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TITLE: EXAMINING THE IMPACT OF MATHEMATICS EDUCATION ON ENTREPRENEURIAL SKILLS DEVELOPMENT IN SECONDARY SCHOOLS IN MASHONALAND EAST, WEDZA AT ST MARGARETS CHIGODORA SECONDARY SCHOOL.

BY

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DEDICATION

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ABSTRACT

This research aimed to investigate the impact of mathematics to the acquisition of entrepreneurship at St Margarets Chigodora Secondary school, in Wedza, Mashonaland East. Prior research has highlighted that students are studying entrepreneurship with no mathematical background which is a significant subject. This research opted to explore the impact of learners mathematical background on their learning of entrepreneurship. With increasing emphasis on fostering and entrepreneurship mind set and skills, it becomes essential to understand how students with a background in mathematics perceive and engage with entrepreneurship education. The study adopted the mixed-methods approach, including both quantitative and qualitative analysis. Questionnaires include both structured and unstructured questions. The interviews were conducted qualitatively with both students and teachers responding freely to the questions. The findings of the research reviewed that there are many roles which mathematics can contribute in the acquisition of entrepreneurship. The respondents pointed out that mathematics prepare learners to be arithmetic accuracy, being able to work with numbers, being able to take risks, to plan and to organize. Based on the results of the research the participants explained their views and perceptions of mathematical background on the acquisition of mathematics. The results indicated that there is relevance in mathematics, the subject bring confidence on the part of learners and the ability to apply knowledge on the acquisition and learning of entrepreneurship. The findings from this research were expected to bring clarity and justice on the relationship between mathematics and entrepreneurship. The

results indicate that mathematics plays a significant role in preparing learners for entrepreneurship studies. By bridging a gap between mathematical and entrepreneurial competencies, educational institutions can better equip learners to successfully navigate the dynamic landscape of entrepreneurship.

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CHAPTER 1: INTRODUCTION TO THE STUDY

1.0 Introduction

Youth unemployment hampers economic development and poses a global security threat, leading to higher crime rates and vulnerability to extremist groups (Obonyo, 2021). In Zimbabwe, the situation is particularly critical for young people due to the struggling economy. The official youth unemployment rate is 12.37% (Statista, 2023), but activists argue that this figure underestimates the true number of unemployed young Zimbabweans (Moyo, 2023). With over 60% of the country's population below the age of 25, Zimbabwean youth face significant barriers to realizing their economic and political potential (Oyewale, 2023; UNICEF Zimbabwe, 2021). To address these challenges, Zimbabwe's revised National Youth Policy (2020-2025) envisions holistic youth development through education, skills development, employment, entrepreneurship, governance, and well-being (Government of Zimbabwe, 2021). To shed light on this issue, the research aims to explore the impact of mathematics education on the acquisition of entrepreneurial skills among secondary school students. By investigating the relationship between mathematics education and entrepreneurial abilities, we seek to uncover how mathematics education can effectively foster skills that will benefit students in their future entrepreneurial endeavours.

1.1 Background

Mathematics holds a prominent place in the school curriculum as a result of its critical role in scientific and technical advancement, and as such, is the foundation for the development of entrepreneurial abilities (Uka, 2020). A solid understanding of Mathematics will improve one's ability to solve complex life challenges. According to Ale and Adetula (2020), the distinction between developed and developing countries is based on their level of mathematical ability and ingenuity. Mathematics is often considered an undeniable driver of economic growth and wealth creation. Mathematics is more than just the science of numbers that professors teach in schools and that many pupils either enjoy or fear. Mathematics plays an important role in people's lives and in the development of any society (Odumosu, 2021). Because we rely on mathematics to address our daily problems, this has become required. In today's increasingly technological culture, Mathematics is also essential for a variety of occupations and work prospects (Odumosu, 2010).

According to Udonsa (Mujuru & Muzvare, 2018), the national objectives of primary and secondary education in relation to Mathematics learning include laying a solid foundation for the concept of numeracy and scientific thinking; providing opportunities for the child to develop manipulative skills that will enable him to function effectively in society within his capacity; developing in the child the ability to adapt to his changing environment; and providing the basic tools for further learning. With these goals in mind, Oviawe (2010) observes that Zimbabwe, like most developing countries around the world, faces a slew of issues and harsh realities, including poverty, unemployment, conflict, and sickness. Poverty is one of the repercussions of unemployment (Mambondiyani & Shava, 2019). A state of poverty is a general shortage or a lack of a specific amount of material possessions or money. It's a multi-faceted idea with social, economic and political components. Poverty eradication in all kinds and dimensions, including extreme poverty, is the most pressing global challenge and a prerequisite for national and long-term development.

The learning of entrepreneurial skills for employable individuals is critical to addressing the issue of unemployment and eradicating poverty in Zimbabwe. Mathematics knowledge prepares students to be actively engaged and responsible citizens, creative and imaginative, able to work cooperatively, and fully aware of and conversant with the complex difficulties that society faces (European Commission, 2015). Scientific knowledge aids in describing and comprehending the world around us. Science education is critical for promoting a culture of scientific thinking and inspiring citizens to make decisions based on evidence. Therefore, it is of significant importance to ensure that citizens have the confidence, knowledge, and skills to participate actively in an increasingly complex scientific and technological world. This would help individuals to develop problem-solving and innovation competencies, as well as analytical and critical thinking skills, which are required to empower citizens to live personally fulfilling lives. As a result, mathematics is one of the instruments required for entrepreneurial success.

An entrepreneur is someone who takes the risk of starting and running a company. The entrepreneur looks inward into his or her environment to uncover problems that others are facing (or business possibilities) and introduces new products and services to make money (Ugwoke & Abidde, 2014). According to Moemeke (2013), an entrepreneur is a lifelong learner, a creative person, an initiate, and a potential industrialist, in addition to being an inventor. As a result, entrepreneurs control the destiny of nations because they shape, materialize, and bring any nation's developmental goals and economy to fruition. Entrepreneurial skills are business skills that an individual learns on their own in order to run a successful business and be self-sufficient (Umunadi, 2014; Nwafar, 2009).

The skills entail the effective use of ideas, information, and facts to assist a learner in developing competencies, providing services, or becoming productive employees of an organization. Entrepreneurship is the process of using private initiative to transform a business concept into a new venture or to grow and diversify an existing venture or enterprise with high growth potential (Muponda & Chikwetu, 2019). It is the process of using private initiative to transform a business concept into a new venture or to grow and diversify an existing venture or enterprise with high growth potential (Mkpa, 2014; Ugwoke & Abidde, 2014).

At a global level, there is a growing recognition of the importance of entrepreneurship education in preparing students for the rapidly changing economic landscape. Entrepreneurial skills such as critical thinking, problem-solving, and creativity are increasingly seen as essential for success in the modern world. Mathematics education plays a crucial role in developing these skills as it provides students with the analytical and quantitative reasoning abilities necessary for entrepreneurial endeavors (Madondo & Marume, 2019). Numerous studies worldwide have highlighted the positive impact of mathematics education on entrepreneurial skills development in secondary schools.

Moving to a continental level, in Africa, there is a strong emphasis on promoting entrepreneurship as a driver of economic growth and job creation. Many African countries are incorporating entrepreneurship education into their school curricula to equip students with the skills needed to succeed in an increasingly competitive global market (Chikukwa & Murovatsanga, 2019). Mathematics learning is recognized as a key component of this entrepreneurial education, as it helps students develop the numerical and logical reasoning skills necessary for business success.

As a result, it is critical that entrepreneurial skills be incorporated into the basic science curriculum for children. The federal government of Nigeria has recently established a policy of entrepreneurship education as a compulsory field of study at all levels of education in Nigeria, notably at the secondary level of school, in response to continuing trends of youth unemployment (Obioma 2012). In light of current realities and the need to develop and empower society's youth, this change from general education to explicitly entrepreneurship education becomes vital. There appears to be agreement on the need for entrepreneurship in addressing several socioeconomic issues, particularly poverty, unemployment, and various social vices (Oviawe, 2010). Oviawe (2010) investigated the possibility of employing entrepreneurial education as a method or instrument for redirecting the necessary energy of Nigerian universities, faculties, and students away from paid work and toward self-employment, which is important for capacity building. Entrepreneurial education, where students are trained on the fundamentals of

entrepreneurship and how to construct a successful company strategy, must be prioritized for entrepreneurs to flourish.

At a regional level, in Zimbabwe, including Mashonaland East province and specifically at St Margaret's Chigodora school in Wedza, there is a growing interest in enhancing the quality of education to foster entrepreneurship among students. The government and various organizations have been implementing programs to promote entrepreneurship education in schools, aiming to cultivate a culture of innovation and self-reliance among the youth. At the school there is involvement of students in tuckshop audit, profit and loss calculations by mathematics learners. Understanding the impact of mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza, including at St Margaret's Chigodora school, is critical for informing policies and practices that can effectively support students in acquiring the skills needed for successful entrepreneurship.

1.2 Statement of the problem

The problem statement for the impact of using numerical skills on entrepreneurial skills development in secondary schools in Mashonaland East, specifically at St Margaret's Chigodora School in Wedza, revolves around the need to assess and understand the effectiveness of mathematics learning in preparing students for entrepreneurship. Despite the growing emphasis on entrepreneurship education, there is a gap in the literature regarding the specific impact of mathematics learning on the development of entrepreneurial skills among secondary school students in this region.

The problem statement highlights the lack of empirical evidence on how mathematics learning influences the acquisition of entrepreneurial skills such as critical thinking, problem-solving, and innovation among students at St Margaret's Chigodora School. This gap in knowledge poses a challenge in designing targeted interventions and curriculum enhancements that can better support students in developing the skills necessary for entrepreneurship and future success in the increasingly competitive economic landscape of Mashonaland East.

Therefore, the problem statement emphasizes the need for research to investigate the relationship between mathematics education and entrepreneurial skills development within the context of St Margaret's Chigodora School in Mashonaland East, Wedza. By addressing this gap in the literature, the study aims to provide valuable insights that can inform educational policies and practices aimed at enhancing entrepreneurship education and fostering a culture of innovation among secondary school students in the region.

1.3 Main research question

- How does mathematics learning influence the learning of entrepreneurship secondary school students?

- What are the contributions of Mathematics towards the learning of entrepreneurial in secondary schools?

- What are the perceptions of secondary school students towards mathematics learning and its relevance to entrepreneurship?

1.4 Research objectives

- ❖ To examine the influence of mathematical skills to entrepreneurship among learners
- ❖ To evaluate the specific aspects of mathematical learning and its contribution towards the development of entrepreneurial abilities.
- ❖ To examine the skills learnt in Mathematics that promotes entrepreneur skills in secondary school students.
- ❖ To determine the knowledge of mathematics that can help in acquiring entrepreneurial skills among secondary school students.
- ❖ To understand if there is any significant relationship between mathematics and entrepreneurship.

1.5 Significance of the study

The researcher

The study can contribute to the researcher's professional development and academic growth by providing them with valuable research experience and insights into the field of education and entrepreneurship. The

findings of the study can also potentially lead to further research opportunities and collaborations in the future.

