information confidentially. I shall, however, encourage all participants to do so. For this reason, I advise you not to disclose personally sensitive information in the focus group.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of participants' responses will be stored by the researcher for five years in a locked cupboard/filing cabinet at the researcher's work office and home office. Electronic information will be stored on a password-protected computer. After five years hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer by a relevant software program. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

No method of payment will be received for participating in this study.

HAS THE STUDY RECEIVED ETHICS APPROVAL?

This study has received written approval from the Research Ethics Review Committee of the University of South Africa, UNISA, the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe and Bulawayo Metropolitan Province. Copies of the approval letters can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, require any further information, or want to contact the researcher about any aspect of this study, please contact **Namatirai Chikusvura** at +263 774 483 600 or email 19674112@mylife.unisa.ac.za/nchikusvura@gmail.com. The findings will be accessible for a lifetime on a publication link to be provided by the researcher once the research findings are finalised. Should you have concerns about how the research has been conducted, you may contact DR SM KODISANG AND PROF MG NGOEPE at kodissm@unisa.ac.za /0124293964 and mgngoepe@gmail.com respectively.

Thank you for taking the time to read this information sheet and for participating in this study. Thank you.

Namatirai Chikusvura

APPENDIX G: LETTER TO SCHOOL HEADS

Date: _____

The School Head

_____

Dear Sir/Madam

Subject: Permission to conduct research in your school.

My name is Namatirai Chikusvura. I am currently in the process of earning a doctoral degree in Education from the University of South Africa. My research focuses on the dynamics of subject choices, and my supervisors is Dr SM Kodisang and Prof MG Ngoepe. I have received formal approval from the Ministry of Primary and Secondary Education in Zimbabwe, Bulawayo Metropolitan Province as well as the UNISA Research Ethics Committee (please see attached letters), to carry out research in five high schools. Your school has been selected as one of the five schools where I will conduct my study. The study will involve one mathematics teacher for Lower 6 or Upper 6, one focus group with six lower 6 or upper 6 learners studying mathematics, and the school head from each school. The study aims to explore the dynamics of subject choices, and the information obtained from the open-ended questionnaires and student focus group interviews will be treated with the strictest confidentiality and used solely for research purposes. Pseudonyms will be used when referring to the school and participants, whose participation is completely voluntary.

The researcher will use a qualitative approach that aims at a full understanding of the social problem. The study aims to come up with a guiding framework that will assist learners in selecting A-Level mathematics subjects offered by MoPSE. This will be achieved through the following objectives:

- The school head and the selected A-Level mathematics teacher are each expected to complete an open-ended questionnaire within two weeks, during their own free time.
- The researcher will collect the completed questionnaires on the day of the scheduled focus group interview with learners from your school or on any other agreed date. © 2024College of Education All rights reserved

- In this study, the focus group interview with the participating learners will be recorded with the consent of their parents. Could you please help by sending the consent forms to the parents of the selected learners at least two weeks before the focus group interview. The participants will be expected to sign the provided consent and assent forms.

Each selected school will serve as a site for conducting this research. All the data collected from each school will be analysed, and a report regarding the study will be written. This study is carried out under the supervision of Dr. SM Kodisang and Prof. MG Ngoepe from the University of South Africa.

This research study is being carried out in the hope that it will contribute to the body of knowledge on the dynamics of subject choices, specifically A-Level mathematics subjects offered by MoPSE

Yours Sincerely,

Signature of researcher: _____

Name of researcher: **Chikusvura Namatirai** Date: _____

APPENDIX H: TEACHER CONSENT LETTER AND FORM

Date: _____

The A-Level Mathematics teacher

School: _____

Dear Dr/Mr/Mrs/Ms/Miss

Following consent from the school head regarding the participation of a selected Lower 6 or Upper 6 mathematics teacher at the school to conduct my research, I am submitting this letter to formalise the process. I am currently studying for a doctoral degree in Mathematics Education through the University of South Africa. My area of interest involves: **Dynamics of subject choices: A framework towards the selection of advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe.**

Please be assured that the confidentiality of your school and yourself will be maintained and will only be used for this research study. I am excited to conduct this research at your school and to have you as a willing research participant. If you consent to participate in this research, you will be joining a group of fellow participants who will also be taking part in the investigation. You will be expected to complete an open-ended questionnaire about the selection of MoPSE A-Level mathematics subjects at your convenience within two weeks to avoid disruptions to your teaching time.

