MINDSET, INTEREST, TEACHING STRATEGIES AND SELF-REGULATED LEARNING IN MATHEMATICS AMONG LOWER SECONDARY SCHOOL STUDENTS IN UGANDA

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A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN EDUCATION OF KYAMBOGO UNIVERSITY

AUGUST, 2024

DECLARATION

This dissertation is my original work and has never been presented for a degree in any other university.

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DEDICATION

I dedicate this dissertation to my husband Mr. Ssentume Peter for the love, support, encouragement, belief in me, sacrifice and patience as well as my children. I owe you a debt of gratefulness that I will never be able to pay back.

ACKNOWLEDGEMENT

The following people deserve my gratitude for their assistance during my academic journey.

My mother, my sisters Maria Namugumya Nkambwe, Ruth Nayiga, and my brother in law Mr. Lukyamuzi David Livingstone deserve special thanks for building a strong foundation. I appreciate all your help and nurturing.

I would like to express my profound appreciation to my supervisors, Dr. Henry Kibedi, Ass. Prof. David Kani Olema, and Dr. Ali Baguwemu, for their tireless support and significant commitment to this study. Your help and time are much valued.

I would also like to express my gratitude to Kyambogo University's Research Grants Committee and staff Development Committee for the research funds and tution. I am also appreciative to all the respondents and the works of the various authors whose contributions made this work possible.

I would also want to extend my gratitude to colleagues in the Departments of; Psychology, Foundations and Educational Psychology, Dr. Mayengo and everyone else, for their support and encouragement. Let me also thank Dr. Leon Matagi and Ass. Prof Denis Zami Atibuni for your special contributions to this work. Your encouragement, time, and support despite your busy schedules cannot be taken for granted. I would also like to thank my dear friend Jalia Nakakande for the emotional, social and financial support you rendered to me during my lowest point, and my PhD classmates for their unwavering support and inspiration.

Above all to God for the life and wisdom. To him be the Glory.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

FGD- Focus group discussion

JICA-Japan International Cooperation Agency

MoES- Ministry of Education and Sports

OECD- Organization for Economic Cooperation and Development

PISA- Program for International Student Assessment

SESEMAT- Secondary Science and Mathematics Teachers' Training

SRL- Self-Regulated Learning

STEM- Science Technology, Engineering and Mathematics

TIMMS- Trends in International Mathematics and Science Study

UACE. Uganda Advanced Certificate of Education

UCE- Uganda Certificate of Education

UNEB- Uganda National Examination Board

ABSTRACT

The study investigated the effect of mindset, interest, and teaching strategies on Self-Regulated Learning among lower secondary school students in Wakiso district. The study specifically investigated differences in mindsets, levels and differences in interest, the extent of SRL, perceived use of teaching strategies, whether interest mediated the relationship between mindset and SRL and whether teaching strategies moderated the relationship between mindset and SRL. The study employed a convergent parallel mixed methods design. Quantitative data was collected from 332 S3 students while qualitative data was from 12 Focus group discussions and 14 teachers. Quantitative findings indicated that interest mediated the relationship between a growth mindset and Self-Regulated Learning (a*b) β= 0.04, BootLLCI and BootULCI of 0.14-0.73. Further, the relationship between a growth mindset and Self-Regulated Learning was only moderated by teacher-centred and student-interactive strategies, BootLLCI and BootULCI of 0.003-0.05 and BootLLCI and BootULCI of 0.02-0.29 respectively. On the other hand, qualitative results partly agreed with qualitative findings and showed that gender, parents/guardians, and teachers can have an influence on students' mindset, interest, and Self-Regulated Learning in Mathematics. Overall, the findings showed that students' SRL in Mathematics is influenced by students' mindsets, particularly their growth mindsets, and their level of interest in the subject, and the teachers' teaching strategies and methods. In order to produce highly self-regulated learners, it is crucial to take measures to address students' mindsets, interests, and teachers' teaching strategies.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Any nation's development is dependent on its educational system. Secondary education, in particular, is crucial because it sets the groundwork for the development of the knowledge economy and society in various countries (Agwot & Osuu, 2014). Although teachers and instructors are regarded as the primary drivers who can assist all nations in achieving that aim, the role of students in their education cannot be overlooked A variety of factors influence learning including age, color, gender, attitudes, beliefs, teachers' teaching strategies, and students' ability to direct their learning, among others (Farrington et al., 2012). Dweck et al. (2014) recommend focusing on the student's psychology and non-cognitive factors to understand learning. Self-Regulated Learning (SRL) is one of the factors among students' psychology and non-cognitive factors.

1.1 Background to the study

1.1.1 Historical background

There is an increasing need to teach self-sufficient, autonomous, and critical thinkers to satisfy the ever-changing needs of the employment and market economy (Kwarikunda et al., 2022). This is explained in part by the world's proliferation of knowledge in Science and Technology, which has produced a need for new knowledge, skills, attitudes, a high degree of adaptability, innovations, and creativity (Uganda Media Center, 2020). It is believed that mathematics is a vital gatekeeper of opportunities for social, economic, and mobility growth in an increasingly globalised and technologically advanced society. (Illiyas et al, 2017) as well as scientific and technical development (Salifu & Bakari, 2022). Understanding mathematics is essential for preparing a people especially young ones for life in the modern world. An increasing number of problems and situations that arise in daily life even in work environments need some mathematics reasoning to be understood and or properly addressed. (Madaki, 2021). According to Bruine de Bruin and Slovic (2021), people with weak mathematics skills have less opportunities to obtain well-paying and interesting employment. In addition, a 2017 survey by Chechi and Bhalla discovered that individuals with strong mathematical abilities were even more inclined to trust others by closely examining their thought processes, were more self-assured, and saw themselves as actors rather than objects of political processes.

In spite of the increasing demand for a strong mathematical base, there is a rise in student failure rates in Mathematics (Samuel and Warner, 2021). Key findings from the 2018 Program for International Student Assessment (PISA) scores in the United States Web Report show that the United States scored an average of 478 in Mathematics, which is below the average score of 489 for 15-year-olds in the Organization for Economic Cooperation and Development (OECD). Moreover, out of the 36 OECD countries, the United States ranked lower in Mathematics literacy than 24 school systems, higher in six, and had similar results as six others. The United States had a smaller proportion of high achievers in math skills compared to the OECD average (8% vs. 11%) and a higher percentage of low achievers in math skills compared to the OECD average (27% vs. 24%).

On the other hand, out of 78 OECD participating countries, 23 (30%) had students with low performance rates above 50%. For example, the Dominican Republic had a low performance rate of 92%, whereas Panama and the Philippines 81%, Cosovo has 77%, Morocco 76%, Saudi Arabia 73%, and Indonesia 72%. According to the OECD, (2019a), mathematical literacy is assessed in PISA by focusing on students' ability to formulate, utilize, and interpret Mathematics in a variety of circumstances. In PISA, mathematical competency is defined as students' capacity to extrapolate from what they know and apply their knowledge in both known and novel circumstances, rather than just reproducing their knowledge of mathematical ideas and procedures. As a result, the aforementioned countries were unable to achieve the aforementioned level.

Moreover, as per the OECD (2019b), approximately 16% of 15-year-old students in Beijing, Shanghai, Jiangsu, and Zhejiang (China) and about 14% of students in Singapore achieved Level 6 in Mathematics, which is the top level of competency in PISA. These students were capable of engaging in complex mathematical thinking and reasoning. On average, just 2.4% of students in OECD nations achieved this score. Students from the mentioned countries were discovered to have the ability to mathematically translate situations. They were skilled in utilizing mathematical concepts, facts, and methodologies, as well as in reasoning, investigating, explicating, evolving, interpreting, using, and evaluating mathematical results.

According to a Madaki (2021) report on Mathematics Education in Sub-Saharan Africa, while Sub-Saharan African countries differ in many aspects of Mathematics education, common key issues of concern include a lack of secondary school teachers and mathematicians at the master's and PhD levels, as well as a weak primary and secondary level Mathematics education in most Sub-Saharan African countries.

In Africa, according to the Trends in International Mathematics and Science Study (TIMSS) South Africa's performance in both Mathematics and Science is among the lowest in Africa, of the 64 countries and entities that participated at the Grade 4/5 level in 2019. Morocco too in PISA 2018, scored a mean of 4.3 and a 76% low performance rate. Higher TIMSS scores indicate that students can use their knowledge in basic or complicated settings and communicate their understanding (Reddy et al., 2019). In Uganda, the failure rate in Uganda Certificate of Education (UCE) Mathematics results remains high. For example, in 2019, 39.3% of students received an F9 in Mathematics, 32.8% in 2020, 35.8% in 2022 and 31.7% in 2023. This is low when compared to subjects such as English, which had 15.2% F9s in 2022. UNEB further has persistently reported about students' failure in science subjects as related to poor Mathematics skills. The gender disparity in Mathematics remains, for example males failing at 33.1% and females failing at 38.4% in 2022 UCE. (UNEB, 2021; 2023, 2024).

To maintain an innovative advantage in the world, it is critical to produce highly competent genius researchers, scientists, and engineers. To achieve this goal, it is critical that students develop higher order cognitive skills, particularly in Mathematics. Researchers believe that it is critical to investigate why learners continue to struggle in Mathematics (Schunk 2005). One of the solutions to the puzzles surrounding Mathematics teaching and learning has been identified as SRL. Students' incapacity to manage themselves through the usage and application of relevant learning strategies at the required time is raising a considerable concern. Students continue to replicate what teachers and instructors teach them (Oghenevwede, 2019).

Consequently, policymakers and other key education decision makers are giving attention to Mathematics instruction and learning as a crucial element in education reform. (Mohamed et al., 2017). As a result, many countries are changing their teaching from focusing on the teacher to focusing on the learner (Sunzuma and Luneta, 2023). Students in learner-centred classrooms have complete responsibility for comprehending their learning environment and taking charge of mastering a particular academic assignment. In order to achieve this, students need to establish goals for learning, choose strategies to help them achieve those goals, implement those strategies, and monitor their progress towards those goals (Schunk, 2005). Kwarikunda et al. (2022) describe these students as being self-regulated. The main goals of Mathematics education in the four East African countries (Uganda, Kenya, Tanzania, and Rwanda) focused on developing students' abilities to think and reason with precision, logic, and criticality in various scenarios. Additionally, the objectives aimed to empower students to creatively and confidently utilize mathematical problem-solving techniques to address challenges in other academic disciplines and real-life situations (Karuku & Tennant 2016). This can be achieved by having students who regulate their own learning by not only acquiring knowledge from the teacher but also understanding their learning process (Muwonge et al., 2020).

The concept of Self-Regulated Learning in education is traced back to the 1980s (Daniel, et al., 2016; Schraw et al., 2006; Zimmerman, 2002), and to Albert Bandura when defining self-regulation behaviours that are important in accomplishing an academic or learning goal. According to Schunk (2005), prior to the introduction of the notion of SRL in education, much early self-regulation research was therapeutic in nature with researchers teaching participants how to change dysfunctional behaviours such as violence, addictions, and behavioural issues. Since then, SRL has gotten a lot of attention from education scholars because of its positive association with academic performance and success. SRL not only enhances educational competencies, but also prepares a life-long learner to face professional obstacles in their work after school (Muwonge et al., 2020). According to SRL research, students' use of learning strategies; where individuals use a variety of individual skills, strategies and tactics to help them learn; lies at the heart of Self-Regulated Learning (Amoozegar et al., 2022; Kwarikunda et al., 2022).

Previous research studies have found that learners' capacity to employ learning strategies varies. Students that are autonomously motivated and use adaptive learning techniques such as critical thinking outperform their peers who use maladaptive learning strategies such as rote memorization and rehearsing (Manganelli et al., 2019). Wirth et al. (2020), noted that a lack of a well-adapted Self-Regulated Learning strategy repertoire may have a negative impact on students' academic progress and success. While significant studies have been conducted on SRL in science in general, less is known about students' repertoires of Self-Regulated Learning in Mathematics learning, particularly in lower secondary school in Uganda.

Learning strategies have been classified differently in studies for example based on the depth of knowledge processing and internalization (Kwarikunda et al., 2022) which follows the Biggs model that comprises deep and surface learning strategies. They are further classified according to the nature of learning strategies which follows the Pintrich et al. (1991) model that comprises of cognitive, metacognitive and resource management strategies. Different results have been obtained from studies on Self-Regulated Learning, which is defined as students' ability to apply a variety of learning strategies in their learning. The majority of research on Self-Regulated Learning has focused on its benefits. Recent global research include, but are not limited to, the effects of SRL on students' mathematical achievement (Fauzi & Widjajanti, 2018), Predicting Mathematics and Reading Performance of Grades 5-8 Students in Australia (Harding et al., 2019), improving Mathematics connection ability in Junior High School in Indonesia (Putri et al., 2019), solving mathematical higher order thinking problems among senior high school students in Indonesia (Ansari et al., 2021), improving students' outcomes in Ninth grade students in Biology in California (Jansen, 2021), enhancing Azad University students' performance in an English course (Nodeh, 2021), improving course satisfaction and perceived learning in Malaysian Universities (Amoozegar et al., 2022), and, relationship with English understanding in Iran (Nejati, 2022).