Community

The study can benefit the community by providing insight into the role of mathematics education in developing entrepreneurial skills in students. This information can help community members, parents, and other stakeholders understand the importance of mathematics education in preparing young people for future success in the entrepreneurial world.

School

The findings from this study can help schools in Mashonaland East, particularly St Margaret's Chigodora Secondary School, to improve their mathematics education curriculum to better support the development of entrepreneurial skills in their students. This can potentially lead to better academic performance and increased opportunities for students in the future.

University

The research can provide valuable data and insights for university education departments and researchers studying the impact of mathematics education on entrepreneurial skills development. This can contribute to the body of knowledge on education and entrepreneurship, leading to improved teaching practices and policies.

Government

The findings of this study can inform government policies and initiatives aimed at promoting entrepreneurship and improving mathematics education in secondary schools. This can ultimately lead to a more skilled and entrepreneurial workforce, contributing to economic growth and development in Mashonaland East and Zimbabwe as a whole.

1.6 Limitations:

The results of this study are limited to only one school in Mashonaland East, Wedza, which may not be representative of all secondary schools in the region. Furthermore, the research only focused on the impact of mathematics education on entrepreneurial skills development and may not take into account other factors that could also influence skill development. More so, the study was confined to a small sample size which could limit the generalizability of the results. The research also relied on the self-reported data from

students and teachers which could be a bias to other educational stakeholders. Furthermore, the study could not consider the specific teaching methods or curriculum used in mathematics education at St Margaret's Chigodora School, which could impact the results.

1.7 Delimitations:

- The study will specifically focus on the impact of mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza.
- The study will only consider data from St Margaret's Chigodora school, allowing for a detailed examination of the relationship between mathematics education and entrepreneurial skills development in a specific context.
- The study will involve both qualitative and quantitative data collection methods to provide a comprehensive understanding of the topic.
- The study will only consider students and teachers as participants, as they are directly involved in the education process.
- The study will consider the limitations of the research design and attempt to address them through thorough data analysis and interpretation.

1.8 Definition of terms

Entrepreneurship: Peter Drucker states that an entrepreneur is the one who always searches for

Changes, responds to it and exploits it as an opportunity. He further states that innovation is the specific tool of an entrepreneur. Entrepreneurship skills include various skills sets such as leadership, business management, time management, creative thinking and problem solving. By introducing entrepreneurship skills at school learners can be able to competent citizens.

1.9 Chapter summary

This project aims to investigate the influence of mathematics learning on entrepreneurial skills in secondary schools. By addressing research questions, conducting a comprehensive literature review, using mixed-methods, and considering ethics, this study will contribute to understanding how mathematics learning fosters entrepreneurial skills. Findings will inform educational policies, promote economic growth, and advance society.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter contains the conceptual, theoretical, and empirical literature. It also contains the gaps highlighted with regard to the statement of the research problem and the stated objectives. The conceptual review discussed various concepts and constructs relevant to the stated objectives of the study. The theoretical review was based on three theories that are relevant to the topic. The study adopted experiential learning theory. The empirical framework reviewed empirical studies in line with the specific objectives of this study. A critical analysis of the reviewed literature was carried out and gaps identified were summarized.

2.1 The Concept of Entrepreneurship

There is no generally acceptable definition of entrepreneurship that is considered as adequate, and the absence of a universal definition results in the lack of consensus on the meaning of this concept (Katz & Green 2019). A number of researchers such as; Drucker (1985) Bruyat and Julien (2021) have characterized entrepreneurship from various perspectives and viewpoints, however the different conceptualizations are generally an impression of the analyst's field of specialization. Ronstadt (2022) depicted entrepreneurship, as the dynamic procedure of making incremental wealth. As indicated by Ronstadt (1984), this wealth is made by people who take considerable risk as far as value, time, and career commitment, in giving value to some products.

2.2 Functional Resource Perspective of Entrepreneurship

Barringer and Allen (2019) stated that the functional resource perspective of entrepreneurship, centers on the role of an entrepreneur in the process of opportunity exploitation and resource combination, and their effects on the economic system. The functional resource perspective is regarded as a neo-classical economic perspective, which emerged around the inception of the nineteenth century with a focus on the economic role of entrepreneurs (Jones & Spicer, 2019). The theoretical foundation for this perspective

was mainly provided by the works of Schumpeter (2022) and the primary aim was to examine the socio-economic consequences of carrying out new combinations. Consequently, researchers such as Hitt (2020) supported by Long (2020) focused on the opportunistic elements of entrepreneurship, which defines the concept based on pursuit and exploitation of business opportunities.

The word entrepreneur is said to have originated from France long before the conceptualization of the term entrepreneurship (Casson, 1982; Minniti & Lévesque, 2008). One of the earliest uses of the word is dated back to the sixteenth century describing individuals who were engaged in spear-heading military missions and expeditions (Swedberg, 2017). Some writers and French economists in early 1800 attempted to give a definite meaning to the words, entrepreneurship and entrepreneur.

However, there were disparities based on the features of the aspects of the economic sector of interest (Baumol, 2022). According to Kizner (2017) asserted that the French economist Jean-Baptise were the first to have first used the term entrepreneur as a technical concept. Valerio, A., Parton, B., & Robb, A. (2014) in his definition referred to the entrepreneur as the agent who organizes factors of production with the aim of creating a new product, while Jean-Baptise Say incorporated the concept of leadership, in defining an entrepreneur as one who organises individuals, in order to create a useful product (Kirzner, 2020). It was Joseph Schumpeter who clearly associated entrepreneurs with the concept of innovation and economic development, defining an entrepreneur as the one responsible for organizing all factors of production to create quality products, while maximizing the employment of resources to achieve high productivity (Shane, 2021).

2.3 Education and Entrepreneurship Development

Education is considered as one of the effective tools human capital and societal development, because no nation can attain an appreciable level of development beyond the level of her education (Job,2023). Education is very central to the training and development of human resources in any nation through impartation of suitable skills, knowledge, capacity building, attitude and value re-orientation employed in the transformation of individuals, communities and nations at large (Boyi, 2024).

Therefore, education is seen as the most important instrument of any fundamental change, particularly with regards to the achievement of economic goals such as entrepreneurship development, job creation and poverty eradication, especially in the teenagehood (Mukandawire, S., & Madzore, T. (2022). The Zimbabwe Education New Curriculum Education 5.0 gives credence to thereof education in the development of self- reliant abilities and entrepreneurship skills in individuals. Therefore, the role of

secondary school education as regards to entrepreneurship development in Secondary Schools cannot be over emphasized.

Fayolle and Gailly (2021) defined entrepreneurship education as any pedagogical Programme, associated with inculcating entrepreneurial skills and qualities in learners. Similarly, Oduwaiye (2019) described entrepreneurship education as the scope of lectures, curricular and programmes that attempt to provide students with the necessary entrepreneurial competencies, knowledge and skills, geared towards the pursuit of a career in entrepreneurship. This was supported by Tende (2022) who posited that the acquisition of relevant knowledge skill, and expertise, as regards the process of entrepreneurship is imperative for successful business startup. It was believed that entrepreneurs are individuals with peculiar genes who emerge as a consequence of genetic inheritance, however this myth has been demystified based on the premise that every individual has the potential to become an entrepreneur through the process of education (Apkomi, 2019).

Most definitions of entrepreneurship education, agree that one of the main goals is inculcating entrepreneurial skills in learners which should culminate in entrepreneurial behavior and action (Akpomi, 2019). Two key words closely associated with education as a concept, is information, skill and competencies. Hence a comprehensive definition of entrepreneurship education should incorporate information and skill as outcomes of the process (Gibb, 2016). Therefore, this study will adopt the definition of entrepreneurship education presented by Poli (2014), which described entrepreneurship education as the structured formal communication of entrepreneurial competencies, which consists of skills and mental awareness employed by individuals towards the expression of entrepreneurial behavior and action.

2.4 Teaching Methods which fosters Entrepreneurship

A study by Shulman and Shulman (2021) described teaching methods which fosters entrepreneurship as an assortment of teaching practices that have a strong research base, that are clearly understood by classroom practitioners and are direct responses to students needs and challenges. Lovat (2021) asserted that research has dismissed these two myths as regards teaching; effective teaching derives from subject knowledge and mastery, and a competent teacher can teach or instruct on any subject. This was supported by Schwartz (2016) who argued that effective teaching is not just a function of subject mastery, but also the ability to identify the essential and relevant mix of knowledge and skills, necessary for effective

teaching.

In the same light, Fayolle and Gailly (2024) posited that the effectiveness of teaching methods which fosters entrepreneurship, is assessed based on the extent to which the methods are able to essentially blend knowledge and skills, required for teaching and learning entrepreneurship. To this end Brendel and Yengel (2022) argued that methods of teaching such as class lectures, question and answer sessions and drills, are not adequate to facilitate the development of business ideas and similar entrepreneurial behavior outcomes. This was supported by Lonappanand Devaraj (2021) who suggested that some of the most common and effective classifications of teaching methods in entrepreneurship include; group and individual research projects, invitation of guest speakers, role play, hands on and simulations.

2.5 Secondary School Support Systems

Gnyawali and Fogel (2023) described school support systems in the context of entrepreneurship through learning Math, as an entrepreneurial environment which consists of supporting infrastructures and initiatives. These include initiatives such as tuckshop selling, poultry producing, seed funding, business incubation, patenting and commercialization to mention a few. Considering that school teaching environments represent the most influential factors that affect students perceptions and considerations of an entrepreneurship career. Mahlberg (2016) argued that secondary school learning plays an active and important role in the promotion of entrepreneurship education, particularly because they are the most ideal setting to nurture and shape an entrepreneurial culture among students. Bygrave (2024) stated that secondary schools are at the forefront in the promotion of entrepreneurship as regards influencing students to think and behave like entrepreneurs. Roffe (2019) posited that secondary schools create an environment that is entrepreneurially supportive, which encourages students engagement in entrepreneurial activities due to their ideal age of cognitive development. This was supported by Nasiru, Keat, and Bhatti (2015) who stated that entrepreneurial secondary schools create an environment that present entrepreneurship in a positive light, in order to attract the attention of students towards an entrepreneurial career.

2.6 Mathematics learning and entrepreneurship

According to Kolb (2023) defined learning orientation as the process of transforming new experiences in a

mix of novel and existing knowledge. Joy and Kolb (2009) stated that learning orientation comprises an individual s access to new knowledge and their ability to accommodate such new knowledge into their present knowledge base. Dweck (2016) argued that learning orientation reflects an individual s inclination towards a continuous search for new knowledge. Dweck and Leggett (2018) supported by Honig and Karisson (2019) stated that the theoretical underpinning of learning orientation suggests that the inclination to acquire new knowledge, and subsequent accommodation of this new knowledge into the existing knowledge set facilitates the ability to overcome challenges and deal with uncertain situations. Sarasvathy (2018) explained that a continuous upgrading of current knowledge base enhances the capability and capacity of individuals, to proffer creative and novel solutions to existing problems and challenges.