As part of the research, I will be using a qualitative approach to fully understand the dynamics of subject choices. Please find attached a consent form that you need to complete to confirm your participation in the study.

Kind regards

Chikusvura Namatirai

This letter serves as a consent form for your participation in this investigation and it shall be retained for safekeeping by UNISA. If you need clarity on any aspect of the investigation or have any questions regarding the investigation and your participation, and if you would like to have a copy of the final report of this investigation, please contact me at +263 774 483 600. You can also contact my supervisors at UNISA, Dr. SM Kodisang and Prof. MG NGOEPE at kodissm@unisa.ac.za /0124293964 and mgngoepe@gmail.com, respectively. If you agree to participate in this investigation, please sign this consent form and pass it over to me.

Consent Statement:

I hereby declare that I have read the above consent form and therefore understand the nature of the research project as explained to me. I understand that I have the opportunity to ask questions about the project. I also understand that I have the right to withdraw my consent and thus terminate my participation in the project at any time without any fine. I here agree to participate in the research project conducted by **Chikusvura Namatirai**, entitled **Dynamics of subject choices: A framework towards the selection of Advanced-level Mathematics subjects Offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe.**

Name of Participant: ……..

Participant Signature: ……

Date:……

……

Certification Statement:

I, **Chikusvura Namatirai** (Researcher), hereby confirm that I have explained to the above-named participant the purpose and nature of this research project. I have also mentioned to the participant that he or she is free to ask any possible questions regarding the project and participation. I also certify that I have provided the participant a copy of this signed consent form.

Researcher Signature: _____

Date: _____

APPENDIX I: LETTER TO PARENTS

Dear Parent

Your child is invited to participate in a study entitled: **Dynamics of subject choices: A framework towards the selection of advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe.**

I am undertaking this study as part of my doctoral research at the University of South Africa. The purpose of the study is to develop a framework that can guide learners towards the selection of Advanced-level mathematics subjects offered by MoPSE and the possible benefits of the study are the improvement of subject alignment to aspired careers. I am asking permission to include your child in this study because he/she is currently studying one of the mathematics subjects offered by MoPSE at A-Level. I expect to have five other children participating in the same group with him or her.

If you allow your child to participate, I shall request him/her to:

- Take part in a group interview

When, where, and time: A Convenient date and time will be communicated by their subject teacher as arranged by the researcher. The interview will occur at their school.

Other: The researcher will have focus group interviews audio recorded for later transcription. Audio-taping the focus group interviews will enable the researcher to accurately capture what participants said during the interviews. The researcher will listen to the audio recording repeatedly to ensure that information has been correctly captured. In her small notebook, the researcher will write down patterns discovered during the focus group interviews. Since the researcher needs to focus on the participants and the conversation, she will work out these ideas in her notebook directly after the interview.

Any information that is obtained in connection with this study and can be identified with your child will remain confidential and will only be disclosed with your permission. His/her responses will not be linked to his/her name ,your name or the school's name in any written or verbal report based on this study. Such a report will be used for research purposes only.

There are no foreseeable risks to your child by participating in the study. Your child will receive no direct benefit from participating in the study; however, the possible benefits to education are being equipped to make sound decisions when choosing MoPSE mathematics A-Level subjects for registration which aligns with children's aspired careers. Neither your child nor you will receive any type of payment for participating in this study.

Your child's participation in this study is voluntary. Your child may decline to participate or withdraw from participation at any time. Withdrawal or refusal to participate will not affect him/her in any way. Similarly, you can agree to allow your child to be in the study now and change your mind later without any penalty.

The study will take place as arranged by the subject teacher and the researcher with the prior approval of the school and your child's teacher. However, if you do not want your child to participate, they will be excluded. In addition to your permission, your child must agree to participate in the study and you and your child will also be asked to sign the assent form which accompanies this letter. If your child does not wish to participate in the study, he or she will not be included and there will be no penalty. The information gathered from the study and your child's participation in the study will be stored securely on a password-locked email for five years after the study. Thereafter, records will be erased.