Owing to the significance of Self-Regulated Learning, numerous research have looked into its antecedents such as motivation. Gafoor and Kurukkan (2016) and Mustapha et al. (2023) investigated motivation and Self-Regulated Learning among undergraduates in Nigeria, whereas Otieno and Povey (2022) investigated the effects of text book use in secondary schools in Kenya. In Uganda, Mubuuke et al. (2017) investigated the effect of feedback on Self-Regulated Learning among medical students in Uganda, Ekatushabe et al. (2021) investigated the relationship between cognitive activation, self-efficacy, achievement emotions, and (Meta) cognitive learning strategies among Ugandan Biology secondary school learners then Muwonge et al., (2019) investigated modelling the link between motivational beliefs, cognitive learning techniques and academic performance among teacher education students. In addition, Kwarikunda et al. (2022) studied profiles of learners based on their cognitive and metacognitive learning strategy use: occurrence and relations with gender, intrinsic motivation, and perceived autonomy support among secondary school students in Physics using self-report questionnaires. The majority of self-regulation studies have been conducted outside Uganda but research conducted in Uganda, in particular, have not been conducted in Mathematics at the lower secondary school level and used quantitative methods. According to Dweck et al. (2014), greater focus should be placed on the learner's psychology, specifically the psychological elements that may enhance Self-Regulated Learning, in order to improve learning. As a result, the antecedents of Self-Regulated Learning in Mathematics were explored in terms of mindsets, interest and teaching strategies using mixed methods.

The study of self and the beliefs people hold about themselves, as well as their interests about schooling, are all part of the student psychology. As a result, self-esteem, self-concept, self-efficacy, and mindset are among the numerous self-beliefs that have been studied. Mindset, which is newer among them, was investigated in this study. Dweck (2006) coined the term mindset, which evolved from notions like learned helplessness, attribution theory and achievement goal orientation. However, all of these failed to answer the question of why students of nearly equal ability care about proving themselves while others improving themselves. Later, Dweck and Mary Bandura in 1983 introduced implicit theories of intelligence to answer the above question and, in 2006, Dweck introduced mindsets where the entity theory was replaced with a fixed mindset, and the incremental theory was replaced with a growth mindset (Dweck & Yeager, 2019).

A growing collection of research on mindsets and their benefits in education and in life is also available. Some studies look at both growth and fixed mindsets while others focus solely on growth mindsets and still others look at mindset interventions. For example, Snipes and loan (2017), Claro and Loeb (2019) looked at a growth mindset only, Schmidt and Shumow (2017), Burnette et al. (2020), Xu et al. (2021), Petschera et al. (2017), Bedford (2017) looked at mindset intervention using experimentation design while Mofield and Peters (2018), King (2020) and Marriott et al. (2019) looked at studies about both fixed and growth mindsets. In Uganda, Baluku et al. (2018) attribute positive entrepreneurial outcomes to psychological resources. Here, self-efficacy, hope, resilience and optimism are mentioned in the psychological capital resources but not mindsets. Different results have been found in all of the above studies and these studies have all been done in western contexts, particularly using the experimentation design. As a result, a study on mindsets in Uganda using mixed methods, including both mindsets and their effect on learners' psychological factors like SRL and interest in schooling, was needed.

On the other hand, Schiefele's (1991) historical review of interest traces the origins of psychology interest back to Herbart in 1806. Modern interest research in 1913 is associated with Dewey. According to the review, interest in Education and Psychology diminished with the introduction of behaviorism. Luckily, Schiefele revived it in 1974 when he noticed that achievement motivation focused only on results and performance, disregarding the fact that students find joy in learning due to their interest in certain subjects. Researchers such as Renninger, Hidi, and Krapp from the 1980s are recognized for their latest research on interest, according to Schiefele (1991). Research on interest can provide explanations for why individuals choose to engage with or disengage from different topics, themes, subjects, or situations (Laine, 2019).

Educational institutions prioritize promoting interest in education, especially in Mathematics, due to low interest among secondary school students (Xu et al., 2021).Various researches have been conducted worldwide to determine how interest is related to various variables that affect learning. Interest has been investigated in many ways in various studies; for example, some studies just look at individual interest or situational interest, while others look at both. For example , Roure et al. (2019), Xu et al. (2021) solely looked at situational interest, while Burnette et al. (2020) looked at both individual and situational interest. In Uganda, Matembu (2014) studied, solely, individual interest and recommended a study that looked at both individual and situational interest. For this case, Mayeku (2019) in a study on interest, self-regulation and academic achievement defined interest as intrinsic goal orientation, extrinsic goal orientation and task value. Consequently, different outcomes have been obtained but studies in Uganda have not examined the relationship between interest and psychological characteristics such as mindsets and Self-Regulated Learning (SRL), which was the focus of this research.

SRL is quite important in students’ learning but the importance of teachers and the teaching strategies they use on the other hand, cannot be overlooked. Arends and Castle (2021) trace the roots of teaching strategies to ancient Greece and

Socrates in the 17th century, stating that nineteenth-century teaching strategies were teacher-centred. Dewey developed learner-centred strategies in the 20th century. Different approaches are currently used to describe teaching strategies. For example, Tularam and Machisella (2018) discuss traditional (synchronous learning) and non-traditional (asynchronous learning) approaches, Kangu, (2019) discusses heuristic and didactic approaches, and the most recent is online and blended learning (Dhawan, 2020). However, the importance of teachers and instructors in students' education at all levels cannot be overstated. According to Han (2021), a range of teacher factors might influence students' learning processes and academic outcomes, which is why teaching strategies moderated the relationship between mindset and SRL in this study.

The motivation to study SRL came from Schunk (2005) who states that skills and abilities do not fully explain student accomplishment. In addition, Dweck et al. (2014) go on to say that in order to increase learning, the emphasis should not be solely on the learner's IQ but also on the learner's psychology, specifically the psychological characteristics that may promote Self-Regulated Learning. Mindset and interest being some of the psychological factors, because students do not study in isolation, teaching strategies were included in the study. The Social Cognitive Theory (SCT) mentions environmental factors as influencers of students' learning (Bandura, 1991). Thus, utilizing mixed methods, the study investigated Mindset with Self-Regulated Learning in Mathematics mediated by Interest and moderated by Teaching Strategies in Uganda among lower secondary school students.

1.1.2 Conceptual background

According to King (2020), mindsets are people's beliefs about their own skills. Similarly, in this study, mindsets were defined and operationalized according to Dweck (2017), as the view or belief that people hold about their own intelligence or ability. Operationalization of mindset in the study was based on Dweck (2017) that states that according to implicit theories of ability, there are two mindsets which are fixed and growth mindsets that were studied independently in the current study. A growth mindset is the belief that people's basic qualities can be developed through hard work, good strategies, and the assistance of others. Growth mindset people believe that a person's true potential is unknown and unknowable. So, students who have a growth mindset are more likely to persevere and put forth effort while learning, even when content seems difficult, thus, the growth mindset belief fosters a desire to study (Dweck 2017; Dweck & Yeager, 2019). On the other hand, a fixed mindset is the belief that people's core attributes are chiselled in stone or unchangeable, that they are somethings fundamental about them that cannot be changed. People with a fixed mindset regard effort as a waste of time and easily give up in case of challenges or failure, they will always try to appear smart/bright, wanting to demonstrate whether they possess a high level of a particular quality, and in the face of a challenge, they will give up easily and see effort as futile (Dweck, 2006; Dweck & Yeager, 2019; Mofield & Peters, 2018; Ng, 2018; Polirstok, 2022)

According to the definition by Said, et al. (2018), interest is a longing to gain further knowledge or engage in an activity. In this research, interest was defined and operationalised based on Renninger and Hidi's (2011) description as a psychological state and an inclination to revisit particular activities, objects, or information consistently as a consequence of interacting with one's surroundings. Interest was operationalized as individual interest and situational interest. Situational interest was defined in terms of focused attention and emotional response in a specific context, that may or not be triggered by an external stimulus and may be temporary or long-lasting (Laine, 2019; Renninger & Hidi, 2011). Situational interest is triggered when a person's attention is captured by something in the surroundings, which could be influenced by external factors rather than one's prior knowledge of the subject. As per Renninger and Hidi (2022), situational interest has the potential to evolve into individual interest through time. Individual interest, conversely, is a consistent inherent characteristic of an individual encompassing delight, personal significance and favouritism towards a subject, and an overall passion for a particular area (Atasoy, 2015; Szymanska, 2022). This kind of interest is based on personal values, cognitive factors, acquired knowledge, and a person's past experiences with a general liking and enjoyment in the situation, which can vary from one situation to another (Laine, 2019).

Adediran et al. (2015) define teaching strategies as all the methods teachers use to achieve effective teaching and learning. However, teaching strategies in this study were conceptualized according to OECD (2010), as a broad range of procedures ranging from the organization of classrooms and resources to the moment-by-moment actions performed by teachers and students to improve learning. t They were further operationalized as teacher-centred strategies, learner-centred strategies, and teacher-student interactive strategies according to Costa (2014). These were, in addition, operationalized using different teaching methods.

A teacher-centred strategy is one in which students get knowledge from the teacher (Sibomana et al., 2022). Here, the teacher directs the transmission and sharing of knowledge, attempting to maximize information delivery while reducing time and effort (Atoyebi & Atoyebi, 2022). This study considered the lecture method as one good example. On the other hand, learner-centred strategies put the learner at the centre of the learning process and so learners can get more knowledge from their studies. According to Kafyulilo et al (2016), a teacher's job in a learner-centred strategy is to oversee classroom activities and assignments that require students to engage in critical thinking in order to discover and generate knowledge. With this strategy, students actively participate in the teaching and learning process by interacting with the teacher as well as one another (Mavumba & Mtitu, 2022). The student-teacher interactive strategies integrate both teacher-centred strategies and learner-centred strategies in lessons. According to Mostafa et al. (2018), combining learner-centred and teacher-centred strategies could promote learning by first giving students the teacher direction/guidance and background information on science concepts before engaging in enquiry-based activities.

Self-Regulated Learning in this study was conceptualized according to Schunk (2005) as an active constructive process in which learners set goals for their learning and then attempt to monitor, regulate and control their cognition, metacognition, motivation, and behaviour, guided and constrained by their goals and contextual factors in the environment. This entails employing Self-Regulated Learning strategies which was further operationalized as the ability of students to employ cognitive, metacognitive, and resource management strategies. This followed the Pintrich et al. (1991) Motivated strategies for learning. Cognitive strategies include methods for learning how to encode, memorize, and recall information and they included rehearsal, elaboration, organization and critical thinking. Then,meta-cognitive strategies are methods for becoming aware of one's own learning and being able to monitor and regulate one's own learning and cognition process (Kwarikunda et al, 2022). Meta-cognitive self-regulation was considered under meta-cognitive SRL. And resource management in SRL involves students' self-regulatory strategies to manage their resources other than their cognition were also considered. The resources included managing time and study environment, effort regulation, peer learning and help seeking strategies (Pintrich et al., 1991; Jackson 2018)

1.1.3 Theoretical background

The study was guided by Albert Bandura's Social Cognitive Theory (1986) and the Four Phase model by Renninger and Hidi (2006)

The Social Cognitive Theory (SCT)

According to Koutroubas and Galanakis (2022), the Social Cognitive Theory (SCT) originated from the Social Learning Theory and can be traced back to Bandura (1986). This theory proposed a perspective on human functioning where cognitive, vicarious, self-regulating, and self-reflective processes are emphasized in human adaptation and change. Pajares (2002) considers people as individuals who are self-organizing, proactive, self-reflective and self-regulating, rather than reactive individuals influenced by environmental factors or inner drives. According to Bandura (1991), human functioning is impacted by a mix of personal, behavioral, and external/environmental factors. Based on Social Cognitive Theory, people have control over their own growth and can influence outcomes through how they behave

(Bandura 2023). The theory stresses the significance of self-beliefs in human behavior, highlighting self-efficacy as a key belief. This theory also assigns a role to a belief system related to one's abilities. As per this theory, individuals who believe in developing skills through learning and practicing, view challenges as chances for growth, take lessons from errors, and assess their abilities based on their own progress rather than comparing to others. These individuals look for challenges that offer chances to increase their understanding and skills (Bussey, 2023). Dweck (1988) states that these students believe in an incremental theory of intelligence or a growth mindset as per Dweck (2006).

People who believe that ability is a more or less inherent capacity, where errors and deficient performances carry a high evaluative threat, view high effort as threatening because it presumably reveals low ability and the successes of others denigrate their own perceived ability (Bandura 1991). These people subscribe to the entity theory of intelligence according to Dweck (1988) or the fixed mindset according to Dweck (2006). According to Firmansyah and Seapuloh (2022), our decisions are impacted by our beliefs as well as our capabilities and self-directedness is a significant and ongoing source of personal fulfilment, interest, and self-esteem. As a result, without purposes and evaluative involvement in tasks, people stay unmotivated, bored, unsure of their abilities and reliant on temporary external stimulation for their motivation.

The SCT has been applied in the study of motivation, interest (Kwarikunda et al., 2020), Self-Regulated Learning (Jansen, 2021; Lourenco & Ferreira, 2019) interpersonal communication (Govindaraju, 2021), work place and organizational behaviour (Koutroubas & Galanakis, 2022). In the context of SRL, the SCT suggests that individuals can control their own development and achieve outcomes through their behaviors. Individuals possess self-beliefs that enable them to have influence over their thoughts, emotions, and behaviors. People's thoughts, beliefs, and emotions impact their actions. Therefore, efforts to enhance self-regulated learning (SRL) can focus on enhancing emotional, cognitive, or motivational aspects, improving behavioral skills, or altering the social context in which students are educated. Additionally, human behavior is shaped by psychological mechanisms within the self-system that are influenced by environments and social systems. (Pajares, 2002). This means that educational and family structures do not directly impact human behavior, but rather influence people's aspirations, beliefs, personal standards, emotional states, and other self-regulatory influences to a certain extent (Bandura, 1991). Self-Regulated Learning is explained in the study as the use of self-organizing, self-reflective, and self-regulatory strategies. Mindsets are beliefs concerning the conception of ability and interest under affect. In this scenario, the beliefs, interests, and self-regulated learning behaviors of students may be influenced by environmental factors, with teachers and their teaching strategies playing a pivotal role. In the study, the researcher anticipated that mindsets would impact students' interests and Self-Regulated Learning, as well as teachers strengthening the relationship between mindsets and SRL through their instruction.