Consequently, considering that a career in entrepreneurship is inevitably characterized by high levels of uncertainty, Moorman and Miner (2018) posited that learning orientation is a facilitating factor necessary to transform students career specific considerations into action based intentions. According to Sinkula Bakerand Noordewier (2017) supported by Poracand Thomas (2020) Perin, Sampaio, barcellos, and Kugler (2021) Hidi and Harackiewicz (2020) and Hidi and Renninger (2016) the following are considered as five components of individual learning orientation; commitment to learning, shared vision, critical thinking, knowledge sharing and interest.

2.7 People s Perceptions on Entrepreneurship Education

Students perception in terms of an entrepreneurship Programme portrays the way student s analyses and interpret the teaching and learning processes involved in entrepreneurship education (Barnes & Lock, 2023). Student perception towards entrepreneurship education is an important topic based on the premise that perception affects behaviors. In line with the study of O Malley and McCaw (2019) one of the major factors that determine the perceived effectiveness of an entrepreneurship Programme is the perceived characteristics of the Programme. Students will then act in accordance to the perceived effectiveness of an entrepreneurship Programme. Hence many students perceptions play a role in determining either to or not to pursue educationally sound behaviors such as participating in activities involved in an entrepreneurship Programme.

There are two common approaches to getting intended values from an entrepreneurship Programme: regulating students behavior and changing their perceptions (Barnes & Lock, 2020). A weakness of the first approach is that students may not express the desired entrepreneurial behavior when they are guided

by their perceptions to circumvent the learning process. This is important considering the fact that entrepreneurship education is a compulsory course particularly in the Zimbabwean school setting. This is why the concept of students perception is very salient to the overall assessment of the effectiveness of an entrepreneurship Programme. This is consequent upon the fact that a careful assessment of students perception of an entrepreneurship Programme can serve as a basis for improvement and effective implementation of the Programme.

Perceptions of entrepreneurship educators in the context of entrepreneurship education describes the way entrepreneurship educator s analysis and interpret the teaching and learning processes and the outcomes of an entrepreneurship Programme (Irrissappane & Yasodha, 2021). Entrepreneurship educators are seen as the key factors in promoting entrepreneurship education; hence it is important to stress their perceptions as promoters of an entrepreneurship Programme Entrepreneurship Muponda, L., & Makwara, B. (2017). educators play a very important role regarding the overall aims of entrepreneurship programmes, which is hinged on combating unemployment and increased future entrepreneurial activities in the society. This is consequent upon the fact that entrepreneurship educators are instrumental to the transformation of the goals of an entrepreneurship Programme into teaching activities and learning outcomes (Irrissappane & Yasodha, 2014). This also suggests that entrepreneurship educators are also in the best position to evaluate the goals, the actions, and the outcomes of entrepreneurship education. This is why the perceptions of entrepreneurship educators regarding the teaching and learning processes of an entrepreneurship Programme is very important.

Students and educators may have same or different perceptions of the effectiveness of an entrepreneurship Programme (Horwitz, 2020). However, conflicting perceptions in any aspect of an entrepreneurship Programme between students and entrepreneurship educators may lead to a lack of student confidence in and satisfaction with the teaching and learning processes as well as the activities involved in the skills imparting. Therefore, the goal of assess in students and educators perceptions of an entrepreneurship Programme is to identify areas of agreement and to predict conflicts that may contribute to student and educator frustration, anxiety, or lack of motivation as regards participation in the activities involved in an entrepreneurship Programme (Brown, 2021). Therefore, an analysis and interpretation of the perceptions of both students and educators involved in entrepreneurship education, can present a holistic picture of the effectiveness of the teaching and learning processes as well as areas of improvement in an entrepreneurship Programme.

2.8 Entrepreneurship Education and Entrepreneurial Intentions

A career in entrepreneurship is characterized by uncertainties particularly because entrepreneurs are associated with novel efforts geared towards the achievement of challenging goals thus insufficient entrepreneurship-related knowledge may militate against the development of entrepreneurial propensity and lead to a risk-averse behavior (Wang, 2022)..To this end Gelard and Saleh (2020) argued that adequate and effective entrepreneurship learning can stimulate and increase students career considerations in entrepreneurship. This is achievable because according to Izquierdo and Buelens (2018) entrepreneurship education can effectively equip learners with the required skills and knowledge, consistent with effectively tackling challenging situations and complexities in decision making, associated with a career in entrepreneurship. Therefore, the perceptions of the impediments and risks associated with entrepreneurship is downplayed which motivates venture creation and well established business start-ups (Patel, V. K., Manley, S. C., Hair Jr, J. F., Ferrell, O. C., & Pieper, T. M. (2016).

In the same vein, practical knowledge and adequate exposure to the business world may also explain why higher level students and learners, indicate higher entrepreneurial inclination than students and learners in lower levels of an institution (Ahmed, 2020). Studies such as Kolvereid (2016) supported by Crick (2018) have also shown that students who express interests in participating in entrepreneurship programmes as a taught course especially in the secondary schools, are likely to exhibit a higher level of perceived behavioural control which indicates that exposure to entrepreneurship education, positively influences perceived behavioural control. Various studies such as Basu and Virick (2018) have also showed that perceived behavioural control positively influences entrepreneurial intentions hence the theoretical underpinning indicates that the higher the perceived behavioural control of an individual the higher the entrepreneurial intentions and vice-versa.

A study by Alberti and Sciascia (2024) argued that although students may possess the relevant entrepreneurial knowledge and skills, however they may not venture into entrepreneurship if the school supporting systems and infrastructure fail to promote the positive image of entrepreneurship. According to Kauffman (2023), secondary school play a major role especially in creating an environment, which motivates students to express entrepreneurial behaviour,by linking their research and students education to emerging industry interests. Guerrero (2021) posited that collaborations and innovations among school students can be achieved through activities such as partnering with businesses, offering internships, creating venture funds and industry funded incentive programmes. Morris, Kuratko and Cornwall (2022) argued that school support systems may stimulate knowledge building and sharing among undergraduates

culminating in technological innovations and product development. Therefore, the lessons learnt from the experiences and opportunities offered by support systems in Zimbabwean secondary schools may motivate knowledge sharing among students which may foster a conducive atmosphere for innovations.

2.9 Theoretical Framework

This study seeks to explore the relationship between entrepreneurship education and entrepreneurial implementation intentions and the role of learning orientation in mediating therefore mentioned relationship. Therefore, the theoretical underpinning of this study derived from the following theories; human capital entrepreneurship theory, experiential learning theory, and implementation intention theory. In this situation, the intention model is of outpost importance.

The concept of entrepreneurial intention requires the use of a predictable and strong theoretical structure that can reflect start-up intentions. Different reviews and researchers have proposed various intention models, notable among these models are; Bird's (1988) model further developed by Boyd and Vozikis (1994), the Shapero model (Shapero & Sokol, 1982) which was validated by Krueger (1993), Azjen's model (1988, 1991) and Davidson's (1995) model,which was likewise created and tested by Autio KeeleyKlofsten and Ulfstedt (1997).Thetwo prevailing intention models that havebeen distinguished in the literature and have been progressively utilised since 1990's are Ajzen theory of planned behaviour, and Shaper theory of entrepreneurial event (McGee, 2021). Ajzen's theory of planned behaviour (TPB) was first postulated by Ajzen (1988). The theory emphasises that intention is determined by attitude towards behavior, subjective norm, and perceived behavioural control.

Shapero's model of entrepreneurial event was first postulated by Shapero (1980). The model emphasises that intention formation is a function of interactions among contextual factors which impacts individual s perception. However, another intention model that is hardly considered in entrepreneurship education literature is implementation intention theory. The theory was first postulated by Golwitzer (1993) who stressed that intentions can be substantiated through actions initiated in pursuit of a goal. Hence these three theories of intention will be reviewed as a basis for the choice of intention model considered appropriate for the context of this study.

Gollwitzer (2023) posited that apart from the theory of planned behaviour, a volitional stage consisting of efforts geared towards initiating the intended behaviour by formulating specific plans of where, when and how to implement the intended behavior is referred to as implementation intentions. The effectiveness of an implementation intention intervention, when applied to entrepreneurship education is evidenced by the

fact that an assessment of an entrepreneurship programme based on implementation intentions may have the ability to increase the likelihood of students performing entrepreneurial behaviour as a result of initiated efforts such as ideas generated, opportunity identified, startups and other similar entrepreneurial efforts as indicators of intention to engage in entrepreneurial activities even after completing their level of schooling. (Madondo, C., & Marume, R. (2019). Therefore, the intention model employed for this study is the implementation intention theory.

2.10 Empirical Framework

The contents of an entrepreneurship curriculum should stimulate critical thinking in students and motivate generation of feasible and viable business ideas. This was supported by the study of Bodnar, Renee, and Besterfeild-Scacre (2015) who examined the development and assessment of two offerings of a sophomore-level engineering innovation and entrepreneurship boot camp. The boot camp was based mainly on the development of entrepreneurial mindset skills via the provision of curricular content on idea generation and the customer s role in the design and technology transfer process. Results indicated that the boot camp curricula can motivate learning of innovation and idea generation and lay the basic foundation for students skill sets that can be further developed within their academic careers.

In the same vein, Mahajar and Yunus (2022) explored the inclination towards entrepreneurship among school students. The total population in this study was 181 and the respondents were selected by using simple random sampling. The findings of the research showed that the role of secondary school learning in promoting entrepreneurship, entrepreneurial curriculum and content and role models had significant impact on the inclination of the students towards entrepreneurship. In a similar study, Gafar, Kasim, and martin (2023) examined entrepreneurship training in the tertiary institutions and development of innovative business idea to the business venture start-up stage. The Business Team Project Partnership Program (BT-PPP) was identified as a strategic teaching curriculum for facilitating entrepreneurial idea ggeneration PPP passed the suitability fitness for motivating entrepreneurial idea generation, interaction and networking, as entrepreneurial learning outcomes.

Conversely, Caloghirou, Protogerou, and Deligianni (2023) focused on the role of education in the promotion of entrepreneurial activity among students and young school graduates. The study examined the link between relative educational programmes designed to stimulate knowledge-intensive entrepreneurship with emphasis on engineering education. The study was based on a survey undertaken among graduates of the National Technical school of Athens (NTUA). The findings showed that the

contents of the curricular offered by NTUA was weak in offering the necessary non-technical knowledge and skills that would assist young graduates in setting up entrepreneurial ventures. In a similar work by Papadimitriou (2017) the study compared the entrepreneurial intention of business students attending the first and the fourth year of Business studies, in a Greek school in order to determine the impact of curriculum and to explore the role of the Theory of Planned Behaviour (TPB) in explaining students entrepreneurial intention. Copies of questionnaire were distributed to a sample of 186 students attending the 1st (108) and the 4th (78) year of studies at Business Management. The results of the research showed that entrepreneurial curriculum contents were insignificant in influencing the intentions of business students to pursue a self- employed career.