The benefits of this study are that your child will be equipped to make informed decisions regarding which MoPSE A-Level mathematics subjects to register, which will positively influence their career choices.

There are no potential risks involved.

If you have questions about this study please ask me or my study supervisors, Dr SM Kodisang and Prof MG Ngoepe of Department of Mathematics Education, College of Education, University of South Africa.

My contact number is +263774 483 600 and my e-mail is 19674112@mylife.unisa.ac.za. The e-mails of my supervisors are kodissm@unisa.ac.za and mgngoepe@gmail.com . Permission for the study has already been given by the Ministry of Primary and Secondary Education, Zimbabwe, Bulawayo Metropolitan Province, and the Ethics Committee of the College of Education, UNISA. You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow him or her to participate in the study. You may keep a copy of this letter.

Name of child: _____

Sincerely

_____ _____ _____

Parent/guardian's name (print) Parent/guardian's signature: Date:

Chikusvura Namatirai _____ _____

Researcher's name (print):

Researcher's signature:

Date:

APPENDIX J: LETTER TO LEARNERS AND ACCENT FORM FROM LEARNERS

Title of research**: Dynamics of subject choices: A framework towards the selection of advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe.**

Dear MoPSE Mathematics A-Level learner

Date: _____

I am doing a study on **: Dynamics of subject choices: A framework towards the selection of advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe** as part of my studies at the University of South Africa. Your school head has permitted me to do this study in your school. I would like to invite you to be a very special part of my study. I am doing this study to come up with a framework for the selection of Advanced-level mathematics subjects offered by the (MoPSE). This may help you and many other learners of your age in the future in different schools.

This letter is to explain to you what I would like you to do. There may be some words you do not know in this letter. You may ask me or any other adult to explain any of these words that you do not know or understand. You may take a copy of this letter home to think about my invitation and talk to your parents about this before you decide if you want to be in this study.

I would like to ask to involve you in a focus group (a group of 6 participants). Discussion in the focus group will take no longer than fifty minutes.

I will write a report on the study, but I will not use your name in the report or say anything that will let other people know who you are. Participation is voluntary and you do not have to be part of this study if you don't want to take part. If you choose to be in the study, you may stop taking part at any time without penalty. You may tell me if you do not wish to answer any of my questions. No one will blame or criticise you. When I am finished with my study, I shall return to your school to give a short talk about some of the helpful and interesting things I found out in my study. I shall invite you to come and listen to my talk.

The benefit of this study is to be equipped in terms of selecting appropriate MoPSE A-Level mathematics subjects for registration which aligns to your future career. No risk is involved. You will not be reimbursed or receive any incentives for your participation in the research.

If you decide to be part of my study, you will be asked to sign the form on the next page. If you have any other questions about this study, you can talk to me or you can have your parent or another adult call me at +263774 483 600. Do not sign the form until you have all your questions answered and understand what I would like you to do.

Researcher: NAMATIRAI CHIKUSVURA Phone number: +263 774 483 600.

Do not sign the written assent form if you have any questions. Ask your questions first and ensure that someone answers those questions.

WRITTEN ASSENT

I have read this letter which asks me to be part of a study at my school. I have understood the information about this study and I know what I will be asked to do. I am willing to be in the study.

_____ _____ _____

Learner's name (print): Learner's signature: Date

_____ _____ _____

Witness's name (print) Witness's signature Date

(The witness is over 18 years old and present when signing.)

_____ _____ _____

Parent/guardian's name (print) Parent/guardian's signature: Date

Chikusvura Namatirai _____ _____

Researcher's name (print) Researcher's signature: Date

APPENDIX K: FOCUS GROUP-LEARNER ASSENT AND CONFIDENTIALITY AGREEMENT FORM

I, _____ grant assent that the information I share during the focus group may be used by Namatirai Chikusvura for research purposes. I am aware that the group discussions will be digitally recorded and grant assent for these recordings, provided that my privacy will be protected. I undertake not to divulge any information that is shared in the group discussions to any person outside the group in order to maintain confidentiality.