When applied to the study, the theory implies that students' beliefs in their ability as malleable or fixed cause them to regulate their learning differently, with those having a growth mindset investing effort and using different SRL strategies to learn, whereas those with a fixed mindset seeing effort as threatening their ability and using low effort strategies to learn. Mindsets can be linked to students' Self-

Regulated Learning behaviour, as well as their selection and application of various SRL strategies. However, as an affective and psychological component of personal characteristics, interest can alter the trajectory of Self-Regulated Learning behaviour. Furthermore, the fact that students remain in social environments suggests that their beliefs can interact with environmental forces to influence their SRL actions. Students' ideas, interests, and SRL behaviours are influenced by contextual influences (Pajares 2002). This calls for social others such as parents and teachers, to assist children by correcting their faulty beliefs, improving their interest and self-regulation skills, and changing school and classroom environments that may have a detrimental impact on their beliefs, interests, and SRL practices.

Regardless of the aforesaid strengths, personal and environmental factors tend to influence self-ability beliefs (mindsets in this case), interests, and students' self-regulated behaviours. Teachers, parents, and school environmental influencers, for example, can impact students' belief in their ability and interest in Mathematics through feedback mechanisms. Personal factors like gender (Dweck 2007), interest - a psychological aspect of an individual that leads to enjoyment and valuing of a subject can also shake one's ability views and SRL behaviours (Kihwele & Mkomwa, 2022). The theory emphasizes self-efficacy as a belief (Bandura, 1991) and only briefly covers the malleability and fixedness of beliefs. It also covers interest briefly, and the function of teachers in students' Self-Regulated Learning is referenced indirectly under environmental effects. Students do not learn in isolation and teachers play an important part in their learning, which is why the study looked into the interaction of self-beliefs in the form of mindset, interest and teachers' teaching strategies on students' Self-Regulated Learning in depth. It was believed that this would shed more light on how different personal and environmental factors interact to influence students' SRL and propose a framework to explain SRL more. The SCT could not explain interest well and that’s why the Four Phase model of interest development supplemented the SCT.

The Four Phase Model of interest development by Renninger and Hidi (2006)

This model outlines the progression of learner interest through four stages, starting with a triggered situational interest. If this initial stage continues, it will evolve into the subsequent phase, which involves sustained situation interest. The third stage, with characteristics of low developed individual interest, could arise from the second stage. The fourth stage of interest development may be a result of the third stage, characterized as a fully developed individual interest (Hidi & Renninger, 2006; Harackiewicz et al., 2016; Renninger & Hidi, 2020). The four stages are seen as consecutive and separate, representing a form of gradual and advancing development in circumstances where interest is supported and sustained, whether through external help or because of perceived obstacles or chances linked to a task. However, without external help, each phase of interest development can stagnate, regress to a previous phase, or disappear completely. The model also posits that varying levels of self-regulated learning may happen during each phase of development (Renninger & Hidi, 2022).

The model has been utilized in research investigating levels of interest and methods for promoting interest (Darlington, 2017; Hogheim & Reber, 2017; Kwarikunda et al., 2020). When utilizing the model to describe interest and SRL, it was noted that interest stemmed from the interaction between a person and a particular topic, and learners could employ various strategies to study with differing levels of interest. Interest comes from within a person, but it can be influenced and nurtured by external factors like the content and environment. Therefore, support from others, the structuring of the environment, and an individual's personal initiative can all contribute to the growth of interest and self-regulated learning (Hidi & Renninger, 2006).

The researcher in this study suggested that different levels of interest in mathematics were present, and these different degrees could be linked to different personal and environmental factors influencing SRL. This study did not differentiate between Triggered Situational Interest and Maintained Situational Interest, or between Emerging Individual Interest and Well-developed Individual Interest. Its primary emphasis was on only two main stages, that is Situational Interest and Individual Interest.

1.1.4 Contextual background

Mathematics holds significant importance as a subject globally. In Uganda it is compulsory at Primary and Ordinary level (O level) and it is integrated into almost all courses at all educational institutions. Even the national grading system at the primary and secondary levels emphasizes it. Regardless of whether a student passes all of the subjects sat, Uganda National Examination Board) (UNEB) rules state that if a learner receives an F9 (failure) in English or Mathematics, he or she is pushed to a lower grade (Batiibwe, 2020). It is for this reason that Uganda's formal education is notable for its competitiveness, classification, grading, and hierarchical system (Ampaire, 2021). This foundation lays the groundwork for students' surface learning and reading in order to pass exams. Passing tests indicates that a person can apply what they have learned. However, teachers, UNEB and employers generally lament that the 21st century learners are unable to logically analyse or reason beyond laying out step-by-step solutions to a particular problem. Learners are deficient in higher-order thinking skills such as application, analysis, evaluation and creation (Batiibwe, 2020). This can be attributed to a lack of self-regulation skills such as critical thinking, planning, metacognition and the ability to control and adapt to changing situations.

UNEB's concerns regarding STEM subjects (Science, Technology, Engineering, and Mathematics) challenges have been reoccurring for a number of years across all districts, including Wakiso, which is recognized as one of Uganda's academically best performing districts. This study was carried out in Wakiso district. Wakiso district is located in Uganda’s Central region and shares boarders with Kampala the capital city. It is the second most populated district in Uganda and highly urbanized with half of its population living in urban areas. Its location gives it an advantage over other districts because it is endowed with a number of resources including good schools and teachers (Wakiso district Local Government website, 2020). However, it still has challenges with Mathematics for example, findings by Uwezo (2017) revealed that 30% of pupils in Wakiso district could not do basic Mathematics. Another study by Uwezo (2020) revealed that young people (ages 14-20) demonstrated low skills on every day and workplace Mathematics. It was also discovered in the study that 20% of young individuals struggled to identify shapes, numbers, money, and place values, while 60% of those interviewed were limited to just recognizing these aforementioned. Additionally, less than 10% were able to effortlessly complete calculations in a work setting. The study's objective was to create instruments for accurately assessing the alignment between school outcomes and skills needed in work and daily life.

Further, during the release of the 2020 UCE examination results, for example, the executive director of UNEB reported that many students were unable to answer questions on the same topic if they were slightly changed. He went on to say that this could be due to students using cram work and rote learning (UNEB, July 30th, 2021). This may indicate that students use methods like rehearsal and do not use other self-regulated strategies including cognition, metacognition and resource regulation, such as effort. The Minister of Education and Sports on the same day commended UNEB for the results and observations, which showed that there was a problem, and tasked the Permanent Secretary to investigate the problem and report back with an evidence-based solution, which also explains this study.

World over, Uganda inclusive, it is widely assumed that STEM subjects, which include Mathematics, are for gifted/bright students. Mathematics is perceived as a subject for boys, as a general belief because it is labelled as difficult, while women are labelled as delicate and frail. As a result, women do not perceive themselves fitting into the difficulty of Mathematics (Ampaire, 2021). This is further supported by the small number of students who choose to take Mathematics at Advanced level (A level) even though it is mandatory at O level. As an illustration, there were 330,080 UCE candidates in 2019 and 329,453 in 2020, with only 31,729 taking A level Mathematics in 2019 and 35,729 in 2020 (UNEB, 2021). Concerning gender, the 2020 UACE exams release statement revealed that female participation in Science subjects such as Mathematics is significantly lower compared to males.

Only 26.7% of females took Mathematics, 6.9% took Physics, 13.2% took Chemistry, and 12.3% took Biology (UNEB, 20th August 2021).

This can be said to begin with students' views about intellectual capacity, in general and ability in Mathematics in particular. Mathematics is often seen as an innate skill or ability that some possess and others do not, rather than a skill that can be grown. It begins with a basic skill and develops through dedication and hard work. Literature suggests that viewing intellectual ability as something innate makes students question their capabilities and motivation diminishes in challenging situations. On the other hand, viewing intellectual ability as something that can improve (growth mindset) motivates individuals to seek active and effective solutions when faced with adversities (Dweck, 2017).

Beliefs about intellectual ability are crucial in Mathematics, which is perceived as complex, difficult, and hard, especially when students perform poorly or do not get good grades. Students who view their intellectual ability as something they can improve (growth mindset) maintain their interest in a certain subject even when they fail. Those who see Mathematics as a gift, on the other hand (fixed mindset), lose interest in their studies and easily drop out in case of failure (Dweck, 2007). Interventions to develop students' interest are important in any educational context, but they may be especially important in academic disciplines that many students do not find initially interesting or in domains where interest often declines over time. For example, students' academic interests diminish in middle and high school, notably in Science, Technology, Engineering, and Mathematics (STEM) disciplines (Harackiewicz et al., 2016). In the realm of education, understanding students' mindsets is critical. Students with a growth mindset, for example, may maintain interest and invest effort, different resources, and a variety of strategies to improve their grades, whereas those with a fixed mindset may lose interest, give up (Dweck 2017), and in the case of Uganda lower secondary school students where Mathematics is compulsory, these will read only to pass by employing effortless strategies.

In Uganda, students' use of cram work and rote learning, as well as their inability to regulate themselves, can be linked to teachers and the way they teach. Because of the competitive character of Uganda's education system, where grades and school rankings are important, teachers become trapped in that cycle and teach students to majorly pass. Much has been done in Uganda, such as the introduction of SESEMAT (Secondary Science and Mathematics Training), which aims at equipping teachers to teach science subjects in a more practical, friendly, and attractive manner. Despite all this, it appears that teachers continue to teach Mathematics by rote method (Mbeya, 2020). For example, at the release of the 2020 UCE exams, the Minister of Education and Sports blamed poor performance in science subjects on teachers' use of theoretical teaching strategies and methods despite obtaining SESEMAT program training (UNEB, 30th, July 2021).

Effective teaching necessitates flexibility, creativity and responsibility in order to provide an instructional environment capable of responding to the learners' individual needs (Cardino Jr & Cruz, 2020). Many factors, both internal and external to the student, influence learning. Some students are unaware of their abilities and motivation to learn, and it is thus entirely up to external agents such as teachers to infuse into such learners whatever it takes to awaken those abilities such as Mathematics abilities, nurture them into self-discovery, enhance their interest and liking of the subject (Iwuanyanwu, 2021). The different strategies that teachers employ and the manner in which they interact with students predispose students to various influencers, which progressively modify their thinking, values, beliefs, interests, and, finally, their self-regulatory processes.

Bandura's Social Cognitive Theory stresses triadic determinism, which holds that personal variables such as cognition, affection, biological events, behaviour, and environmental influences create interactions that result in triadic reciprocity (Bandura, 1991). According to Pajares (2002), determinants of human functioning in the SCT can aid the field of education by directing efforts toward personal, environmental or behavioural factors. Teachers, for example, can improve students' emotional states and learning by using good effective teaching strategies to correct their faulty habits of thinking and mindsets (personal factors), affect (interest), improve students' self-regulation practices and academic skills (behaviour), and change school and classroom conditions and structures that primarily negatively affect students' achievement and success (environmental factors). As a result, this study deemed it useful to investigate the effect of mindset and interest on students' Self-Regulated Learning in Mathematics and teaching strategies as a moderator variable among lower secondary school students in Wakiso District.

1.2 Problem statement

Self-regulated leaners are aware of their academic strengths and short comings. They employ a number of strategies they can use to effectively address the daily challenges of academic tasks depending on the nature of students and the demands and complexity of a given task (Onyinyechi, 2019). However, there seems to be

Self-Regulated Learning challenges among lower secondary school learners. For example, according to UNEB (2018, 2019, 2020), students are unable to answer questions on the same topic if they are slightly changed. Furthermore, teachers, UNEB, and employers generally lament that the 21st century learners are unable to logically analyse or reason beyond laying out step-by-step solutions to a particular problem. Learners are deficient in higher-order thinking skills such as application, analysis, evaluation and creation (Batiibwe, 2020). This can be attributed to students' beliefs and views about their mathematical abilities. Views such as Mathematics being hard, difficult and for males, exacerbate the beliefs that students hold about themselves, their ability to study and associate with Mathematics, and their interest in the subject.

This is further worsened by the competitive nature of Uganda's education system which puts emphasis on grades at all levels, the grading system which pushes one in a lower grade if they fail Mathematics, a compulsory subject in which most students read to pass exams. The way teachers teach also contributes to the problem since they teach students to pass and complete the syllabus, frequently leaving out the weak students. UNEB also provides a summary of examination performance by a number of students who passed and failed, as well as gender categorization, when examinations are released. For A level results, the proportion of those who proceeded with Mathematics at A level is compared to the proportion of those who sat O level. Those with a fixed mindset may see low numbers or gender inequalities in Mathematics as a confirmation of their pre-existing beliefs and interests.

Upon this background, students end up reading to pass tests and examinations and employing effortless strategies. This is exacerbated by instances in which teachers' teaching strategies have been shown to be lacking (Mbeya, 2020). In addition, students utilize strategies dictated by environmental factors such as reading to pass examinations and teachers' theoretical approach to teaching. As a result, this study deemed it necessary to investigate the effect of mindset, interest, and teaching strategies on students' self-regulated learning in order to inform policymakers, curriculum developers, educationists, teachers and parents. If this situation could not addressed, it was possible that a negative mindset in Mathematics would continue to be reinforced, and hence jeopardizing the students' interest and Self-Regulated Learning.

1.3 Purpose of the study

The study assessed the effects of mindset, interest and teaching strategies so as to be able to explain students' Self-regulated Learning in Mathematics that was key in promoting STEM and producing the 21^{st} Century learners.

1.4 Objectives of the study

The study was guided by the following objectives:

1. To examine the differences in mindsets exhibited by lower secondary students in Mathematics.
2. To examine the differences and levels of Mathematics interest among lower secondary students.
3. To determine the extent of Self-Regulated Learning in Mathematics among lower secondary students.
4. To explore the perceived use of teaching strategies in Mathematics among lower secondary students.

5. To determine the mediating effect of interest on the relationship between mindset and Self-Regulated Learning in Mathematics among lower secondary students.
6. To determine the moderating effect of teaching strategies on the relationship between mindset and Self-Regulated Learning in Mathematics among lower secondary students.