In a related research, Bilic, Prka, and Vidovic (2021) assessed the influence of education curriculum on entrepreneurship orientation and intention. The study adopted a survey method using 253 undergraduate and graduate students enrolled in entrepreneurship courses in the Faculty of Economics school of Split, Croatia. The main goal of the research and study was to assess the effect of education system as well as the curriculum in terms of its role and effectiveness in providing relevant knowledge and tools necessary for implementing and engaging entrepreneurial or business idea in practice or in real life situation. The study also examined the willingness and abilities of students to employ additional opportunities such as scholarships, grants and international work experience which should provide additional sample evidence of their considerations for a career in entrepreneurship after graduation. The findings of the research suggest that there is a low correlation between the education system and entrepreneurship orientation. According to the authors, this may be as a result of the inability of the curriculum to stimulate entrepreneurial ideas.

2.11 Gaps in Literature

Empirical studies such as Bilic, Prka, and Vidovic (2021) provide empirical evidence on the influence of education curriculum on entrepreneurship orientation and intention particularly in the context of generation of business ideas, while the work of Bodmar (2022) carried out an assessment on the development of entrepreneurial mindset skills, through the provision of curricular content on idea generation and the customer s role in the design and technology transfer process. However, these empirical studies do not provide succinct explanations on how an entrepreneurship curriculum can enhance entrepreneurial development, especially in the context of generation of business ideas.

The argument here is that the effectiveness of an entrepreneurship curriculum, in motivating generation of

viable and creative business ideas, may also be hinged on the extent to which the curriculum is able to stimulate critical thinking in students. Critical thinking is considered as a major ingredient that can stimulate generation of business ideas, sequel to exposure to a practical oriented entrepreneurship curriculum, which extensively covers idea generation as a major theme. This suggests that there is limited empirical evidence to substantiate the role of the contents of an entrepreneurship curriculum, as regards stimulating critical thinking and generation of viable business ideas by school students especially in the Zimbabwean school context.

In the same vein, empirical evidence provided by the investigation of Saksand Gaglio (2022) on how entrepreneurship educator-practitioners conceptualise and instruct the opportunity identification process, showed that little is known about whether and how opportunity identification is instructed in the classroom. Detienne and Chandler (2004) also showed that individuals can learn the processes of opportunity identification in entrepreneurial classes. Munoz, Mosey, and Binks (2021) also concluded that entrepreneurship courses need to motivate a change in the perception of students regarding reality and also interpret information to enable them to more effectively and efficiently identify new business opportunities.

However, what these studies have not been able to explain is how the engagement of an appropriate pedagogy, motivate students to identify business opportunities. Therefore, the role of experiential pedagogical approaches in motivating a shared vision/focus and opportunity identification by entrepreneurship students cannot be over emphasized. Identification of business opportunities is consequent upon the fact that experiential approaches to pedagogy, can create a shared vision about real life scenerios as regards what entrepreneurship is about. Hence, understanding the main crust of the process of entrepreneurship in a real life context may motivate opportunity identification by entrepreneurship students.This implies that the place of entrepreneurship pedagogy,ii creating a shared vision for identification of business opportunities by students in secondary schools is not clearly established in related empirical literature.

Similarly, the study of Arasti, Falavarjani, and Imanipour (2022) provided empirical evidence to show that the appropriate or effective teaching methods for entrepreneurship education are group project, case study, individual project, new venture creation project and problem-solving activities. Similarly, the research of Penanluna, Peneluna, and Jones (2022) also reported low levels of business start-up activity among students during enterprise education and/or within one year of graduation. However, what these studies have not been able to establish is the link or what can be described as the bridge that connects the

employment of appropriate teaching methods in entrepreneurship and business startups particularly in the course of an entrepreneurship programme, depends largely on the extent to which these methods stimulate students interest. These points to the fact that there is a dearth of research particularly in the Zimbabwean context, on the extent to which teaching methods in entrepreneurship, stimulate students interest and business startups during entrepreneurship education programs.

The empirical study of Amalia (2022) provided evidence to establish the role of the school support environment and development of student entrepreneurship. Shirokova, Tsukanova, and Bogatyreva (2015) also assessed different types of entrepreneurial capital provided by schools and their impact on students involvement in entrepreneurship. However, what these previous studies have not shown is the impact of these school initiates on innovations, particularly because the school environment is considered a conducive atmosphere for innovative activities. Hence, knowledge sharing comes to play especially because these initiatives tend to motivate students to work in groups. This suggests that very little is known on the role of school policy environment, in creating a conducive atmosphere for students knowledge sharing and engagement in innovations, particularly in the Zimbabwean school curriculum.

They are gaps that have found in the research which include the specific relationship between mathematics learning and entrepreneurial skills development in secondary schools in Mashonaland East, particularly in the context of St Margaret's Chigodora secondary school. These gaps include lack of studies exploring the teaching methods and strategies used in mathematics education that contribute to the development of entrepreneurial skills among secondary school students in the region.

Also, another gap would be limited understanding of the factors that influence students' perceptions of the importance of mathematics in relation to their future entrepreneurial endeavors in Mashonaland East. Another gap could be scarce research on the role of teachers in promoting the integration of mathematics education and entrepreneurial skills development in secondary schools in the region.

This also includes insufficient research on the outcomes and impact of mathematics education on the actual entrepreneurial activities and success of former students from St Margaret's Chigodora school in Mashonaland East. Furthermore, gaps could include the lack of studies that examine the potential differences in the impact of mathematic learning entrepreneurial skills development among students from diverse socioeconomic backgrounds in secondary schools in the region.

2.12 Summary

In conclusion, Chapter 2 has provided a comprehensive review of the existing literature on the topic of the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza at St Margaret's Chigodora school. The literature has highlighted the key themes, theories, and research findings in the field, as well as gaps and inconsistencies that need to be addressed. By synthesizing the information from a variety of sources, this chapter has laid the groundwork for the subsequent chapters in this dissertation. Moving forward, Chapter 3 will focus on the methodology employed in this study to address the research questions and contribute to the existing body of knowledge on the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza at St Margaret's Chigodora school. By building on the insights from the literature reviewed in this chapter, the study aims to make a meaningful contribution to the field and advance our understanding of the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza at St Margaret's Chigodora school.

CHAPTER 3: RESEARCH METHODOLOGY.

3.0 Introduction

This chapter outlined the research design and methodology. The focus of the study was on the impact of Mathematics on entrepreneurial skills development in secondary schools in Mashonaland East. A case study of St Margaret's Chigodora School.

In this chapter, the research methodology which was used in conducting the study was explained. The methodology outlined the procedures and techniques that were employed in order to address the research objectives and answer the research questions (Creswell, 2016). The methodology detailed the research approach, design, data collection methods, sampling techniques, data analysis procedures, and any limitations encountered during the research process.

3.1 Research design

The qualitative research on examining the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza at St Margaret's Chigodora School utilized a phenomenological research design. This approach aimed to delve into the lived experiences and perceptions of secondary school students regarding the relationship between Mathematics education and entrepreneurial skills development. The design facilitated an in-depth exploration of the phenomenon under investigation from the participants' perspectives (Creswell, 2013).

The sample population for the study included secondary school students at St Margaret's Chigodora School in Mashonaland East, Wedza. Purposive sampling was employed to select students who had completed their Mathematics education and were actively engaged in entrepreneurial activities. This sampling technique ensured that the participants had valuable experiences and insights to contribute to the study (Patton, 2015). In-depth interviews were

conducted with the selected students to gather comprehensive data on their perceptions and experiences of Mathematics education and its impact on their entrepreneurial skills development.

The data collected from the interviews were subjected to thematic analysis to identify patterns and themes in the participants' responses. This involved coding the data, categorizing the codes into themes, and interpreting the themes to generate meaningful findings. The themes were presented in a narrative form to provide a detailed description of the impact of Mathematics education on entrepreneurial skills development as perceived by the secondary school students (Braun & Clarke, 2006). The findings of the study were triangulated with existing literature on Mathematics education and entrepreneurship to enhance the validity and reliability of the results.

Ethical considerations were prioritized throughout the research process to ensure the well-being and confidentiality of the participants. Informed consent was obtained from all participants, and their anonymity and confidentiality were guaranteed. The research findings were disseminated through academic publications and presentations to contribute to the existing knowledge base on Mathematics education and entrepreneurial skills development. The study aimed to provide insights and recommendations for enhancing Mathematics education in secondary schools to foster the development of entrepreneurial skills among students in Mashonaland East, Wedza.

3.2 Research participants

Qualitative data was gathered through interviews with teachers at the school, to gain insights into their teaching methods and how they incorporate elements of entrepreneurship into their Math lessons. The participants in this study were students in Form one to four at St Margaret's Chigodora school who are doing Mathematics, A sample size of approximately 100 students was selected to participate in the survey portion of the research. Additionally, 5 Mathematics teachers at the school were selected to participate in the qualitative interviews. Informed consent were obtained from all participants, and they were assured of confidentiality and anonymity in the reporting of the study results (Mugenda & Mugenda, 2015). The qualitative data from the interviews with teachers were analyzed thematically to identify common themes and perspectives on teaching practices and the integration of entrepreneurship into Mathematics learning. The findings of the study provided valuable insights into the potential benefits of

incorporating entrepreneurial skills development into Mathematics learning at the secondary school level.

3.3 Sampling methods and procedures

The sampling method used in the study was a stratified random sampling technique. This method involved dividing the population of students into different strata based on their grade level and then randomly selecting participants from each stratum to ensure representation from all levels of the school.

The procedure for sampling involved obtaining of permission from the school administration to conduct the study. Once permission was granted, the researchers obtained a list of all students enrolled in St Margaret's Chigodora school and divided them into different grade levels. After stratifying the population, a random number generator was used to select students from each grade level to participate in the study. This ensured that a diverse group of students was included in the sample to provide a comprehensive understanding of the impact of Mathematics learning on entrepreneurial skills development.

Upon selection, the chosen students were informed about the study and asked to participate voluntarily. Informed consent forms were distributed to the students and their parents to ensure that they understood the purpose of the study and agreed to take part. After obtaining, a consent the students were provided with questionnaires and surveys to gather data on their perceptions of the study. Additionally, interviews and focus group discussions were conducted to gather more in-depth information from the participants.

After collecting the necessary data, the researchers analyzed the results using statistical methods to determine any correlations between Mathematics learning and entrepreneurial skills development. The findings were then compiled into a comprehensive report. The results of the study provided valuable insights into the role of Mathematics education in fostering entrepreneurial skills among secondary school students, which could inform future curriculum development and teaching practices.

3.4 Data collection

The qualitative data collection for the research on examining the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza at St Margaret's Chigodora School involved in-depth interviews with secondary school students. The interviews were conducted to gather rich and detailed data on the students' perceptions and experiences of how Mathematics education influenced their entrepreneurial skills development. Open-ended questions were used to explore the participants' insights and perspectives on the relationship between Mathematics education and entrepreneurship (Merriam, 2009).

The data collected from the interviews were analyzed using thematic analysis to identify patterns and themes in the participants' responses. Thematic analysis involved coding the data, categorizing the codes into themes, and interpreting the themes to derive meaningful findings. The themes that emerged from the analysis provided a narrative description of the impact of Mathematics education on entrepreneurial skills development as perceived by the secondary school students (Braun & Clarke, 2006). This qualitative data collection approach allowed for a deep exploration of the participants' experiences and perspectives on the topic.