Participant‘s Name (Please print): _____

Participant Signature: _____

Researcher’s Name: (Please print): Namatirai Chikusvura

Researcher’s Signature: _____

Date: _____

APPENDIX L: SCHOOL HEAD AND TEACHER CONSENT FORM

(Return slip)

I, _____, confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits, and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty.

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to provide my responses to the open-ended questionnaire provided to me by the researcher.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print) _____

_____ _____

Participant Signature Date

Researcher's Name & Surname (please print): **Namatirai Chikusvura**

Researcher's signature _____

Date: _____

APPENDIX M: CONSENT FORM FOR SCHOOL HEAD(S)

I,_____(Full name of school head) the head of _____(name of school) understand the context of the research study and I grant permission that the research study titled:**: Dynamics of subject choices: A framework towards the selection of advanced-level mathematics subjects offered by the Ministry of Primary and Secondary Education (MoPSE), Zimbabwe** be conducted at my school. I am aware that the teacher and learners' participation is voluntary; all information will be treated with confidentiality and anonymity to ensure that no harm or bad effect will be caused to participants by the research study; participants will be granted the right to withdraw when they so wish, and they may also refrain from answering questions when they see it necessary.

School head's signature: _____ Date: _____

Researcher' signature: _____ Date: _____

School Stamp

APPENDIX N: SCHOOL HEADS QUESTIONNAIRE

SECTION A

Participant Number ☐ **School Code** ☐

Please tick in the appropriate box

Gender Male ☐ Female ☐

Age : 25 years & below ☐ 26 – 30 years ☐

31 – 35 years ☐ 36 – 40 years ☐

41 – 45 years ☐ 46 – 50 years ☐

51 – 55 years ☐ 56+ years ☐

Professional qualification

Certificate in Education Diploma in Education ☐

Bachelor of Education ☐

Master of Education in Mathematics ☐ Masters in Education Management ☐

Post Graduate Diploma in Education ☐ Graduate Certificate ☐

Any Other .....

SECTION B

Kindly fill in your responses in the space provided below each question.

1. Are you offering all A-Level mathematics subject(s) as per MoPSE curriculum?

_____

_____

2. If yes, how do you manage to include all the A-Level mathematics subject(s) in your school's curriculum?

_____

_____

3. If no, what hinders your school from offering all A-Level mathematics subjects as per MoPSE curriculum to increase the selection choice for learners?

_____

_____

4. Could you please clarify why you chose to include the mathematics subject(s) mentioned above in your school's curriculum?

_____

_____

5. Are learners aware of all mathematics subject(s) available to them before committing to certain A-Level mathematics subject(s)?

_____

_____

6. How do you educate learners on the different A-Level mathematics subjects MoPSE has to offer?

_____

_____

7. How are parents involved when A-Level learners select A-Level mathematics subjects?

_____

_____

_____8. What influence do mathematics teachers have when learners select mathematics subjects to study at A-Level?

_____

_____

_____

9. How do you rate the A-Level mathematics subject(s) offered at your school in relation to industrial and higher learning demands?

_____

10. How do external players such as parents' guide the school in the choice of A-Level mathematics subject(s) offered at your school?

_____

11. What improvements would you suggest to help guide A-Level learners when making mathematics subject(s) choices?

_____

Thank you!

APPENDIX O: A-LEVEL MATHEMATICS TEACHERS QUESTIONNAIRE

SECTION A

Participant Number ☐ **School Code** ☐

Please tick in the appropriate box

Gender Male ☐ Female ☐

Age: 25 years & below ☐ 26 – 30 years ☐

31 – 35 years ☐ 36 – 40 years ☐

41 – 45 years ☐ 46 – 50 years ☐

51 – 55 years ☐ 56+ years ☐

Professional qualification

Certificate in Education ☐ Diploma in Education ☐

Bachelor of Education ☐

Master of Education in mathematics ☐ Masters in Education Management ☐

Post Graduate Diploma in Education ☐ Graduate Certificate ☐

Any Other

.....

SECTION B

Kindly fill in your responses in the space(s) provided below each question.