1.5 Research Hypotheses

The study was guided by the following hypotheses:

1. There are significant differences in the mindsets held by lower secondary students in Mathematics
2. There are significant differences in the levels of Mathematics interest among lower secondary students.
3. There are significant differences in the extent of Self-Regulated Learning in Mathematics among lower secondary students.
4. There are significant differences in the perceived use of teaching strategies in Mathematics among lower secondary students.
5. Interest significantly mediates the relationship between mindset and Self-Regulated Learning in Mathematics among lower secondary students.
6. Teaching strategies significantly moderate the relationship between mindset and Self-Regulated Learning in Mathematics among lower secondary students.

1.6 Research Questions

The study was also guided by the following research questions:

1. What differences exist in the mindsets held by lower secondary students in Mathematics?
2. What differences exist in students' interest in Mathematics among lower secondary students?
3. What differences exist in Self-Regulated Learning in Mathematics among lower secondary students?
4. What differences exist in the perceived use of teaching strategies in Mathematics among lower secondary students?

1.7 Scope

1.7.1 Geographical scope

The research took place in Wakiso District in Uganda involving S3 students. Wakiso District, situated in the Central region, was selected due to its consistent top performance in UCE over several years (Wakiso District website, 2020). Being situated in the Central region of Uganda also provided it with a comparative edge in terms of resources and quality schools compared to other districts. However, despite everything, all UNEB assessments have consistently shown that Mathematics remains a challenging subject (UNEB, 2020; UNEB, 2021; UNEB, 2023; UNEB). Further, UWEZO report (2020) showed that most young adults in Wakiso district could not comprehend basic Mathematics. S3 students were chosen because they would have familiarized with Mathematics teaching and learning especially under the newly revised lower secondary schools' curriculum.

1.7.2 Content scope

Content wise, the study investigated mindset as an independent variable, interest as a mediating variable, teaching strategies as a moderating variable and Self-

Regulated Learning as a dependent variable. Mindset was studied in terms of growth and fixed mindsets, interest as individual and situational interests. Teaching strategies were studied as teacher-centred strategy, student-centred strategy and teacher-student interactive strategy. Lecture method was studied under the teacher-centred strategy, then, demonstration, problem solving, project method, inquiry approach, co-operative learning and use of audio-visual media were studied under learner-centred strategy and teacher-student interactive strategy combined both teacher-centred and learner-centred strategies and Self-Regulated Learning were studied using learning strategies categorized as cognitive, meta-cognitive and resource management strategies. Rehearsal, elaboration, organization, critical thinking were studied under cognitive strategies, then, metacognitive self-regulation under meta-cognitive SRL and time and study environment, effort regulation, peer learning and help seeking were under resource management.

1.7.3 Time scope

The study was conducted between 2019 and 2023. The concept paper development was done in 2019. And proposal development, submission, defence at both department and school levels was done between 2020 and June 2022. From June 2022 to February 2023, ethical clearances were got, data collection tools were fine-tuned and a pretest study was done. Then data for this study was collected and analysed between February 2023 and March 2023.

1.8 Significance

The study findings were important because they shaded light to challenges surrounding students' learning of Mathematics specifically with their mindsets, interest, SRL and teachers' teaching strategies. The study specifically showed how students' SRL was affected by their mindsets and interest towards Mathematics. It further pointed out the strategies teachers' used to teach Mathematics and all those might be useful in influencing both policy and practice when it came to teaching and learning of Mathematics among lower secondary school students which findings might also inform the teaching and learning of other subjects at different levels of learning.

The study might also be helpful to National Curriculum Development Centre (NCDC) and Ministry of Education and Sports (MoES) while implementing the new curriculum to come up with strategies to be incorporated that are aimed at changing students' mindsets to a growth mindset and improving students' interest which were found to be important factors in students' SRL.

Teacher training institutions might use the findings to redesign their teaching such that it incorporated skills that would train teacher trainees how to adapt their teaching to the needs and nature of their learners. Similarly, this might apply to MOES and other related bodies responsible for reskilling in-service teachers. The training and retraining should not only focus on the conventional teaching strategies and methods but innovativeness in the classroom such that teachers could employ a number of strategies or methods in class basing on the nature of their students. It was found out that when teachers incorporated both teacher-centred and learner-centred strategies in their Mathematics lessons basing on the nature of their learners, students' mindsets interest and eventually their SRL improved.

The study findings might further be helpful to all stake holders in education by informing parents, care takers and the general public about providing students with a good environment that could help them to change their mindsets to a growth mindset, and interest in the Mathematics which were key in SRL. It was also found out that environmental factors played a role in students' learning where the models, feedback and the stereo types held in society could directly impact on students' mindsets, interest in Math which eventually impacted on their SRL behaviours.

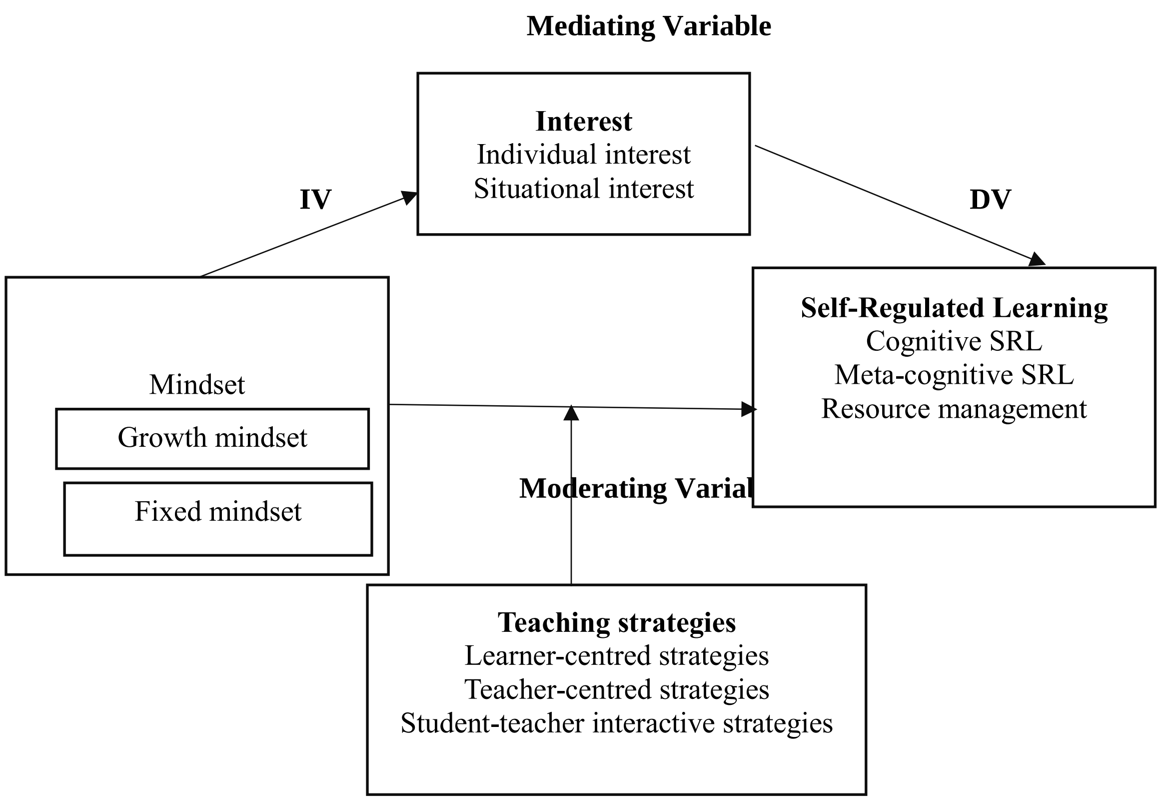
Further still, the study might be helpful to teachers, educators and policy makers in designing mindset training courses. The skills passed on to teachers might be integrated in normal lessons so as to teach learners and teachers about the benefits of having a growth mindset especially in Mathematics that seemed difficult though compulsory for many. The study found out that students' mindsets, for example a fixed mindset, might affect students' interest in Mathematics and eventually use low level strategies while learning and studying Mathematics so as to only pass exams.

The study findings might help students in working towards changing their mindsets, interest and become self-regulated learners.

Finally, the study added on the existing literature on mindset, interest, teaching strategies and SRL. It also made contributions in form of a new conceptual frame work explaining SRL, a further theoretical explanation of SRL factors, a new questionnaire all of which might be helpful to future researchers that might carry out similar studies.

1.9 Conceptual Frame Work.

The study was guided by the following conceptual framework



Source: Self-constructed form the theoretical framework and literature

Figure 1: A Conceptual Framework Showing the Relationship between Mindset, Interest, Teaching Strategies and Self-Regulated Learning

The conceptual framework in Figure 1 shows how mindset, interest and teaching strategies influence students' SRL. From the conceptual framework, mindset is the independent variable, interest the mediating variable, teaching strategies a moderating variable and Self-Regulated Learning the dependent variable. The figure shows that interest mediates the relationship between mindset and SRL, teaching strategies moderate the relationship between mindset and SRL. The figure further shows that mindsets and interest, mindset and teaching strategies can interact to influence SRL. This is based on the theoretical review that indicated that personal factors in form of self-beliefs and affection can interact to influence behaviour. Figure 1 further shows that mindsets in form of a growth mindset and fixed mindset are studied independently from each other.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of the literature that logically flows along the themes in the objectives and the conceptual framework. The chapter is divided into two sections; the first section gives the theoretical review and the second section an empirical review.

2.1 Theoretical review

The study adopted the Social Cognitive Theory by Albert Bandura (1986).

The knowledge, motivation, and volition that learners need to engage in Self-Regulated Learning in regard to a wide range of academic subjects, tasks and learning settings have been the focus of research on Self-Regulated Learning (Schunk, 2012). Although Self-Regulated Learning is widely discussed in literature and much research has been done about the subject, its theoretical underpinnings are not so wide. Different theories of Self-Regulated Learning according to Martin (2004) have been discussed in Educational Psychology literature during the past two decades. However, they are not comprehensive enough to explain the wide nature of SRL. Therefore, it is crucial to develop a more thorough theory that accounts for various SRL-related phenomena.

Self-Regulated Learning has many facets, which cannot be fully explained by the several Self-Regulated Learning theories that currently exist. The various theories of SRL have been divided into three categories: Phenomenological theories, Operant theories, and cognitive theories in an attempt to explain them (Zimmerman & Schunk 2001). Consequently, only cognitive theories have more than one theory explaining Self-Regulated Learning such as the information processing theory, Vygotsky's theory, Piaget's cognitive theory, volitional theory, and the social cognitive theory. (Zimmerman & Schunk 2013). In the actual sense, the operant and phenomenological theories are more referred to as views but not theories of Self-Regulated Learning in most literature. On the other hand, Abdullah (2010) notes that the six prominent theories on SRL, are the Phenomenological theory, the Operant theory, the Volitional theory, the Vygotskian theory, the Cognitive constructive theory and the Social Cognitive Theory. The common thing about all the mentioned theories is that they promote a self-determined view of human behaviour (Mace et al. 2013).

The Operant theory/view according to Nodoushan (2012), favours overt descriptions like self-reinforcement, self-recording and self-instruction whereas Self-Regulated Learning responses are influenced by external rewards and punishments, such as social acceptance, increased status, financial gain and promotions, among others. According to Schunk and Zimmerman (2012), the operant theory sees self-regulated behaviour as just another operant behaviour that is defined by its consequences. Behaviour becomes self-regulated when people change their environment in a variety of ways to change the likelihood that their actions will result in reinforcing or punishing behaviour. The authors, note that commitment, impulsivity, self-control, and self-delivery of reinforcement are important in SRL behaviour.

In a similar vain, Schunk and Zimmerman (2003) point out that, according to the operant theory, self-regulated behaviour entails selecting between alternative courses of action by postponing an immediate reinforcer in favour of a different and typically greater future reinforcer. McCaslin et al. (2013) further point out that from the view of operant theory, one chooses which behaviours to regulate, creates discriminative stimuli for their occurrence, assesses performance in terms of how well it adheres to the standard, and, then applies reinforcement.

Self-reinforcement, self-instruction and self-monitoring are the three main processes in SRL. It is clear that depending on how important SRL is, these theories place a significant emphasis on a learner's capacity for self-reinforcing behaviour. The operant theory, according to Abdullah (2010), is the SRL theory that best explains the relationship between SRL and learners' immediate environments because SRL processes are defined in terms of how they present themselves in overt behaviour. However, Mace et al. (2013) questions the idea that people manage their behaviour by consistently providing private or public reinforcers. In addition, the theory falls short of describing how other personal factors interact with the environment to account for SRL.

According to Nodoushan (2012), phenomenological theory/view contend that a universal sense of self-actualization and self-esteem underlies Self-Regulated Learning. In the same vain, McCombs (2013) adds that a phenomenological viewpoint promotes a person-referenced over a performance-referenced account of SRL processes and activities, accepting the centrality of self-phenomena in steering learning behaviours. On the other hand, Abdullah (2010), note that the phenomenological theory emphasizes the importance of self-concept in explaining SRL but also cite out other self-processes like self-observation, self-reward, self-monitoring and self-evaluation are also significant. The authors point out that the growth of self-concept and self-evaluation naturally leads to the development of

Self-Regulated Learning. Schunk and Zimmerman (2013) note that the self-system, is a critical factor that affects SRL.

Students who have realistic academic expectations and a positive self-concept are more likely to become self-regulated learners, but many students require interventions that are specifically designed to help them to develop positive self-views of their competence, as well as training in self-regulatory processes like self-evaluation. Therefore, the theory accords the ‘self’ a central role in SRL. However, McCombs (2013) point out that the phenomenological theory focuses primarily on self-perception rather than SRL, This is because the theory underlines the importance of personal factors like self-perception while downplaying the influence of the environment in SRL.