To ensure the ethical integrity of the research, informed consent was obtained from all participants before conducting the interviews. Confidentiality and anonymity were maintained throughout the data collection process to safeguard the participants' privacy. The findings from the qualitative data collection were triangulated with existing literature on Mathematics education and entrepreneurship to enhance the credibility and reliability of the results. This rigorous data collection process aimed to provide valuable insights and recommendations for improving Mathematics education to foster the development of entrepreneurial skills among secondary school students in Mashonaland East, Wedza.

3.5 Data collection methods

For the qualitative research on examining the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza at St Margaret's Chigodora School, data collection instruments included interviews and focus group

discussions. In-depth interviews were conducted with secondary school students to gather individual perspectives on the relationship between Mathematics education and entrepreneurial skills development. Open-ended questions were used to prompt participants to share their experiences and opinions on how Mathematics education influenced their entrepreneurial abilities (Merriam, 2009).

Additionally, focus group discussions were held with a group of students to encourage interaction and collective reflection on the impact of Mathematics education on entrepreneurial skills. Focus groups provided an opportunity to generate rich dialogue and explore shared experiences among the participants. The group dynamics allowed for a deeper understanding of common themes and perspectives regarding the role of Mathematics education in developing entrepreneurial skills (Krueger & Casey, 2015).

Data from the interviews and focus group discussions were transcribed and analyzed using thematic analysis. The data were coded, categorized into themes, and interpreted to identify patterns and insights related to the impact of Mathematics education on entrepreneurial skills development among secondary school students. Thematic analysis enabled the researchers to derive meaningful findings and present a comprehensive understanding of the phenomenon under investigation (Muponda, L., & Makwara, B. (2017).

Maintaining ethical standards, informed consent was obtained from all participants before engaging in the interviews and focus group discussions. Participants were assured of confidentiality and anonymity, and their rights were upheld throughout the data collection process. By utilizing interviews and focus group discussions as data collection instruments, the research sought to provide valuable insights and recommendations for enhancing Mathematics education to support the development of entrepreneurial skills among secondary school students in Mashonaland East, Wedza.

3.6 Data analysis

In the qualitative research investigating the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, Wedza at St Margaret's Chigodora School, data analysis of the interviews and focus group discussions entailed a

thorough and systematic process. Following the collection of data through interviews and focus group discussions, transcripts of the recordings were meticulously reviewed to identify key themes, patterns, and insights related to the research question. The data analysis process aimed to uncover the participants' experiences, perceptions, and opinions regarding the influence of Mathematics education on their entrepreneurial skills development.

Thematic analysis was employed as the primary data analysis method for the qualitative study. Through thematic analysis, data from the interviews and focus group discussions were systematically coded, categorized, and interpreted to identify recurrent themes and patterns that emerged from the participants' responses. This method allowed for a comprehensive exploration of the data and facilitated the extraction of meaningful insights and findings related to the impact of Mathematics education on entrepreneurial skills development among secondary school students (Braun & Clarke, 2006).

The identified themes and patterns were then carefully reviewed and synthesized to develop coherent narratives that elucidated the relationship between Mathematics education and entrepreneurial skills development as perceived by the participants. By analyzing the data thematically, the researchers were able to draw connections between the participants' experiences and insights, thus providing a detailed and nuanced understanding of how Mathematics education influences the development of entrepreneurial skills among secondary school students. The thematic analysis process contributed to the overall rigor and validity of the qualitative research findings (Creswell, 2013).

To ensure the robustness and reliability of the data analysis process, the researchers engaged in constant comparison and reflection on the emerging themes and findings. Triangulation of the data with existing literature on Mathematics education and entrepreneurship further enhanced the credibility and trustworthiness of the study results. The meticulous data analysis of the interviews and focus group discussions offered valuable insights and recommendations for enhancing Mathematics education to support the cultivation of entrepreneurial skills among secondary school students in Mashonaland East, Wedza, at St Margaret's Chigodora school.

3.7 Ethical issues

Several ethical considerations were taken into account. Informed consent was obtained from all participants, ensuring that students, teachers, and school administrators were fully aware of the research objectives, procedures, and potential risks and benefits of participating. This transparency allowed participants to make informed decisions about their involvement in the study, while also safeguarding their rights and privacy throughout the research process.

The design of the research methods, including the questionnaire and interview questions, was carefully crafted to respect the dignity and rights of the participants. Ethical considerations were made to ensure that the questions were worded sensitively to avoid causing harm or distress to the participants. Researchers were attentive to the power dynamics present in the interactions, particularly when interviewing students and teachers, striving to create a safe and respectful environment for open communication and sharing of experiences.

Data confidentiality and security were key ethical considerations in the research process. Participants were assured that their data would be used solely for the research study and handled securely to prevent unauthorized access or disclosure. Information about how the data would be used, analyzed, and reported was communicated to participants transparently. Researchers upheld principles of honesty and integrity, disclosing any potential conflicts of interest or biases that could influence the study's findings, in line with ethical standards for conducting research.

Consideration was given to the potential impact of the study on the participants and the broader school community. Researchers weighed the benefits of the research findings in advancing knowledge and informing educational practices against any potential harms or disruptions that could arise. Efforts were made to minimize negative consequences and ensure that the research was carried out responsibly and respectfully. Adherence to ethical guidelines and regulations set by institutional review boards and governing bodies was paramount to ensure the ethical conduct of the study on Examining the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, specifically at St Margaret's Chigodora school in Wedza.

3.8 Summary

Chapter 3 of the research study focused on detailing the research methodology employed in examining the impact of Mathematics education on entrepreneurial skills development in secondary schools in Mashonaland East, specifically at St Margaret's Chigodora school in Wedza. Ethical considerations, such as obtaining informed consent, designing sensitive interview questions, and ensuring data confidentiality, were discussed. The chapter also highlighted the data collection process, including the analysis of Likert scale responses from questionnaires and thematic analysis of interview transcripts. Overall, Chapter 3 provided a comprehensive overview of the research methodology employed to investigate the relationship between Mathematics education and entrepreneurial skills development among students.

CHAPTER 4: DATA ANALYSIS AND PRESENTATION

4.0 Introduction

The purpose of this chapter is to give the presentation of the research findings. The chapter starts off by giving the response rate of the participants with regards to the interviews and questionnaires. The chapter then gives the presentation of the research findings. The collected data was displayed on tables, pie charts, graphs as shown in this chapter. The chapter then gives an analysis of the collected data then a summary thereafter.

4.1 Presentation and analysis of findings

From the research, the writer started by giving on the responses of those who were interviewed and answered questionnaires. Teachers and students were all interviewed.

4.2 Interviews Response rate

The researcher questioned 9 students and they all responded to the interviews, giving a percentage response rate of 100%. 7 school heads were also interviewed and gave a response rate of 100%. 15 questionnaires were prepared and for 9 students and 7 teachers and were fully attempted by each respondent giving a percentage response rate of 100%. The total number of participants interviewed were 16 and they fully respond to the interview guides.

4.3 Questionnaires Response rate

The researcher interviewed 9 students and they all responded to the interviews, giving a percentage response rate of 100%. 7 teachers were also interviewed and gave a response rate of 100%. 15 questionnaires were prepared and for 9 teachers and 7 teachers and were fully attempted by each respondent giving a percentage response rate of 100%. The total number of participants interviewed were 16 and they fully respond to the questionnaires as shown from the table below.

4.4 Distribution of respondents by gender

Fig 4.1 Distribution of respondents by gender

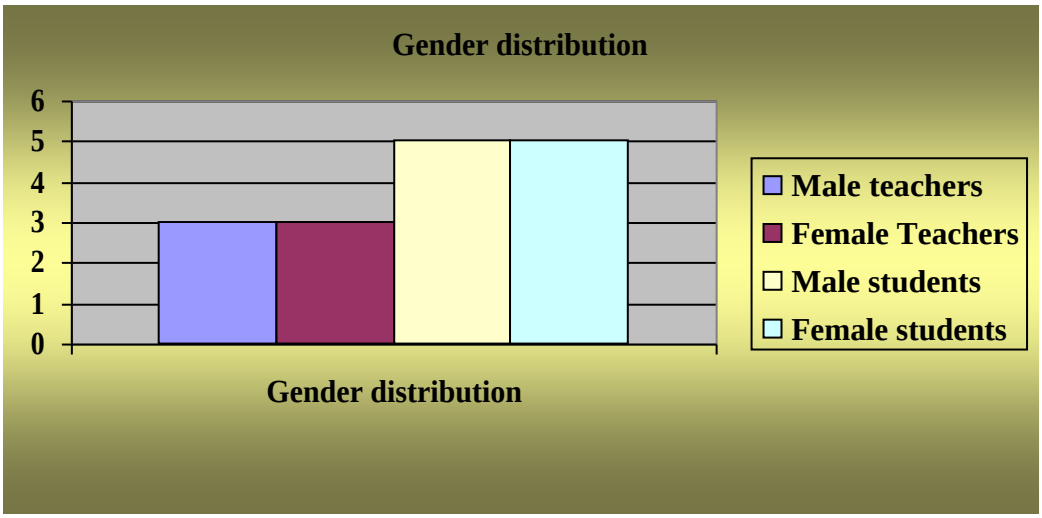

Figure 4.1 above shows that the researcher used 16 participants to conduct this research. 3 teachers, from each gender, male and female participants were used as subjects for the study. 10 students were also used, 5 males and 5 females giving a 100% gender balance and a close to zero bias.

4.5 Qualifications of teachers

The researcher also considered the qualifications of those elected to be interviewed and questioned.

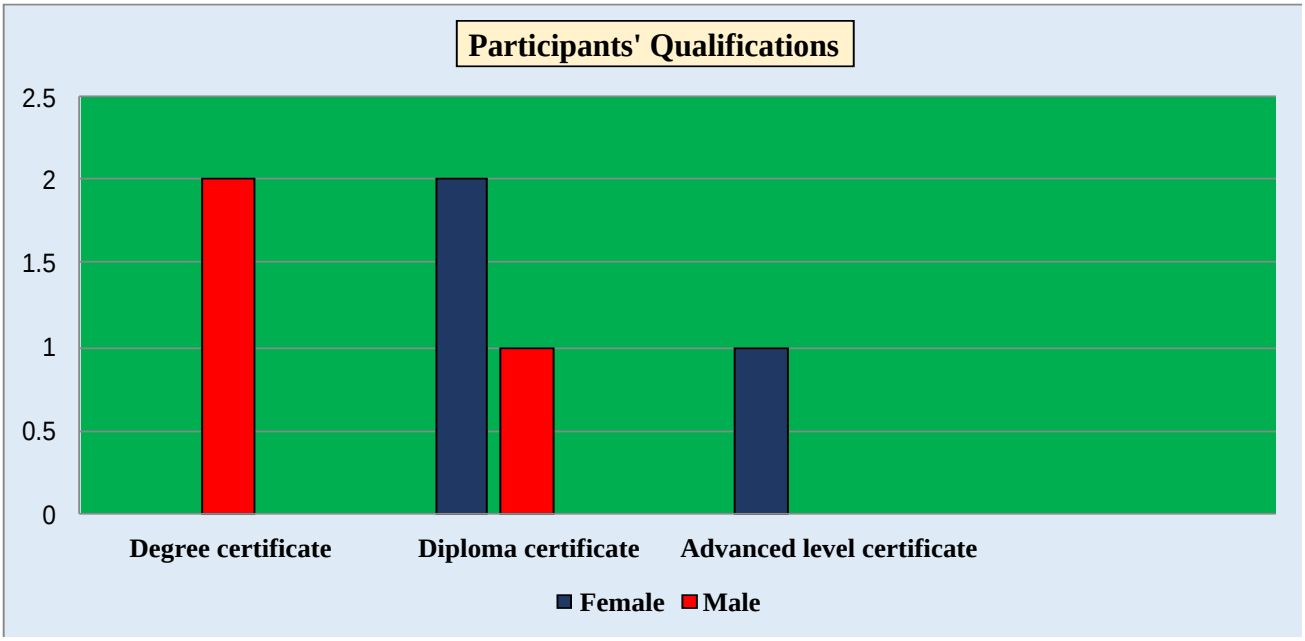

Fig 4.5 Qualifications of teachers

Fig 4.2 displays the qualifications of the participants. The graph show that there is no female holder of a degree certificate from the participants, while all 2 males are holders of a degree certificate. 1 male and 1 female are holders of a degree certificate while the other female is an advanced level certificate holder. Only 1 male is a holder of a diploma certificate.