1. What can you say about the A-Level mathematics subject(s) offered at this school?

_____
_____
_____
_____
_____

2. What do you think are the considerations made by A-Level learners when choosing mathematics subject(s) to study at A-Level?

_____
_____
_____
_____
_____

3. What influence do teachers have on A-Level learners' mathematics subject(s) selection choices?

_____
_____
_____
_____
_____

4. What role do parents or guardians play during A-Level learners' selection of A-Level mathematics subject(s) for studying?

_____
_____
_____

5. How does peer influence impact A-Level learners' section choices of A-Level mathematics subjects to study at A-Level?

6. How useful are the career guidance programmes at your school in guiding the A-Level learners when making A-Level mathematics subject(s) choices?

7. In your opinion, do you think A-Level learners' mathematics subject(s) selection is informed by the industry and higher learning institutions' demands?

8. What improvements would you suggest to help guide A-Level learners when making mathematics subject(s) choices?

9. How do you assist as a subject teacher when learners select their A-Level mathematics subject(s)?

_____

_____

_____

_____

_____

10. Which suggestions would you give for a fair mathematics A-Level subject(s) selection?

_____

Thank you!

APPENDIX P: FOCUS GROUP INTERVIEW GUIDE QUESTIONS

Focus group Number **School Code**

SEX OF LEARNERS

	Number of learners
Girls	
Boys	

AGE OF LEARNERS

	Number of learners
(16-17) years	

18 years and above

Number of mathematics subject(s) studied

	Number of learners
Studying one mathematics subject	

Studying at least one mathematics subject

SECTION B

1. Could you please let me know the A-Level mathematics subjects that are available at your school?

   _____

   _____

   _____

2. Have you thoroughly investigated the topics included in the selected mathematics subject(s)? If so, what kind of investigation have you done?

   _____

   _____

   _____

3. How did the MoPSE subject registration guide assist you in making an informed decision while selecting your preferred A-Level mathematics subject?

   _____

   _____

   _____

4. To what extent did your peers' input guide your decision-making process in selecting the A-Level mathematics subject(s)?

   _____

   _____

5. How were your parents involved in selecting the A-Level mathematics subject(s) that you are currently studying?

6. Could you please elaborate on how your parents support you in pursuing your A-Level mathematics studies?

7. Your mathematics teacher must have played a critical role in selecting the mathematics subject(s) you are currently studying. Can you share more about their influence and how it has impacted your progress in the subject?

8. What academic assistance did you receive from the school for your chosen A-Level mathematics subject(s)?

9. What resources and support are available at your school to help you excel in the A-Level mathematics subject(s) you have chosen?

_____

_____

_____

_____

_____

10. What suggestions do you have to guide A-Level learners in choosing their mathematics subject(s)?

_____

_____

Thank you!

APPENDIX Q: TURNITIN REPORT

Similarity Report

PAPER NAME
NAMATIRAI CHIKUSVURA-FINAL THESIS.docx

AUTHOR
NAMATIRAI CHIKUSVURA

WORD COUNT
58520 Words

CHARACTER COUNT
364142 Characters

PAGE COUNT
210 Pages

FILE SIZE
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SUBMISSION DATE
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Sources overview

APPENDIX R: EDITING CERTIFICATE

EDITING AND PROOFREADING CERTIFICATE

22 Osche Street

The Reeds

Centurion

0157

28 May 2026

TO WHOM IT MAY CONCERN

This certificate serves to confirm that I have edited N Chikusvura's thesis titled, **"Dynamics of subject choices: A framework towards the selection of Advanced Level mathematics subjects offered by the Ministry of Primary and Secondary Education (Mopse), Zimbabwe."**

I found the work easy and intriguing to read. Much of my editing basically dealt with obstructionist technical aspects of language, grammar and syntax, which could have otherwise compromised smooth reading as well as the sense of the information being conveyed. I hope that the work will be found to be of an acceptable standard. I am a member of Professional Editors' Guild.

Hereunder are my contact details:



Jack Chokwe (PhD – University of Leicester (United Kingdom)

Contact numbers: 072 214 5489

jackchokwe@gmail.com

www.academicproeditor.co.za

Professional EDITORS Guild