Similarly, the volitional theory, assumes that students' abilities to self-regulate their learning and their need to use Self-Regulated Learning strategies vary depending on a variety of personal and environmental circumstances, including cognitive ability. The theory is centred on willpower because it is seen to be the key to understanding human behaviour (Abdullah, 2010). According to Corno (1989), investigations of classroom observation have shown that there are many distractions and competing attentional stimuli present while students work in groups to complete academic tasks. Therefore, the mechanisms that activate to control concentration and advance in the face of environmental and personal barriers to academic learning are the volitional features of SRL. In addition, Bartels et al. (2009) state that volition is required to prevent goal desertion and to maintain effort and perseverance in the face of competing goals. Gaeta et al. (2012), also contends that students with strong willpower may keep focus and maintain control over their learning activities in the face of challenges such as improper tasks, challenging materials and peer intrusions. However, environmental elements, although are equally significant in SRL, are seen in the theory as secondary to cognitive processes (Corno, 2013).

Vigotsky's theory (1962) views the social environment as having a major influence on students' learning. In other words, students develop their ability to self-regulate through interactions with more proficient teachers or students such as through the use of scaffolding (Abdullah, 2010). Additionally, Bodrova and Leong (2006) point out that self-regulation is a set of higher mental functions, and that, as is the case with all higher mental functions, children's self-regulatory skills first develop from social interactions before becoming internalized and used independently by children. This indicates that self-regulation is something that is taught formally or informally within the social context rather than something that develops unexpectedly as the child grows.

According to the theory, multiple social encounters with other people lead to SRL. The theory also emphasizes the role of inner speech, particularly meta-cognitive Self-Regulated Learning, in helping students to employ Self-Regulated Learning and self-control during their learning (Abdullah, 2010). Rohrkemper (1989) also notes that reported inner speech serves as a technique for internalizing the social and educational environment as well as a mode of adaptive learning. Although the theory discusses inner speech as a personal factor that is significant in SRL, it falls short of adequately describing how personal and environmental factors combine to explain SRL (McCaslin & Daniel, 2013). Additionally, the theory emphasizes adaptive learning more than SRL.

Then, the cognitive constructive theory, proposes that new knowledge must be actively constructed from experiences. Students are seen to operate like scientists who actively create hypotheses to regulate their own learning (Ozdemir, 2011). This relates with metacognition or knowledge of one's own thoughts, which is conscious, intentional, intelligent, logically or empirically falsifiable, and verbally communicable that involves both conscious awareness and the ability to communicate one's rationale (Fox & Riconscente, 2008). In order to effectively self-regulate, Zimmerman (2013) notes that students need to have knowledge of instrumental strategies like knowledge to manage time, motivation and emotion, as well as self-competence. Self-competence is influenced by beliefs about one's own power, agency and control. The theory gives a central role to self in explaining SRL but ignores other personal factors and the environment and how they interact to explain SRL.

All of the aforementioned theories place a strong emphasis on the idea that knowledge is not passively imparted to students; rather, they are actively involved in reorganizing and reconstructing their prior knowledge using new information. The theories do not, however, go into great detail into how behavioural, environmental and personal factors combine to explain SRL. The SCT, which provides a more thorough explanation for SRL (Panadero, 2017), was therefore chosen to underpin the study.

The SCT views human functioning as an interaction between behavioural, environmental, and personal factors (Pajares, 2002; Zimmerman, 1990). Based on the theory, environmental and personal factors influence Self-Regulated Learning processes like self-observation, self-judgement and self-reaction. The physical context of a learning setting and the social experiences that students have while studying make up the environmental factors (Abdullah, 2010). On the other hand, self-beliefs, self-regulative knowledge, goals, affection, and self-efficacy are among the major factors in SRL with self-efficacy being central (Bandura, 1991). Self-efficacy is the confidence in one's capacity to plan and implement the actions required to achieve a specified performance (Bandura, 1994). However, Bandura (1991) also cites beliefs about the nature of ability as being static or malleable which Dweck (2006) refers to as mindsets. Schunk and Zimmerman (2003) point out that self-regulation is context-specific in the social cognitive theoretical framework. That is to say, learners are not expected to self-regulate equally in all domains of learning. Although some self-regulation techniques, like goal planning, may be universal to all settings, learners must learn how to tailor techniques to particular domains and must feel confident doing so. Insofar, students may have some choice over one or more of the self-regulatory strategies, but when every part of the task is preset, students may learn but their main source of control comes from outside sources like teachers, parents or peers.

Human functioning, according to Schunk (2013), involves reciprocal connections between behaviours, environmental factors, cognitive processes, and personal factors. Schunk and Zimmerman (2003) go on to say that because these components vary as we learn and must be monitored, the interaction of personal, behavioural and environmental factors during self-regulation is a cyclical process. An individual's strategies, cognitions, affection, and behaviour change as a result of such monitoring. Abdullah (2010) posits that the Social Cognitive approach to SRL is the most popular theory for understanding SRL and has three benefits, including the ability to separate personal and environmental factors and explain the influence of each factor. Additionally, it explains the reciprocal effects of the environment, behavioural and personal factors and connects students' SRL processes to particular social experiences, for example as interactions with teachers. It further offers a comprehensive view of learning strategies, motivational beliefs, and academic success. Since the theory emphasizes the importance of behavioural, contextual, and personal elements, it provides a more thorough explanation of the influences of SRL.

However, the theory lays greater emphasis on the social aspects of the learning environment, such as teacher feedback and ignores other environmental settings, such as the home environment, and other teacher factors, such as teaching strategies, in explaining SRL. The theory further emphasizes SRL which is more possible in small classrooms. Therefore, the theory may have a limitation of its applicability in large classes found in most schools in Uganda. Although the theory refers to self-beliefs and affection as personal factors, it solely describes self-efficacy as a belief ignoring other self-beliefs and also ignores the affective aspect of personal factors. Interest being one of the affective personal factor is not described in the theory. That is why, the study felt that it was crucial to provide a more thorough explanation of SRL by considering other personal and environmental factors, and how they interact to account for SRL.

The four Phase model of Interest development by Renninger and Hidi (2006) was used to complement the SCT to explain interest (See chapter 1)

2.2 The Empirical Review

This section reviews literature related to the study variables and objectives. The section is under the subheadings of; conceptualization of variables, the differences in mindsets among students, differences in students' interest in Mathematics, the extent of Self-Regulated Learning, the perceived use of teaching strategies, the mediating effect of interest in the relationship between mindset and SRL and the moderating effect of teaching strategies in the relationship between mindset and SRL.

2.2.1 Conceptualization of variables

2.2.1.1 Mindsets

The origin of mindset can be traced from Dweck (2006). However, Dweck and Yeager (2019) show that its origin can be traced back to the idea of learned helplessness. According to Filippello, et al. (2018), learned helplessness is a psychological condition that manifests as a lack of confidence in one's own abilities, a biased interpretation of events, and a negative interpretation and attribution for success. It is characterized by an internal stable state of attribution for failure and an external unstable state of attribution for success. This eventually became known as the attribution theory, which contends that people have a tendency to look for explanations for the things that occur to them or those around them, which in turn determines their reactions.

Because of the failure of the attribution theory to explain why students with nearly equal ability react and respond differently to difficulties, Dweck and Legget (1988) developed the achievement goal theory (Haimovitz & Dweck, 2017).

According to the theory, students may react differently to various performance and learning situations, successes and failures depending on their achievement goals, such as performance goals that are about proving ability and learning goals that are about developing ability (Becker et al., 2018). Because also the achievement goal theory could not answer the question, Dweck and Mary Bandura in 1983 came up with implicit theories of intelligence to answer the above question (Dweck and Yeager, 2019). Dweck (2006) then introduced the concept of mindset by replacing the entity theory with a fixed mindset and incremental theory with a growth mindset (Yeager & Dweck, 2020). In this case, mindset is a belief that people hold about themselves concerning their qualities/capacities/ attributes. This simple belief can affect one's psychology and all areas of life, learning inclusive. (Dweck, 2017; Jacobs, 2019).

In educational environments, students with a growth mindset believe that qualities such as abilities, traits, and talent can be developed through learning and effort, whereas those with a fixed mindset believe these qualities are immutable and cannot be changed (Mofield & Peters, 2018; Huang et al., 2019). These self-perceived mindsets can influence how people live their lives, including their interest in school activities, particularly in the face of difficulties, and life can have different meanings depending on the mindset one adopts (Dweck, 2006; Burnette et al., 2020).

Students with a growth mindset tend to persist and make an effort when learning even when content seems difficult, whereas students who have a fixed mindset will always try to appear smart/bright, wanting to demonstrate whether they possess a high level of a particular quality, and in the face of a challenge, will give up easily and see effort as futile (Polirstok, 2022; Ng, 2018; Mofield & Peters, 2018; Dweck, 2006; Jacobs, 2019). Literature explains how these mindsets are acquired. For example, parents often begin instilling certain mindsets in their children at an early age by praising brilliance and cleverness while harshly criticizing failure rather than emphasizing effort. Teachers and coaches in schools too when they praise and criticize more and lay less emphasis on effort, through ability grouping and streaming, sitting in class according to performance, emphasis on grades from tests and exams rather than deeper learning where students label themselves as having a certain amount of intelligence, talent or attribute (Dweck, 2006; Haimovitz & Dweck, 2017; Jacobs, 2019).

Farrington et al., (2012) note that there is a reciprocal relationship between mindset, persistence, perseverance, academic performance and better academic behaviours where a growth mindset motivates students to work hard, perseverance, have better academic behaviours and eventually perform well. The good academic performance eventually validates a growth mindset. On the other hand, a fixed mindset suppresses perseverance and hard work which results into poor performance and the poor performance eventually reinforces a fixed mindset. The good thing is that these mindsets can be changed by teachers, parents and students themselves and may be if better mindsets are emphasized, it can impact positively on students' interest and learning of science subjects, Mathematics particularly.

2.2.1.2 Interest

Interest is a topic that researchers have recently become interested in to better comprehend learning processes and results (Renninger & Hidi, 2022). Interest is a psychological state of involvement or an inclination to become involved again with specific objects, events, or concepts with time (Schiefele, 1991). Renninger and Hidi (2011) identify two types of interest: individual interest and situational interest. According to Conard (2023), an individual's interest is a consistent and long-lasting aspect of an individual that includes pleasure, personal significance, and choice of subject matter, as well as an overall fondness for a specific field.

Situational interest on the other hand is described as a focused attention and emotional response to a specific stimulus in the environment, which may be temporary or long-lasting (Laine, 2019; Renninger & Hidi, 2011). Situational interest can occur when something catches someone's attention in the surroundings. It is not dependent on a person's prior understanding of a subject but rather on external variables in the environment. Individual interest, on the other hand, is influenced by a variety of variables, including a person's prior experiences of worth and enjoyment in the context, which might change from one circumstance to another, personal values, cognitive factors, acquired knowledge (Laine, 2019). For instance, someone who is reading a newspaper and recognizes an item that is pertinent to a subject they have been trying to comprehend has individual interest (Renninger & Hidi, 2011). Additionally, a student might be said to exhibit situational interest in Mathematics if they, for instance, show focused attention in a mathematical piece of work, ask questions out of curiosity or react emotionally to a mathematical activity. On the other side, a student can be said to have individual interest in Mathematics if they have a desire to pursue a career in Mathematics, start a discussion about a previous topic or read independently (Darlington, 2017).

Since interest is a mental condition, individuals may not always be conscious of it, leading educators to assume its presence or absence. All students must be interested in order to study effectively, and teachers can help students cultivate this interest (Harackiewicz et al., 2016). Hidi and Renninger (2006) presented a four-phase model of interest development, with different amounts of value, affection and knowledge present in each step. The first phase of Situational interest is triggered situational interest, and if it is maintained, it advances to maintained situational interest. The third phase, which may emerge out of the second phase is a less well developed/emerging individual interest and may result into the fourth phase, which is a well-developed individual interest. Silvia (2008) add that experience, temperament, and genetic susceptibility may all have an impact on a phase's ability to endure. In addition, they contend that a lack of external support could, at any stage, cause it to regress to an earlier phase or disappear. Therefore, educators and social others have a role of helping learners to develop interest in the different areas of study.

2.2.1.3 Teaching Strategies

According to OECD (2010), teaching strategies encompass a wide variety of processes, including how classrooms and materials are organized, as well as the activities teachers and students do to enhance learning. In the same way, Shah et al. (2022) define teaching strategies as a detailed blueprint for a lesson, incorporating the structure, objectives, and a set of techniques for implementing the teacher's actions in class, such as refining teaching methods, offering appropriate environment for prompt responses, rehearsing acquired skills, improving responses through supplementary tasks, etc. While conceptualizing teaching strategies, many approaches are employed, for example Kangu (2019) mentions the heuristic and didactic approaches. Methods that are heuristic or learner-centred allow students to actively engage and participate in the learning process. When employing learner-centred strategies, a teacher serves as a helper who challenges the student to make discoveries on his/her own. Conversely, didactic approaches, such as the lecture method, drill, talk and chalk methods, put the learner in a passive position and are teacher-centred. These strategies make the learners passive recipients and teachers become information sources and classroom managers.

According to Atoyebi and Atoyebi (2022), there are two types of teaching strategies for Mathematics classified as alternative and traditional. The traditional teaching strategies, which are teacher-centred, cover the basic computing techniques using a pencil and paper, with the teacher modelling before individual practice. Sibomana et al. (2022) assert that teacher-centred strategies for teaching Mathematics are extremely unreliable and full of many shortcomings that prevent students from actively constructing their mathematical knowledge, and it is linked to students' poor performance. These teaching strategies, which consists primarily of lectures, demonstration, drills and practice sessions, do not help students build a conceptual understanding of Mathematics. In a similar vain Mostafa et al. (2018) observe that students exposed to teacher-centred strategies are less motivated in their studies, have negative attitudes towards the subjects being learned, and have little or no collaboration and communication skills. The benefits of teacher-centred strategies are however suggested by Otukile-Mongwaketse (2018) as wider coverage of content, orderliness in classes which brings about easy class management and better preparation for standardized tests.