4.6 Responses on teaching experience.

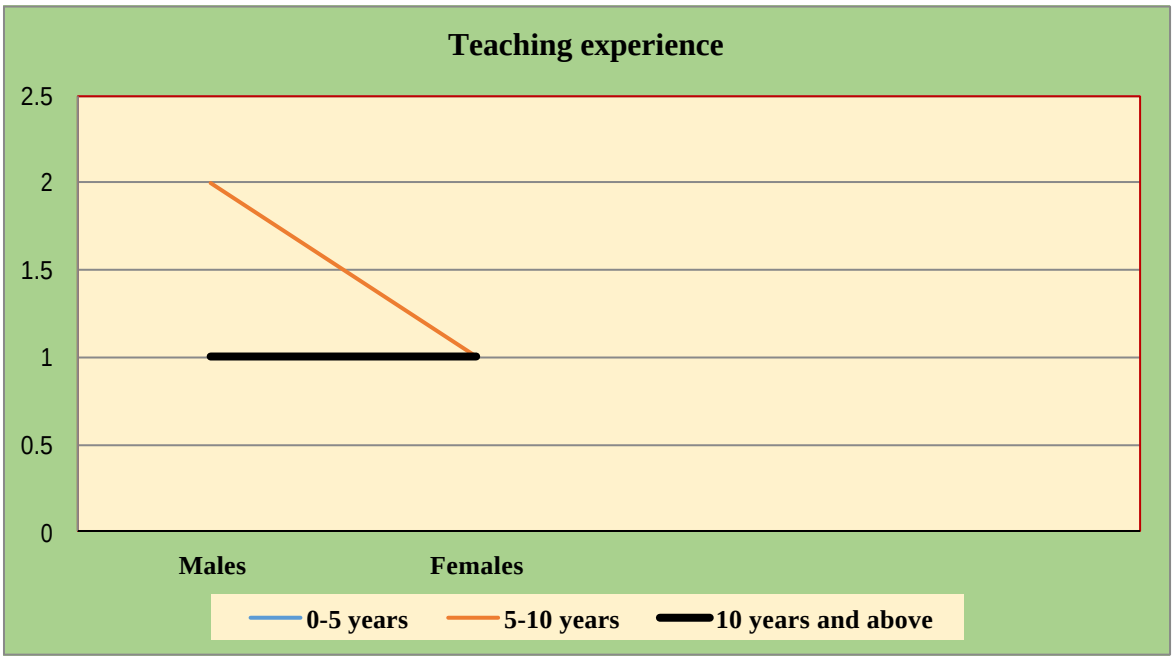

Fig 4.3 Responses on teaching experience

Fig 4.2 above shows responses on the teaching experience of participants. All the participants have more than 5 years teaching experience, with 2 males with 5-10 years of experience. 1 female participant has 5-10 years of experience. 1 female and 1 male have more than 10 years of service in the teaching industry.

4.7 The effect of mathematics learning on the acquisition of entrepreneurial skills.

All 16 participants, both teachers and students frequently mentioned that an individual with a mathematical skill background is initiative in entrepreneurship, giving a percentage frequency of 100. 14 of the participants point out that an individual with a mathematical skill background is a risk-taker in entrepreneurship, giving a percentage frequency of 88. Problem solving abilities is the other role of entrepreneurship as pointed out by 12 participants, giving a percentage frequency of 75. 10 participants mentioned that decision-making skills can be as a result of having a mathematical skill background in entrepreneurship, giving a percentage frequency of 63. 8 of the respondents mentioned that critical thinking skills may come as a result of

mathematical skills giving a response rate of 50%. 40% of the 16 participants point out that planning and organising skills in entrepreneurship emanate from having a mathematical background.

Table 4.1 The effects of mathematics learning on the acquisition of entrepreneurial skills (n=16).

Role	**Frequency (N)**	**Percentage (%)**
It enables individuals to be initiative	16	100
Enables risk taking	14	88
Develop problem solving abilities	12	75
Facilitates sound decision making	10	63
Fosters critical thinking	8	50
Initiates planning and organizing.	6	40

Source: Field data

4.3 Skills learnt in Mathematics that promotes entrepreneur skills

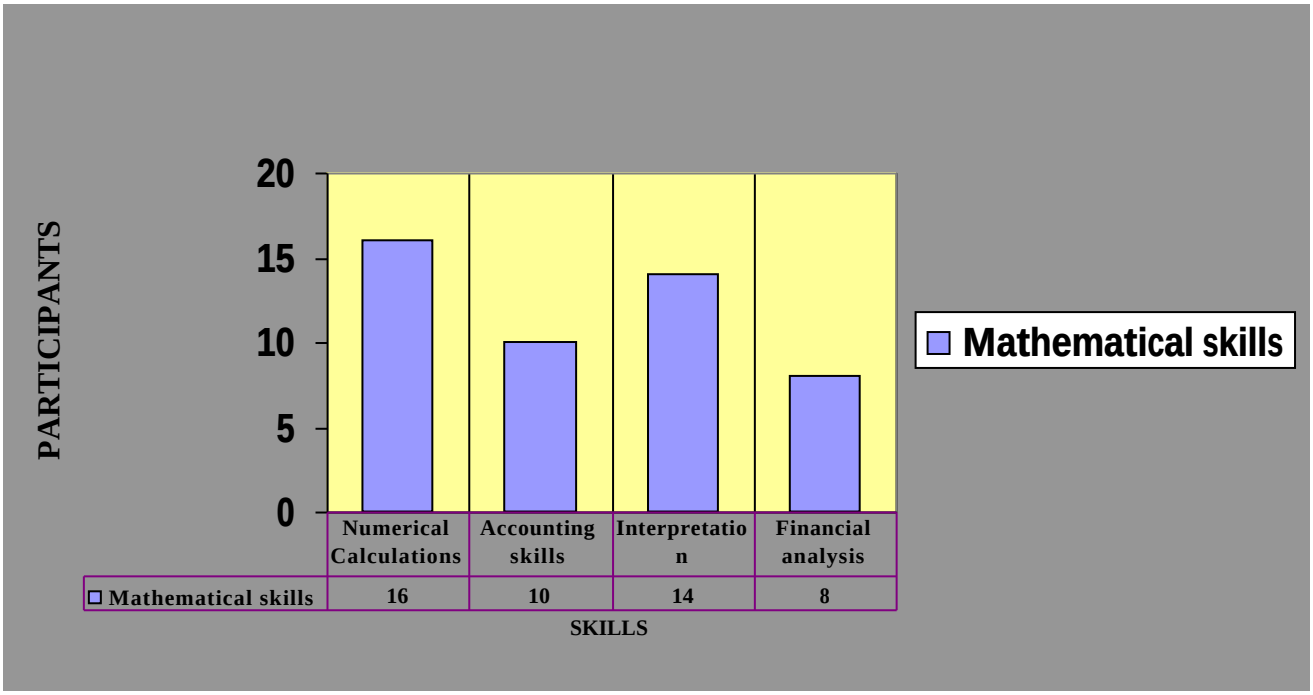

Fig 4.3 ***Responses on the skills learnt in Mathematics that promotes entrepreneurial skills***

The results above interpret the responses made by the participants from the questions asked by the researcher on the skills learned in mathematics which can promote entrepreneurship. All the 16 participants mentioned that numerical calculations is one of the most common skill learned in mathematics which may promote entrepreneurship skills. While 14 of them indicated that interpretation is also another skill, a mathematical student may impart which then help in entrepreneurship. Accounting skills, as highlighted by 10 participants is also another entreprenuerial skill which may help a learner in the learning of mathematics. 8 participants suggested that financial analysis is another skill which may originate from the learning of mathematics which then helps a learner in the studying of entrepreneurship.

4.8 Secondary school students perceptions towards mathematics learning and its relevance to entrepreneurship

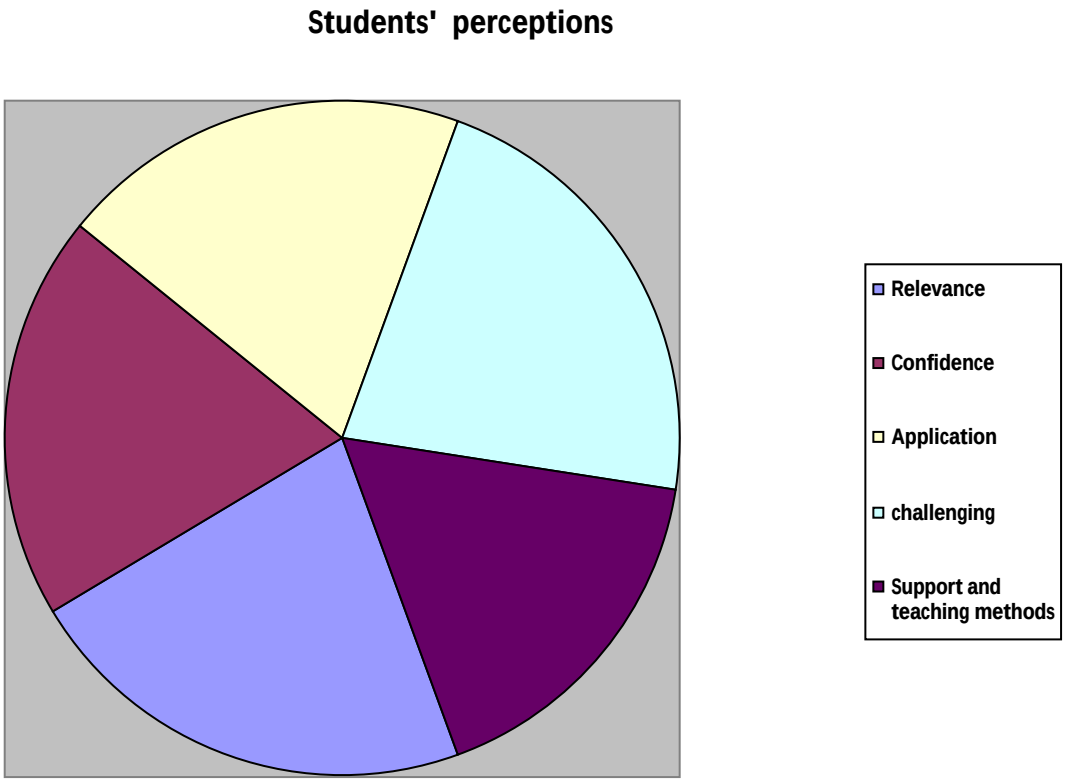

Fig 4.4 Students perceptions.