On the other hand, alternative teaching strategies that are learner-centred let students to share their approaches to solving mathematical word problems, which serves as the main learning tool. Learner-centred strategies put the learner at the centre of the learning process and so learners can get more knowledge from their studies. According to Kafyulilo et al. (2016), a teacher's job in a learner-centred strategy is to oversee classroom activities and assignments that require students to engage in critical thinking in order to discover and generate knowledge. With this strategy, students actively participate in the teaching and learning process by interacting with the teacher as well as one another (Mavumba & Mtitu, 2022). In additon to teacher-centred and learner-centred strategies, Costa (2014) suggests use of student-teacher interactive strategies which is an integration of both teacher-centred strategies and learner-centred strategies in lessons. According to Du Plessis (2016), combining learner-centred and teacher-centred strategies could promote learning by first giving students the teacher direction/guidance and background information on science concepts before engaging in enquiry-based activities.

Identifying the most effective teaching methods and strategies that are also compatible with students' preferred learning styles is one of the problems in the teaching-learning process. Therefore, to create an instructional environment that can respond to each learner's unique needs requires flexibility, creativity and responsibility (Cardino Jr & Cruz, 2020). Learning depends on many internal and external factors to the students. Some students are not aware of their abilities and motivation to learn so it is up to external agents like teachers to give these students the instruction they need to awaken their talents and abilities, such as their Mathematics abilities, and to guide them towards self-discovery (Iwuanyanwu, 2021). Thus, the importance of teachers in education cannot be understated.

2.2.1.4 Self-regulated learning

Self-regulated learning is an active, constructive process in which students set learning goals and then work to monitor, control and regulate their cognition, motivation and behaviour, constrained and directed by their goals and the environmental features/factors (Zimmerman, 2002). Inherently, self-regulated learning appears to be as old as humanity. According to Zimmerman and Schunk (2011), research on self-regulation in education has its roots in psychological investigations of adult self-control and the development of self-control in children. The research was therapeutic and participants learned how to change dysfunctional behaviours like aggression, addiction, and other behavioural challenges. In academic learning, Nejadihassan and Arabmofrad (2016) trace SRL back to the 1980s, when there was an interest in finding a solution to the question of how students could take control of their own learning. Schunk (2005) cites the inability of skills and talents to adequately explain students' achievement as the reason for the necessity to research self-regulated learning in the academic setting. This implied the significance of factors like motivation and self-regulation. Self-regulated learning has its theoretical roots in Bandura's 1987 Social Cognitive learning theory (Schraw et al., 2006).

Self-regulation is a self-directed process through which learners convert their mental abilities into academic skills rather than a mental ability or academic performance skill (Zimmerman, 2008). Self-regulation is one of the critical skills needed by everyone, even outside of school. For example, high levels of self-regulation predict better academic achievement, greater professional success and income, stronger interpersonal relationships, more fulfilment, and better health

(Mrazek et al., 2018). Panadero (2017) provides a thorough analysis of the various models that have been used to explain the theoretical and practical implications of self-regulated learning in education. The most cited out in most literature are by Zimmerman, Boekaerts, Winne and Hadwin, Pintrich, Efklides, and Hadwin, Järvelä and Miller. All the models agree that SRL is a cyclic process composed of different phases and sub processes and each discusses cognition, metacognition, motivation and emotion.

Self-Regulated Learning is a key major function of education because it promotes the development of skills for lifelong learning in all areas of life. (Schunk, 2005). According to Udemgbo and Onyinyechi (2019), using learning strategies to improve learning is a typical characteristic of self-regulated learners. Self-regulated learners in particular are aware of their academic strengths and shortcomings and have a number of strategies they can use to effectively address the daily challenges of academic tasks. Masud and Islam (2022) in support say that a self-regulated student in school learning is proactive in the process, which includes usage of learning strategies. Furthermore, autonomously motivated students use more adaptive learning strategies, like critical thinking, than their counterparts who use maladaptive learning strategies, like rote learning and rehearsal, according to Kwarikunda (2022), who also notes that learners differ in their ability to use learning strategies. Shi (2017) also notes that learners are active participants who process information and employ a variety of strategies to help them learn and understand during the teaching and learning process rather than passive recipients who only take in the information from the teacher or instructor. Learning strategies are crucial because they support active, self-directed learning by assisting students in choosing, acquiring, organizing, and integrating existing knowledge

While operationalizing SRL, a number of strategies exist including subject specific strategies and general content strategies. Among the general content strategies that are mostly used are the John Biggs model of deep and surface learning strategies (Dan & Todd, 2014; Roure et al.,2019; Floyd et al., 2009) and the Pintrich et al. (1991) motivated strategies for learning. Pintrich et al. (1991) developed the Motivated Strategies for Learning Questionnaire (MSLQ), measuring students' motivation and usage of various learning strategies. These were categorized as cognitive, metacognitive and resource management strategies. Cognitive strategies include strategies for enabling one to gain better skills of encoding, memorizing and recalling of information. These include rehearsal, elaboration, organization and critical thinking. Metacognitive strategies involve monitoring and regulating learning as well as teaching students to think about their thinking and learning. Thirdly, resource management strategies involve students' self-regulatory mechanisms to control their resources other than their cognition. These include effort regulation, peer learning, managing time and the study environment, as well as help-seeking (Pintrich et al., 1991; Schraw et al., 2006; Rotgans & Schmidt 2010).

The MSLQ was employed in studies by researchers like Shi (2017), Lackey (2013), and Muwonge et al. (2017). The MSLQ is a more comprehensive approach and was used in the current study. Rotgans and Schmidt (2010) notes that the MSLQ is one of the most popular self-report tools for self-regulated learning and was designed to measure a variety of self-regulated learning constructs and that is why it was selected for this study.

2.2.2 Differences in mindsets among students

When trying to understand how learners learn, Dweck et al. (2014) advocate paying attention to both non-cognitive elements and the learner's psychology, and mindset is one of the non-cognitive factors. Dweck (2017) suggests that an individual's psychology and overall well-being can be influenced by whether they adopt a fixed mindset or a growth mindset. Research indicates that people can have varying mindsets when it comes to certain areas, like their ability for science overall and their proficiency in Mathematics specifically. The impact is greater for evaluations of specific subject skills (Burnette et al., 2020). Due to the aforementioned and the fact that Mathematics is employed in every part of life, this study only focused on Mathematics.

Mindsets are often considered as qualities individuals possess or lack, however, they can actually fluctuate depending on the circumstances, and everyone can experience both fixed and growth mindsets at times (Dweck, 2006). This demonstrates that students in a class can have varying mindsets. In a research on attitude and motivation in science classes in secondary schools, Bedford (2017) identified various mindsets among 15 to 17-year-old students in England. Also, students demonstrated a growth mindset more often than a fixed mindset, even though there was no discernible difference between the two. In a separate study in the Netherlands by Glerum et al. (2020) with VET students who had completed both a Mathematics and English exam, it was discovered that 13.9% of students had a fixed mindset, 47.3% had a growth mindset, and 38.8% had a mixed mindset; nevertheless, the findings did not show statistical significance.

In a study by Snipes and Loan (2017) among students in Nevada from elementary, middle, and high schools, it was found that most participants demonstrated beliefs consistent with a growth mindset in Mathematics. Additionally, Gouedard's (2021) research involving 78 countries that took part in PISA exams revealed that a larger number of students possessed a growth mindset rather than a fixed mindset. This indicates that differing mindsets among students could lead them to motivate each other to switch between a fixed mindset and a growth mindset. It also implies that there might be additional influences shaping these mindsets in students. That is why this research aimed to investigate variations in mindsets shown by Lower secondary school students based on their demographics.

Literature shows that certain persons, occurrences, or situations can influence people's mindsets. For example, a fixed mindset can develop when someone feels stereotyped, judged, or in an environment that does not allow for mistakes. Hence, one's mindset is heavily shaped by the surroundings, and it is up to educators and significant individuals in students' lives to assist them in cultivating a growth mindset (Dweck, 2017).

Gender is a factor that is associated with differences in mathematics mindsets. This relates to the idea that girls in STEM fields are seen as having less natural intelligence than boys, a stereotype impacts on girls. The adverse effects of fixed ability narratives about women having less math ability than men can be reduced by promoting a growth mindset message (Dweck 2007; Burnette et al., 2020). Nevertheless, previous research has produced inconsistent findings. In a study on the impact of growth mindset on Mathematics learning among California students in grades 4–7, Claro and Loeb (2019) discovered that girls exhibited a stronger growth mindset compared to boys. Zarrinabadi et al. (2021) discovered that there were notable differences in mindsets between male and female language learners in Iran, particularly in terms of fixed mindsets, among both L2 and L3 learners.

Similarly, as per Gouedard (2021), girls showed a stronger growth mindset than boys in the sciences in 39 out of the 78 countries that participated in the PISA exams, while boys exhibited a stronger growth mindset in only six countries, and there were no notable variations in mindsets between genders in 32 countries. Other researches by Burnette et al. (2020) in the United States among computer science university students, Mcpartlan et al. (2020) in America among college students, and Donohoe et al. (2021) in Scotland among secondary school students aged 13 to 18 found no considerable differences between the mindsets of males and females. The previous findings indicate contradictions as whether differences in mindsets exist across gender. Nevertheless, the majority of these findings are in Western contexts, therefore their applicability is constrained. They are also dispersed throughout various age groups, educational levels, from elementary school to university, and across different subjects. Additionally, the studies used experimental design, quantitative research, and mindset intervention. In Uganda, the current study used a mixed-methods approach to examine lower secondary students' mindsets towards Mathematics.

In addition to gender, literature provides multiple reasons for variations in Mathematics mindsets. Bedford (2017) discusses the factors that influence students' mindsets towards Mathematics, such as their previous beliefs, family experiences, study environment, and peer influence, while Farrington et al. (2012) focuses on students' academic achievement. Gouedard (2021) examined the family's socio-economic status, while Donohoe et al. (2021) focused on age and ability groups, and Dweck (2017) looked at teachers, coaches, parents, and other important figures.

Results regarding the factors aforementioned vary. In research on the contagiousness of mindsets among 2^{nd}-4^{th} year students in the Philippines, King (2020) found that peers affect each other's mindsets, indicating that mindsets can spread socially and can be obtained from various sources of influence. Nevertheless, the research conducted by Haimovitz and Dweck (2016) in San Francisco involving 4th and 5th graders did not discover a direct connection between parents' intelligence mindsets and their children's mindsets. However, they did observe a direct link between parents' views on failure and their children's mindsets. The researchers found that parents who believe failure is limiting tend to emphasize their children's performance and innate ability over their learning, leading their children to see intelligence as rigid instead of flexible. Although Gouedard (2021) results from PISA showed that teachers influenced students' mindsets through their practices, such as their messages to students informing them that all students can learn Mathematics and providing feedback about failure and performance, Park et al. (2016) found no direct correlation between the mindsets of teachers and students in first and second grade. These findings indicate that students' mindsets can be influenced by significant others in society. Since these studies were carried out outside Uganda and at different educational levels, it is not clear whether similar findings are true for lower secondary students in Uganda which motivated this study.

Regarding social economic status, Snipes and Loan (2017), as well as Gouedard (2021), found that there were varying mindsets based on social economic status, with students from a privileged background more likely to have a growth mindset, while those from disadvantaged backgrounds often demonstrate a fixed mindset. Research was carried out in the areas of science, Mathematics, and English respectively. On the other hand, Mcpartlan et al. (2020) discovered no notable variations among students regarding their socioeconomic status. Donohoe et al. (2021) found no notable variations in mindset with age. In terms of ability levels, Claro and Loeb (2019) found that students with better grades showed a higher mindset (growth mindset) compared to lower achievers.

Considering religion, Luebke (2019) noted that sometimes students rely on their religions for strength when they feel they are falling into a fixed mindset. Their religions and faith helps them to belive that they have the ability to do anything. In a study about religiousty however, Luebke (2019) used mixed methods and quantitative results showed no notable variations in mindsets across religions. However, qualitative results showed there is a relationship between mindsets and religion. Students in their narratives revealed that their religions gave them support and encouragement whenever they felt like they are falling into a fixed mindset or struggling with their mindsets. Basing on the contradictory findings about mindsets, a growth mindset can be developed by all learners. It raises the question of whether students' environments provided them with enough resources to cultivate better mindsets when students of diverse demographics, such as gender, age, and socioeconomic level, exhibit a growth mindset less often. Literature demonstrates that there exist mindset disparities in other contexts and across many disciplines. Similar research regarding the various mathematical mindsets in Uganda is required. Research on students' mindsets in schools is necessary in light of the literature and findings in various fields.

2.2.3 Students' interest in Mathematics

Mathematics is a required subject in secondary schools for the pursuit of scientific disciplines at all academic levels (Duru & Okeke, 2021). This is due to the fact that logical reasoning and Mathematics form the foundation of science and technology (Yeh et al., 2019). Furthermore, the study of Mathematics greatly enhances every individual's daily life by assisting in the acquisition of knowledge and skills necessary for solving problems (Musbahu et al., 2021). Mathematical skills play a role in different aspects of life, such as shaping interactions in private, social, and civil domains and connecting to different sources of knowledge (Salifu & Bakari, 2022; Chand et al., 2021). This explains why most countries require Mathematics to be taught at both primary and secondary levels (Arhin & Yanney, 2020; Fosu et al., 2023). However, Mathematics is one of the least liked and despised subjects in secondary schools despite its importance and being compulsory at the lower secondary level (Repuya & Esterninos, 2022).