In Fig 4.4 the pie chart indicates the responses made by participants on their perceptions on the students perceptions and attitudes towards mathematics learning and its relevance to the learning of entrepreneurship. All 10 students interviewed suggested mathematics brings relevance to the learning of entrepreneurship in schools. 8 interviewed participants suggested that mathematics is useful for the application of figures to entrepreneurial concepts, while 7 of them suggested that the attitudes of learners on mathematics can positively change due to the support and varying of teaching methods. However, 4 participants viewed mathematics as a challenging subject and must not be linked to the studying of entrepreneurship.

4.9 Discussion of findings

The researcher discovered the fact that there are too many roles of mathematics as indicated by the respondents that are required in acquiring entrepreneurial skills. The respondents highlighted the following roles of mathematics in the acquisition of entrepreneurship studies which include problem solving, innovatiness, iniatiation,accuracy to mention a few.

As suggested by the respondents, learners with mathematical background are quite initiative in their acquisition of entrepreneurship studies. By exploring into the studying of mathematics the learners will be able to be creative and innovative instantly. This is in support of the view of Detienne and Chandler (2004) who out that individuals can learn the processes of opportunity identification in entrepreneurial classes. And also, participants point out that, students with a mathematical background can take risks in the acquisition of entrepreneurship studies. This shows creativity and may reduce the risks of failing to embark into projects. This is in support of Yellowe (2006) s ideas of supporting the learning of mathematics in entrepreneurship development, job creation and poverty eradication.

The results showed that the studying of mathematics plays a pivotal role in assessing and managing risks for students studying entrepreneurship. The interviewed participants mentioned that mathematical techniques such as statistics and probability help learner studying entrepreneurship to analyse uncertainties and estimate potential risks. This information therefore helps learners as entrepreneurs, to develop decisions about investments and resource allocation. This is in line with the views of Irrissappane & Yasodha, (2021) who assert that perceptions of entrepreneurship educators in the context of entrepreneurship education, describes the way entrepreneurship educators analyse and interpret the teaching and learning processes and the outcomes of an entrepreneurship programme (Irrissappane & Yasodha, 2021).

The study showed that having mathematical background may help learners to think critically and be able to solve problems that are related to entrepreneurial studies. The respondents mentioned

that mathematics fosters innovative thinking and problem solving skills. The learners with no mathematical background often encounters complex problems in their acquisition of entrepreneurship studies which require creativity in calculations on either profits or losses and whether to take risks. The majority of the interviewed participants highlighted that mathematical thinking helps entrepreneurship learners to break down breakdown complex problems that require creative and innovative thinking. This is in support of Guerrerro (2021) who posited that collaborations and innovations among school students can be achieved through activities such as partnering with businesses, offering internships, creating venture funds and industry funded incentive programmes.

The subjects of the study also point out that, learners with a mathematical background can be able to make sounding and creative entrepreneurship decisions. The participants explained that learners with mathematical background can be able to interpret, analyse and understand data and information so as to make sounding decisions. This is in support of Oduwaiye (2019) who posited than, entrepreneurship education is seen as the scope of lectures, curricular and programmes that attempt to provide students with the necessary entrepreneurial competencies, knowledge and skills, geared towards good quality decision making and the pursuit of a career in entrepreneurship. This also equates to the views of Dweck (2016) who suggests that learning orientation reflects an individual s inclination towards a continuous search for new knowledge.

The participants also mentioned that, having a background of mathematics can help learners to plan and organise for entrepreneurship acquisition. From the 6 participants interviewed, the majority of them further explained that, if a learner cannot interpret the math, usually on financial documents, planning and organising becomes difficult to master, therefore in order for students to understand new knowledge, the mathematical background is relevant. This is in alignment to the ideas of Joy and Kolb (2009) who stated that learning orientation comprises an individual s access to new knowledge and their ability to accommodate such new knowledge into their present knowledge base.

The majority of respondents highlighted that, students with a background in mathematics are able to calculate values and numbers in entrepreneurship acquisition. They explained that,

entrepreneurship learning is equivalent to simply learning business skills and therefore business is all about selling which then involve monetary transfers. 7 of the participants further explained that entrepreneurship content is usually illustrated in figures which then need to be calculated so skills in additions, subtractions, multiplications and divisions should therefore be mastered by learners and is acquired through the learning of mathematics. This is equivalent to the ideas of Gelard and Saleh (2020) who argued that adequate and effective entrepreneurship learning can stimulate and increase students career considerations in entrepreneurship.

The participants indicate that accounting skills are easier to master if a student have a background in mathematics. 3 of the interviewed teachers further explained that the accounting skills include the ability of a learner to interpret complex challenges in business statistical records, figures and their meanings instantly. This is in alignment to Izquierdo and Buelens (2018) who point out that entrepreneurship education can effectively equip learners with the required skills and knowledge, consistent with effectively tackling challenging situations and complexities in decision making, associated with a career in entrepreneurship.

The study also indicated that interpretation is also another skill which may be acquired in entrepreneurship if one has a mathematical background. This aligned to the views of Sarasvathy (2018) who explained that a continuous upgrading of current knowledge base enhances the capability and capacity of individuals, to proffer creative and novel solutions to existing problems and challenges.

The relevance of mathematics to entrepreneurship is one of the most mentioned perception by the participants. Students, from the questionnaires state that they perceive mathematics as an important subject for entrepreneurship. This is in agreement to the ideas of Reber (2021) who posits that entrepreneurship learners are seen as the key factors in promoting entrepreneurship development, hence it is important to stress their perceptions as the main agents of an entrepreneurship programme.

Following an open ended questionnaire, the researcher observed that, confidence is another perception highlighted by the respondents. 7 of the participants state that, students who appreciate practical application and real world problem solving may view mathematics as a tool

to explore and gain insight on the entrepreneurial concepts. This then aligned to the views ofSarasvathy (2018) who asserted that being able to analyse and interpret business data and information may help you to get more skills and confidence.

The respondents also mentioned that application is another attribute that a mathematically equipped learner possesses. The respondents suggested that learners who appreciate practical application and real-world problem solving may view mathematics as a tool to explore and understand entrepreneurial concepts. The respondents suggest that, students may recognise that mathematical models and statistical analysis can assist in predicting and optimising business outcomes. The respondents perceived that application is a mathematical skill which can help in the learning of entrepreneurial studies. This perception enabled the researcher to fully conclude that mathematical background is important when learning entrepreneurial skills. This equated to the ideas of Caloghirou, Protogerou, and Deligianni (2023) who points out that focused on the role of education in the promotion of entrepreneurial activity among students and young school graduates.

Some of the interviewed participants viewed the learning of mathematics in preparation for entrepreneurship as a challenging subjectThis contradicts to the views of Reber (2021) who asserts that entrepreneurship is mainly focused on calculations, analysis, measuring and predicting.

The majority of the subjects mentioned that some of the learners have no interest as they may view it as hurdle rather than an asset to entrepreneurship. This is supported by Tende (2022) who posited that the acquisition of relevant knowledge skill, and expertise, as regards the process of entrepreneurship is imperative for successful business start-up.

The majority of learners suggested that, students attitude towards mathematics learning in relation to entrepreneurship can also be influenced by the support they receive from teachers and the teaching methods used.

4.10 Summary

The summary presented and analysed data from the secondary school under study. The chapter indicated the teaching experiences of respondents, their gender and qualifications. The analysis given in this chapter was in alignment with the research questions. The researcher then gave a description on the perceptions of learners regarding the idea if having mathematical background for the learning of entrepreneurship. Graphs, pie charts and tables were used to describe and the analyse data.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The purpose of this chapter is to summarise, conclude and make recommendations of the study. The summary is brief outline of the whole research. The conclusion gives what the researcher has found out, its relevance to mathematics and the researcher s judgement. Lastly, recommendations on whether to pursue a further study on the research topic or what can be done for further studies.

5.1 Summary of the study

The aim of this research was to examine the impact of mathematics learning on entrepreneurial skills development in secondary schools, with the reference to one of the secondary schools in Wedza Mashonaland east. The study indicates the influence of mathematics leaning on the learning of entrepreneurship on secondary school students. The study also highlights the contributions of mathematics towards the learning of entrepreneurship in secondary schools. The study finally reviews the perceptions of secondary school learners towards the learning of mathematics as a preparation for the acquisition of entrepreneurship learning. The study sought to produce both qualitative and quantitative results on having basic mathematical skills towards the learning of entrepreneurship in secondary schools. The sample for the study was composed of 10 students and 6 teachers. The data was presented in tables, graphs and pie charts. The discussions of the study were given based on the results of the study.

The initial objective was to examine the influence of mathematical skills to entrepreneurship development at St Margarets Chigodora Secondary school. The objectives were fulfilled as the responses of participants highlighted that mathematics plays a major role in entrepreneurial skills such as problem solving, risk taking as well as critical thinking. The second objective was to examine the skills which are learnt in mathematics, which may contribute towards the acquisition

of entrepreneurship leaning in secondary schools. The objective was achieved as the participants point out that there are several skills which include numerical calculations and accounting appreciation which require a mathematical background. The third objective was to identify the major roles played by mathematics in the acquisition of entrepreneurship in secondary schools. The objective was accomplished as the research indicates that mathematics play a major role which includes planning and organizing of entrepreneurship content as the respondents highlighted. The final objective was to produce the relevant knowledge of mathematics that can help in acquiring entrepreneurial skills among secondary school students.

5.2 Conclusion

The research has revealed the impact of mathematics education on entrepreneurial skills development in secondary schools. The researcher concluded that mathematics and entrepreneurship studies are related constructs which cannot be separated easily. Therefore, for the effective acquisition of entrepreneurship, mathematics should be the background if a learner is to succeed as the results of the study reviewed that.

Students of modern days are now familiar with entrepreneurial studies therefore in order for them to succeed in their studies; mathematical background remains a contributory knowledge. The researcher then concludes that schools should be supportive in giving the necessary mathematical skills as it helps learners in preparation for entrepreneurship. Although students may possess the relevant entrepreneurial knowledge and skills, however they may not venture into entrepreneurship if the school supporting systems and infrastructure fail to promote the positive image of entrepreneurship. In other regards, not matter how slow a learner is, everyone knows the value of money and its benefit.