For students in school, Mathematics is commonly a challenging subject where they struggle to develop their conceptual mathematical comprehension (Asmira et al., 2021). Due to its abstract nature, Mathematics is often considered uninteresting by many students, leading to poor performance (Mazana et al., 2019). Some countries have implemented different approaches to tackle the problem of students' engagement and enthusiasm in Mathematics in order to address the issue effectively. In Uganda for example, the Ministry of Education and Sports (MoES) and Japan International Cooperation Agency (JICA) collaborated to launch the SESEMAT program in 2005, aimed at training teachers to enhance their professional Science and Mathematics skills for better quality lessons (Mbeya, 2020).

Nevertheless, a lack of interest for Mathematics persists as evident from the small number of students pursuing Mathematics at the A level. For example, just 11.7% of the 330,080 students who took the UCE Mathematics exam in 2019 continued with Mathematics at A level (UNEB, 2023). The issue is whether the ongoing challenges in Mathematics are connected to students' interest in the subject, despite the various attempts to enhance it. This is the reason why the research examined the levels of Mathematics interest among students, taking into account individual and situational interest as well as overall interest.

Globally, a significant amount of literature suggests that students do not have much interest in Mathematics. Teachers have been identified as a factor contributing to students' lack of interest in Mathematics. Additionally, students’ interest is an internal aspect that sometimes emerges due to a particular environmental context and teachers being environmental agents for the students’ development of Mathematics interest heavily depends on them (Kihwele & Mkomwa, 2022). Iwuanyanwu (2021) notes that for teachers to help students to develop Mathematics interest, there is need for both therapeutic and preventive measures. Curative measures are necessary because, for the majority of students, teachers must first destroy the bad Mathematics image painted for them before and during secondary school. It is preventive in the sense that teachers/educators must look for approaches to develop and maintain students' interest in Mathematics.

On the curative side, teachers must clear some of the myths and misconceptions that students have about Mathematics that have contributed to their lack of interest in the subject. For instance, literature shows that students see Mathematics as abstract (Kihwele & Mkomwa, 2022), difficult and hard (Asmira et al., 2021), complex and boring (Repuya & Esterninos, 2022), cold, and, in many cultures, predominantly masculine. (Peteros et al., 2019; Arhin & Yanney, 2020). Furthermore, there is a common belief that the complexity of Mathematics inherently creates a fear of the subject (Chand et al., 2021). Research shows different misconceptions about Mathematics. For example findings of a study in Ghana by Salifu & Bakari (2022) show misconceptions among students in form two and three about Mathematics. Students see it as abstract and boring (Mean=2.10, SD=1.33), very complex (Mean=3.07, SD=1.41), with no impact on their lives (Mean=1.65, SD=1.08), and only for talented students (Mean=1.90, SD=1.25).

All of the factors listed earlier played a role in the students' low interest in Mathematics. Further research showed that students had an unfavorable view of Mathematics, leading to a decrease in their interest in the subject. Jameel and Ali (2016) also found in their research in Pakistan that most students believed Mathematics was inherently challenging and were worried about how it might affect their interest. All of these factors contributed to the students' low interest in Mathematics. The research also demonstrated that students had a pessimistic view of Mathematics and their low interest in the subject stemmed from their misconceptions. The majority of students in Jameel and Ali's (2016) study in

Pakistan revealed that Mathematics was a naturally challenging subject and were concerned about its effect on interest in the subject.

In another study by Wong and Wong (2019) in Malaysia among form two students, it was found out that students had a positive interest towards Mathematics. The authors did observe, however, that while students had a tendency to enjoy Mathematics, they did not quite see the benefits of studying it thus perceiving Mathematics as unnecessary which indicates a situational interest. Additionally, authors blamed low individual interest on Mathematics' difficulty, which leads to frustration and powerlessness while dealing with it. In contrast to the findings of Wong and Wong (2019), Ryan et al. (2022) study in Ireland about students' interest in Mathematics after their first year in secondary found out that students, despite their poor performance in Mathematics, were willing to pursue it and eager to succeed in it. This points to individual interest in Mathematics where students have a well-built interest and are willing to continue with it despite the challenges around it. Authors suggested that teachers could help students develop their interests, particularly after the first year. With all the misconceptions around Mathematics in other contexts, this study deemed it viable to investigate students' interest in Uganda among lower secondary school students to establish whether they applied to the Ugandan context.

According to the literature, other students' factors contributing to low interest in Mathematics include Mathematics phobia, students' lack of reading habits, particularly for Mathematics textbooks, perception of success in Mathematics, Mathematics confidence, views about teacher attitude.(Anigbo, 2016;

Salifu & Bakari, 2022; Tembe et al., 2020) past experiences with Mathematics like failures or passing it (Ukobizaba et al., 2021), and inadequate practices (Kihwele & Mkomwa, 2022) anxiety (Atoyebi & Atoyebi, 2022) plus beliefs in ability (Gjoka, 2022). All of these factors heighten the lack of interest students had in Mathematics. Various research findings backed up some of those factors, including for example Low test scores had been shown to demotivate students and lead to low interest in Mathematics, according to VaraidzaiMakondo and Makondo (2020).

Social interactions with peers impact students' misconception about Mathematics and their interest in the subject. Lazarides & Ittel (2013) point out that identifying characteristics of socializers' beliefs and behaviours that are crucial for both girls' and boys' learning of Mathematics is one strategy to prevent the fall in interest in Mathematics and to close the gender gap. Teachers, parents, and peers are some of these socializers. Peers may have a significant impact on students' interests, both positively and negatively, and both intentionally and unintentionally. Girls' interest in Mathematics may be more affected by their friends than boys' interest is. This phenomenon is said to result from the difference between boys' friendships, which are usually competitive and centred on specific activities, and girls' friendships, which are more focused on support and discussion, as well as girls' higher levels of conformity compared to boys. This becomes increasingly apparent during adolescence, when children start turning to their peers for assistance instead of their parents (Eriksson, 2020). According to Eriksson's (2020) analysis of the literature on gender variations in Mathematics schooling interest across 50 countries, girls were more likely than boys to conform to peer pressure. However, Haimovitz and Dweck (2016) discovered that parents could affect their children's interest in Mathematics.

According to previous studies, Students' interest in Mathematics can be positively or negatively be impacted on by their teachers. Teachers motivate students to study Mathematics by using techniques including prizes, recognition, encouragement, and praise. Factors such as teachers' lack of new pedagogies and strategies (Kihwele & Mkomwa, 2022), feeling inadequate because of an impatient teacher (Montalbano, 2021), teachers' beliefs about students' ability, and instructional behaviour-transmission of teachers' beliefs to students' beliefs (Dicke et al., 2021) have been cited as responsible for students' interest in Mathematics. Previous results back up the aforementioned factors for instance, Ukobizaba et al. (2021) found that students may lose motivation and interest in Mathematics due to strict and negligent teachers. Jameel and Ali (2016) also found out that most Mathematics teachers did not make Mathematics learning interesting or applicable, leading to students having negative attitudes, low interest, and ultimately performing poorly in Mathematics. Dicke et al. (2021)in a longitudinal study found that teachers' cognitive support of students in California was connected to the growth of Mathematics interest and utility value in the classroom. Hence, the value teachers place on a subject influences students' perception of its usefulness and interest.

Additionally, studies conducted by Savelsbergh et al. (2016) and Mun and Hertzog (2018) indicated that the incorporation of creative teaching methods and strategies by teachers resulted in increased interest in Mathematics among students. Hence, teachers play a crucial role in shaping students' attitudes towards the subject, as well as their retention and comprehension of knowledge. Likewise, Gouedard (2021) discovered in the PISA study involving 78 nations that teachers played a crucial role in shaping students' interest in Mathematics. Studies in the literature show that students' interest in Mathematics is influenced by social factors like peers, parents, and teachers. Nonetheless, the question of applicability of the findings to Ugandan lower secondary school students justified the use of a mixed-methods approach in the study.

Regarding gender, most individuals hold the belief that men are more powerful and skilled than women in various areas, particularly in those related to science, such as Mathematics (Akinrotimi & Imoh, 2022). Women appear to be more affected by this idea compared to men. Oluyemo et al. (2020) observed that women displayed a lower level of interest in Mathematics compared to men. Generally literature points out that interest in most academic subjects rapidly declines among young people when they enter adolescence for both boys and girls (Schweder & Raufelder, 2021). Harackiewicz et al. (2016) notes specifically that students' academic interests decline, especially in middle school and high school STEM classes. Dweck (2006) notes specifically that females continue to score lower than males in terms of their interest in Mathematics as they mature. The literature is supported by research gaps on gender differences in Mathematics interest. According to a study by Marriott et al. (2019) conducted in the USA, males had more interest in Mathematics than females. Tembe et al. (2020) in a study about interest in relation to their achievement in the Subsaharan region found out that both males and females showed interest in Mathematics, but males’ interest was greater than women’s interest.

Another study by Oluyemo et al. (2020) in Nigeria revealed that 52% of males exhibited low level interest in Mathematics, while 14% and 34% had high and moderate interest, respectively. In contrast, only 11% and 18% of females showed high or moderate interest in Mathematics and 71% expressed low interest. Although both males and females expressed low levels of interest in Mathematics, females did so at a lower level. On the other hand, Yadav and Aggarwal (2016) observed no significant differences between males and females in their interest in Mathematics and Song et al. (2019) too in Korea did not find any significant variations in the mean interest levels of males and females. In terms of individual and situational interest, Hogheim and Reber (2017) found that while there were no gender differences in situational interest, boys exhibited higher individual interest than girls in a study regarding how to make Mathematics exciting among middle school students in Norway. Gender gaps in Mathematics interest seem to pose a threat to the future of Mathematics and STEM courses in general. Studies in other contexts that are contradicting worsen the issue thus a study in Uganda about students' interest in Mathematics including gender was worth carrying out.

Other researches on students' interests in Mathematics have revealed that factors including the school type attended, their age, and the location of the school—whether urban or rural—can affect their interest in the subject. For example, a study by Musbahu et al. (2021) among junior high school students in Nigeria found that whereas private schools performed better in Mathematics than public schools, students in the latter showed greater interest in the subject. The difference was linked to the public schools' better resources, such as their good teachers. Further Hogheim and Reber's (2017) research among 8^{th} –10^{th} grade students showed that there were variations in Mathematics interest depending on grade level. It was then concluded that students' interest in Mathematics tended to decrease as they progressed through school, implying that the older a student becomes, the less interested they are in Mathematics. On the other side, Yadav and Aggarwal (2017) did not find any significant differences in Mathematics interest with depending on whether the school was urban or rural, in a study among secondary school students in India.

A number of factors have been cited out in literature explaining differences and levels of interest in Mathematics and past findings present contradictions. Further studies have been carried out in other contexts other than Uganda and across different levels. That is why this study investigated students' interest levels and differences among lower secondary school students Mathematics being compulsory at this level in Uganda.

2.2.4 The extent of Self-Regulated Learning

Teachers, educators, and policymakers are highlighting the importance of student-centred learning globally. This is because it allows students to create new knowledge by using their existing knowledge while regulating their own learning (Mubuuke et al., 2017). Without a doubt, every student utilizes regulatory processes to a certain degree. In light of this background, the present research examined the level of Self-Regulated Learning in Mathematics. The way students learn is evolving, with an emphasis on students taking more responsibility for their own learning and demonstrating increased Self-Regulated Learning. The reason for this is the relationship between students' learning and Self-Regulated Learning (Van der Graaf, 2022).

Learners in different contexts and schools differ in the extent to which they regulate their learning. For instance, Llagoso (2017) discovered that 50% of respondents were highly self-regulated whereas 50% of respondents were poor on Self-Regulated Learning in a study on Self-Regulated Learning strategies in Mathematics among grade 10 students in Dumanjug, Cebu. The study concluded that the highly self-regulated learners were conscious of their own thinking and showed higher responsibility in their learning contrary to those that were low on Self-Regulated Learning that did not have a defined way of learning Mathematics. In contrast, Harding et al. (2019) found that lower secondary school students had lower levels of self-regulation than primary school pupils in a research carried out in Australia among students in grades 5-8. These findings showed that there existed different levels or extents of self-regulated behaviours among students. The current study attempted to establish the extent of Self-Regulated Learning in Mathematics among lower secondary school students.

Kwarikunda et al. (2022) state that self-regulated learners need to use various individual methods and skills, known as learning strategies, in order to enhance their learning. Students vary in their ability to control their own learning and therefore employ a range of strategies based on their individual characteristics and the difficulty of the task at hand (Kesuma et al., 2021). In example, students who are self-driven are more likely to employ beneficial learning strategies such as critical thinking, in contrast to unmotivated students who resort to less effective methods like rote learning and rehearsal (El-Adl & Alkharusi 2020). A research conducted by Llagoso (2017) revealed that proficient students in self-regulation tend to recognize and apply a broader range of self-regulated learning strategies in

Mathematics compared to students with low self-regulated learners. The study findings further showed that most students with high levels of self-regulation utilized environmental organization (time and study environment), along with self-assessment, goal-setting, and planning (Meta-cognitive self-regulation), while they seldom sought assistance from their peers. Conversely, students low on Self-regulated Learning utilized fewer self-assessment, goal-setting, and planning strategies (metacognition) and relied more on environmental restructuring and seeking help from peers. This research utilized an academic Self-Regulated Learning scale created by Magno (2010).

In another study by Alotaibi (2017) in Saudi Arabia among college students using the SRL instrument developed by Purdie et al. (1996), it was found out that students used more rehearsal and memorization (cognitive strategies) followed by seeking social assistance- resource management and the least used strategies were goal setting and planning as well as keeping records and monitoring-Metacognitive self-regulation. The study took both English and Mathematics into consideration. Another study by Ansari et al. (2021) among grade 10 students in Indonesia about students' Self-Regulated Learning strategies and Self-Regulated Learning in solving mathematical higher-order thinking strategies found that learners used orientation (lower level strategies) more frequently, and organization and elaboration was minimally used. Additionally, a study conducted by Kwarikunda et al. (2022) among Ugandan lower secondary school students in Physics found that these students reported using rehearsal, elaboration, and metacognitive self-regulation learning strategies the most while using critical thinking strategies the least. The study showed that there were various levels of learners, including surface level learners who used more rehearsal than critical thinking and meta-cognition, struggling strategy users who used all cognitive strategies but at a level below simple average, competent strategy users who performed well on all cognitive strategies, and deep level strategy users who reported using more critical thinking and metacognition than rehearsal and elaboration.