The researcher also concludes that there you cannot underestimate the relationship between mathematics and entrepreneurship as the results from the research show that there are several roles of mathematics in entrepreneurship studies which include risk taking, problem solving and critical thinking. The learning orientation comprises an individual s access to new knowledge

and their ability to accommodate such new knowledge into their present knowledge base to apply it to the relevant subject.

5.3 Recommendations

From the results of this study, the researcher gives the following recommendations:

I. Mathematical skills should be made a requirement before the acquisition of entrepreneurship. The study complied sufficient evidence that mathematics plays a significant role in in preparing learners for the acquisition of entrepreneurship.

II. The researcher also recommends that teachers should be supported with the resources to help in preparing learners to acquire mathematical skills before the acquisition of entrepreneurship program.

III. Schools should not underestimate the relationship between mathematics and entrepreneurship as the two interrelate. The researcher strongly recommends the subjects to be implemented concurrently.

IV. The results of the study reviewed that there is a closer relationship between mathematics and entrepreneurship, therefore their researcher recommends that students should acquire both mathematical and entrepreneurship knowledge at the same time at their youthful stage.

V. The researcher also recommends students to understand the basics of mathematics. The study indicates that, mathematics, just like any subject it starts by building a strong foundation. However, the researcher strongly recommends learners to familiarise themselves with fundamental concepts such as calculations, analysing and comparing mathematical concepts.

VI. More so, based on the results of the study, the researcher also recommends that students must embrace a growth of mind set and constantly seek improvement and leverage their analytical skills to evaluate business principles and make data driven strategies.

VII. Mathematics is also the most significant subject in as far as entrepreneurship is concerned. The research reviewed that a successful student of entrepreneurship has a good sounding background in maths. However, the researcher would recommend that learners must seek mentorship, finding entrepreneurs or industrial experts who can provide guidance and support so that they understand the actual mathematical content which may be relevant to entrepreneurship.

5.4 Recommendation for further studies

As the research could not touch more on some ways other than mathematics which may prepare learners on the acquisition of entrepreneurship studies, further researchers may refer to that area. More so, the research could not review the major mathematics topics which are important in the studies of entrepreneurship, further researchers may give references to that.

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APPENDICES

Appendix A: Interview guide for Teachers

My name is Kudakwashe E Nyakunuhwa. I am a student at Bindura University of Science and technology. This study is a research on a dissertation titled Examining impact of Mathematics on entrepreneurship skills development in secondary schools in Mashonaland East Province in partial fulfilment of BED Hons Degree in Mathematics. As teachers and learners, your views and contributions are of significant importance to this study. This is purely for academic purposes and your responses will be kept anonymous and confidential. Thank you for your time and cooperation.

Interview Questions

1. What is your understanding of Entrepreneurship?
2. What are the causes of poor entrepreneurship acquisition in secondary schools?
3. What role does mathematics play to entrepreneurship studies?
4. What are the skills in mathematics which are relevant to entrepreneurship studies?
5. What are your perceptions and views of such learners with no mathematics and are studying entrepreneurship?
6. What advice would you give to learners who wants to study entrepreneurship with no mathematics background?

7. What is the relationship between mathematics and entrepreneurship?

8. What are the perceptions of secondary school students towards the relevance of mathematics learning to entrepreneurship?

Appendix B: Interview guide for Students.

My name is Kudakwashe E Nyakunuhwa. I am a fourth year student at Bindura University of Science and technology. This study is a research on a dissertation titled Examining impact of Mathematics on entrepreneurship skills development in secondary schools in Mashonaland East Province in partial fulfilment of BED Hons Degree in Mathematics. As teachers and learners, your views and contributions are of significant importance to this study. This is purely for academic purposes and your responses will be kept anonymous and confidential. Thank you for your time and cooperation.

Interview Questions

1. What is your understanding of Entrepreneurship as students?
2. What are the causes of poor entrepreneurship results in your studies?
3. What role does mathematics play in preparation for your entrepreneurship studies?
4. What are the skills do you get in mathematics which are relevant to entrepreneurship studies?
5. What are your perceptions and views of such learners with no mathematics and are studying entrepreneurship?
6. What advice would you give to your fellow learners who wants to study entrepreneurship with no mathematics background?
7. Do you think there is a relationship between mathematics and entrepreneurship, if so how are the two areas related?

8. What are the perceptions of your fellow secondary school students towards the relevance of mathematics learning to entrepreneurship?

Appendix C: Questionnaire for all participants.

As a student at Bindura State University, studying a Bachelor of education Degree in Mathematics. Part of the requirements of my studies is to conduct an academic research for acknowledgement. The topic under study is on *examining the impact of Mathematics on entrepreneurship skills development in secondary schools in Mashonaland East Province* , in partial fulfilment of BED Hons Degree in Mathematics. Your hand is greatly required as it helps in my goal achievement. The responses you will give will be used in this research for conclusions and judgments.

COMPLETION INSTUCTIONS

- ***Please insert a tick (√) for the option of your choice on any given box***
- ***Please enter your responses on the spaces given using a black or blue pen.***
- ***Please answer all the questions***

SECTION A

Demographic information

1. What is your gender?

   Male Female

2. Are you a teacher or Student at the school?

   Teacher Student

3. As a teacher, how many years have you been in the teaching industry?
4. As a teacher, what s your highest level of certificate?

   Diploma Degree Advanced level

SECTION B PERCEPTIONS OF PARTICIPANTS ON THE INFLUENCE OF MATHEMATICS ON ENTREPRENEURSHIP SKILLS AND DEVELOPMENT.

1. What do you think are the Mathematical skills to the studying of entrepreneurship in schools?.....

2. How can mathematical knowledge affect the learning of entrepreneurship in secondary schools? ----------
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3. Do you think a student with mathematical background can understand entrepreneurship better than the one with no mathematical background?

YE S		N O	

Explain ----------
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SECTION C

ROLES AND SKILLS OF MATHEMATICS TOWARDS ENTREPRENEURSHIP DEVELOPMENT

1 What are the Roles of mathematical studies on entrepreneurship development?

2. Does the background in mathematics helps to equip learners towards the acquisition of entrepreneurship?

YES	
NO	

Explain ----------

---

3. what are entrepreneurship skills does mathematics have?

YES	
NO	

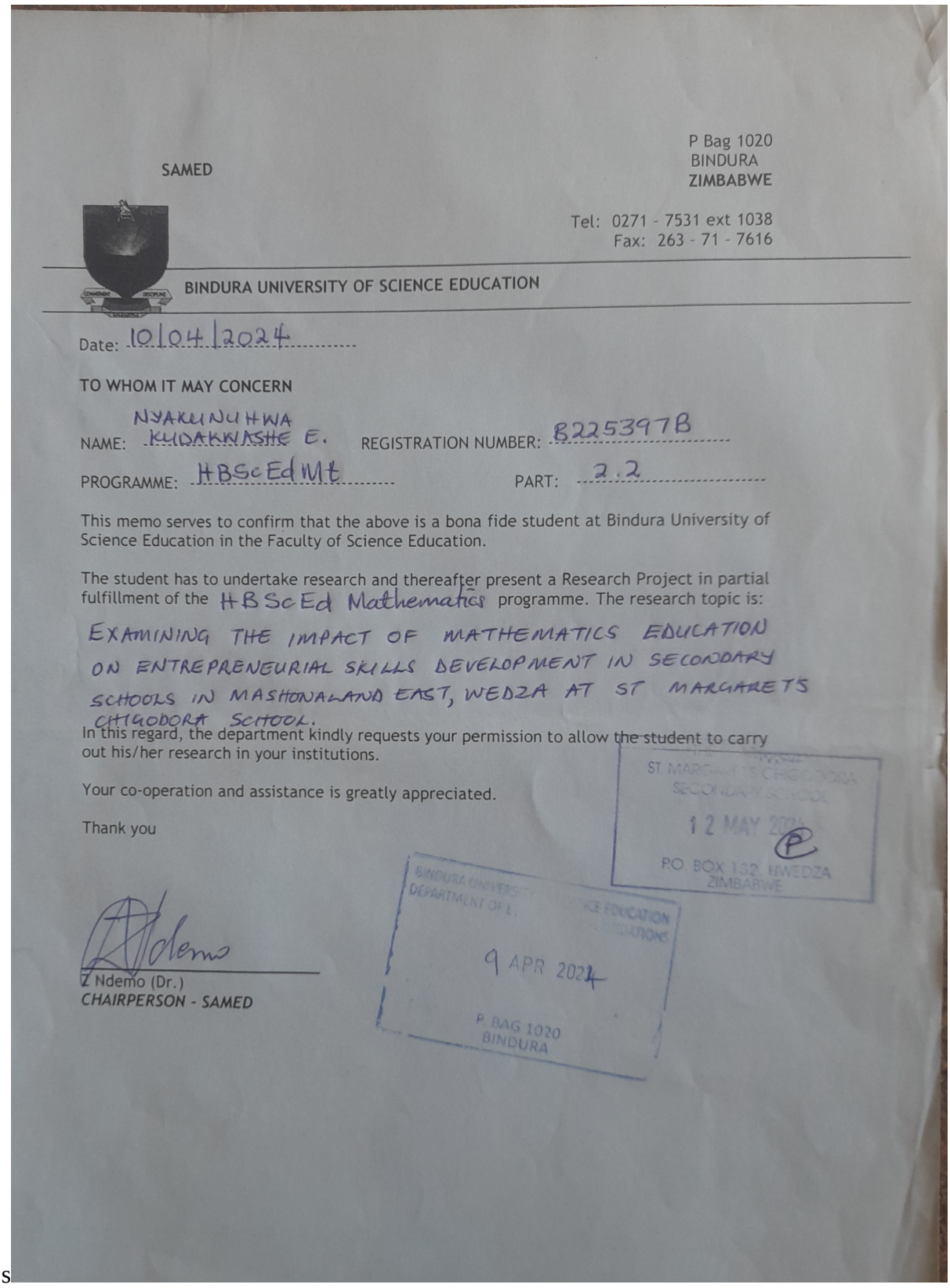
Explain ----------

---

4 Why do you think mathematics is relevant towards the acquisition of entrepreneurship studies?

Explain

Appendix D: Approval letter



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BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 10/04/2024

TO WHOM IT MAY CONCERN

NAME: NYAKUNUHWA KUDAKWASHE E. REGISTRATION NUMBER: B225397B

PROGRAMME: HBScEdMt PART: 2.2

This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

The student has to undertake research and thereafter present a Research Project in partial fulfillment of the HBScEd Mathematics programme. The research topic is:

EXAMINING THE IMPACT OF MATHEMATICS EDUCATION ON ENTREPRENEURIAL SKILLS DEVELOPMENT IN SECONDARY SCHOOLS IN MASHONALAND EAST, WEDZA AT ST MARGARETS CHIGODORA SCHOOL.

In this regard, the department kindly requests your permission to allow the student to carry out his/her research in your institutions.

Your co-operation and assistance is greatly appreciated.

Thank you

ST. MARGARETS CHIGODORA SECONDARY SCHOOL
12 MAY 2024
P.O. BOX 132, HWEDZA
ZIMBABWE

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