The findings of the previous studies show that different learners employ various learning strategies, and some students are capable of using a variety of self-regulated strategies in the same subject. In Chile, across different levels of learning, Kizilcec et al. (2016) discovered that students employed more self-evaluation and elaboration, followed by strategic planning, task strategies, and goal setting; help seeking was the least used strategies. However, these studies into Self-Regulated Learning were conducted outside of Uganda and used different measures to study SRL. Due to differences in the measures of Self-Regulated Learning used, there are different results on which strategies are more or least used. The MSLQ was used in the Ugandan study of physics, however resource management techniques were not included. Therefore, it was not clear whether the same results applied to Ugandan lower secondary students in Mathematics using the MSLQ which motivated the study.

Most literature on Self-Regulated Learning refers to student's states rather than genetic or personality characteristics that are outside their control. Thus, Self-Regulated Learning involves various factors within oneself and in interactions with others, both at an individual and contextual. Age, gender, prior knowledge and achievement are a few examples of the students' personal variables that can be taken into account (Sáez-Delgado et al., 2022). However, because they fell beyond the purview of the investigation, academic achievement and prior knowledge were not examined for differences in Self-Regulated Learning in this study. The aforementioned factors are examples of individual factors. Zimmerman (2002) notes that there exists differences in students' learning styles and students' backgrounds. Zimmerman went on to say that the ability to know about oneself and manage one's limitations while trying to learn is typical of self-regulated learners, especially in terms of their metacognition. Metacognition is being aware of and knowledgeable about one's own thinking for instance, a day student knowing that he/she has less time to revise and contact with teachers than boarding students and uses compensatory strategies.

Gender is one of the factors contributing to individual differences in Self-Regulated Learning and, specifically, studying Mathematics as shown in literature. There is a performance disparity in Mathematics between the sexes. For instance, gender differences in Mathematics performance have been reported in earlier UNEB reports from Uganda (UNEB, 2020, 2022, 2023). Therefore, it is crucial to look into how much Self-Regulated Learning varies by gender. The literature already in existence has frequently stated that Mathematics and science are purported to be male-dominated fields and that most scientists are men (Ampaire 2021). Students' ability to learn independently or their usage of various Self-Regulated Learning strategies may be impacted by this.

According to a study by Kwarikunda et al. (2022), among the cognitive strategies used in Physics, male students utilized more rehearsal and critical thinking while females used more organization and elaboration. The authors came to the conclusion that in order to close the gender gap, teachers needed to give students clear, precise and direct instructions on how to apply cognitive strategies when learning, with a focus on deep-level learning techniques for girls in particular. This can be applicable to learning Mathematics as well as other strategies like metacognitive and resource management strategies. In another study in Chile by Kizilcec et al. (2016), it was found that even though females showed greater goal-setting, task-planning, and help-seeking tendencies, they exhibited lower levels of strategic planning, elaboration, and self-evaluation.

Similarly, Gafoor and Kurukkan (2016) conducted a literature analysis and found that while female students utilized more help-seeking than male students, they also frequently employed more self-regulation strategies. Another study by Mutua and Oyoo (2020) revealed that overall, girls outperformed boys in the use of learning strategies, but boys were in the higher-level category and more girls in the average category. Additionally, there were significant differences in the usage of several strategies, with females using more rehearsal and organization. Similar findings were done by Filho and Nova (2020) and Sáez-Delgado (2022), who discovered that women had a greater SRL level than men. Contrarily, a study by Masud and Islam (2022) among 11th grade students in Pakistan revealed that there were no significant differences between boys and girls in their use of Self-Regulated Learning strategies, suggesting that male and female students used the SRL strategies almost equally.

Age or grade level disparities in Self-Regulated Learning are another distinction. According to a review of the literature by Muijs and Bokhove (2020), there isn't any strong evidence that age-related or school-phase differences in Self-Regulated Learning exist. The same review, however, indicated that secondary school students, who were more mature than primary school children, benefited more from collaborative strategies. This is corroborated by Llagoso (2017), who noticed that students spent more time connecting with peers and classmates during high school, which led to the development of sharing skills. Additionally, it was noted that adolescents tended to turn to their peers rather than their parents as sources of study techniques. Contrary to Muijs and Bokhove (2020), Harding et al. (2019) study found age related differences in Self-Regulated Learning. The researchers discovered that grade 8 students reported using SRL less frequently than grade 7 students, who also reported using SRL less frequently than students in grades 5 and 6. The authors raised an issue about how unusual it was for students to go down the continuum with regards to SRL as they moved through the educational system. In a similar vain, Gafoor and Kurukkan (2016) discovered in their analysis that utilization of self-regulation strategies decreases as grade levels increased. On the contrary, Kizilcec et al. (2016) discovered that older students consistently reported higher levels of SRL, with the exception of help seeking and Filho and Nova (2020), found out that age didn't significantly influence Self-Regulated Learning.

Besides personal student characteristics, factors in the surrounding environment like teachers' teaching strategies, assignments, social interactions, and school atmosphere also influence students' Self-Regulated Learning. Therefore, self-regulation is impacted by external factors as well as internal factors like cognitive abilities and motivation. Therefore, it is evident that self-regulation is a dynamic and participatory procedure that can be impacted by consistent guidance and practice across a range of situations in diverse environments (Sáez-Delgado et al., 2022). Regarding this study's focus on Self-Regulated Learning, school factors in the forms of day or boarding, urban or private, and private or government were examined. According to the literature, there are variances in SRL depending on whether a student is a day student or a boarding student. For instance, Farooq and Asim (2020) note that the home environment has a significant impact on SRL due to parents' encouragement of their children's development of self-regulated behaviour. However, boarding students are used to living autonomously and must abide by a variety of restrictions, which may or may not have an impact on their SRL behaviours (Kesuma et al., 2021).

A study by Susilowati et al. (2020) in Indonesia among university students revealed that all students had an average degree of Self-Regulated Learning that fell into the moderate category. Furthermore, it was discovered that students who lived at home, students who attended Islamic boarding schools, and students who attended public boarding schools did not significantly differ in their capacity for Self-Regulated Learning. The average Self-Regulated Learning, however, was found to be 151.25 for students living in their own homes, 150.83 for students living in boarding schools and 135.33 for students residing in public boarding houses. The descriptive data indicated that day students were more self-controlled than boarding students, despite the fact that there were no significant differences in the t-test results.

Contrary to the literature, a study by Ogechukwu and Chika (2018) in Nigeria stated that day students were less likely to study than boarding students because they were not under the teachers' control at home and were more likely to be distracted by chores. Some parents also fail to foster a reading culture in their children and don't give them time to relax after school. In support of Ogechukwu and Chika (2018), a study by Chinamasa (2014) revealed that day students typically socialized on their own (and faced discrimination from boarding students), which hindered their ability to learn alongside boarding students on a peer-to-peer basis. The study also found that day students faced stiff academic competition and a perceived lack of teacher support, both of which had a negative impact on their aspirations, motivations and learning. Day students were also excluded from some activities that were organized, particularly when day students were not at school.

In terms of public and private schools, Maamin et al. (2021) revealed that private school students scored higher on deep strategy use than public schools but there were no significant differences in surface strategy use. Another study by Arefi and Ghobadi (2016) in Iran indicated that there were no significant differences in Self-Regulated Learning based on public versus private schools among high school students. Contrarily, Shehzadi et al. (2022) found out that there were significant differences in goal setting, environment structuring, help seeking, self-evaluation and self-regulation with private schools scoring higher than public schools. However, there were no significant differences in use of task strategies, time management and cognitive strategy use in public schools. In terms of school location, a study by Masud and Islam (2022) in Pakistan revealed that there was no significant difference between respondents from urban and rural localities in the use of academic Self-Regulated Learning strategies, suggesting that respondents from both urban and rural localities used SRL strategies in nearly similar ways.

The results from literature and previous findings indicated that there existed contradicting findings in extent of SRL as regards to personal and environmental factors. Further research was done in other contexts other than Uganda, using different measures of SRL. Whether the findings applied to Ugandan lower secondary school students in Mathematics was a matter of investigation and hence the reason for this study.

2.2.5 The perceived use of teaching strategies

In lower secondary education, Mathematics is compulsory. Nevertheless, it is also seen as abstract and associated with underperformance, leading to reduced interest, stress, and a general aversion of the subject (Kihwele & Mkomwa, 2022). The manner in which Mathematics is taught by teachers is noted as a key factor among the many problems related to it (Jameel & Ali, 2016). According to literature, varied teaching methods, tactics, approaches and strategies might affect students' mathematical outcomes. (Ukobizaba et al., 2021; Yeh et al., 2019) There are many different types of teaching strategies, but the two most frequent types are learner-centred strategies and teacher-centred strategies. A teacher's impact on Mathematics learning can be significant. Many individuals often attribute their Mathematics-related struggles to a particular Mathematics teacher they had during their education. It provides additional proof of the impact Mathematics teachers can have on students' Mathematics education, both positive and negative. Students love a teacher who can alleviate stress and make the learning process enjoyable and exciting (Okafor & Anaduaka, 2013). Educators who have a strong passion for their subject are more inclined to gain a thorough comprehension of the content, which allows students greater opportunities to find significance in their studies (Dicke et al., 2021).

For instance, a study conducted in Pakistan by Jameel and Ali (2016), revealed that most Mathematics teachers failed to create interesting and practical relevancies about the subject, causing students to have negative views towards the subject and perform poorly in Mathematics. In a study in Rwanda by Ukobizaba et al. (2021), research was done on teaching practices and student attitudes towards Mathematics. Findings indicated that 50% of students believed that strict and inattentive teachers could discourage them from learning Mathematics, and students preferred teachers who were attentive, friendly, and empathetic towards their needs and interests.

In order to learn Mathematics, policymakers from all over the world are urging schools and the teachers to employ effective, research-based teaching strategies (Killen & O'Toole 2023). In Uganda, the lower secondary school curriculum is competency-based and mandates the use of learner-centred instructional strategies that encourage active learning, cooperative learning, and problem-based learning in order to help students to develop the skills necessary to succeed in the twenty-first century. It was therefore necessary to investigate which strategies were employed in schools while teaching Mathematics at the Lower secondary school level.

Various methods of teaching Mathematics are suggested in the literature under various teaching strategies. Cardino Jr. and Cruz (2020) specifically recommend cooperative learning, deductive approach, inductive approach, demonstrative approach, repetitive exercises, and integrative approach, lecture type. While Costa (2014), considers lecture method under the teacher-centred strategies, demonstration, problem solving, project method, inquiry approach, cooperative learning, use of audio-visual media under the student-centred strategies, and student-teacher interactive strategies that integrate both teacher-centred and learner-centred strategies.

According to a review by Halawa et al. (2020), the top five learner-centred teaching methods were experimenting, discussing, explaining and a combination of experimenting and explaining. Teacher-centred methods were primarily questioning, setting norms, and guiding. In the student-teacher interactive method, teachers' roles were as a facilitator or coach to support students' inquiry rather than as a source of information. In a similar vain, Thomson and Hillman's (2019) findings from the TALIS 2018 results showed that Mathematics and science teachers more commonly utilized teacher-directed instruction (teacher-centred strategies) to provide a well-structured lesson on a topic than other forms of instructional practices. The findings hypothesised that the employment of teacher-centred strategies was because they were often less time-consuming and simpler to apply, and a growing expectations on teachers to teach a longer curriculum in more diverse classrooms. TALIS 2018 results also revealed that Australian teachers utilized more methods that called on pupils to analyse, integrate, and apply their knowledge in the context of thinking critically, problem-solving and dealing with complex issues.

On the other hand, a systematic review by Atoyebi and Atoyebi (2022) looked at the impact of Mathematics teaching methods on Mathematics anxiety. The review notes that strategies including inquiry-based learning, problem-based teaching, direct teaching, single instructional strategy, systematic and structured approach, creative and discovery approach, inclusive instructional strategies, and student-centred learning methods are used while teaching Mathematics. The study found a link between students' concern about Mathematics and the methods used to teach it. In another systematic review by Savelsbergh et al. (2016) about the effects of innovative science and Mathematics teaching on students' achievement, it was found out that inquiry-based, context-based, computer-based, collaborative learning strategies and extracurricular activities were better strategies for teaching Mathematics and science.

There are numerous strategies and methods available for teaching Mathematics and according to Gouedard (2021), teachers should be creative and adapt their instruction to the needs and nature of their students when teaching science subjects. In Uganda, SESEMAT was introduced primarily to retrain teachers on better methods of teaching Mathematics in a friendly and inviting manner. This was done to improve the teaching of STEM disciplines. However, there were still complaints about Mathematics learning and performance, and it was unclear whether any of the challenges were related to the way the subject was taught. Because of this, the study looked into how lower secondary school students perceived the usage of teaching strategies in Mathematics.

In a qualitative study by Warner and Kaur (2017), they investigated how instructors in the Caribbean used the 2T2C (Thinking, Technology, Communication, and Confidence) model with form four pupils. It was discovered that before receiving training in the 2T2C model, teachers were instructing Mathematics using the lecture method, without first allowing the students to comprehend the subject conceptually. Teaching pupils how to pass tests was the justification given for utilizing the lecture method. Instead of comprehending Mathematics conceptually, students were used to learning to pass tests. Even when teachers strived to be creative, students still expected them to do the Mathematics calculation for them and show them the types of questions that might be on the exams. In another qualitative study, Mavumba and Mtitu (2022) in Tanzania used observation and discovered that when teaching Mathematics to secondary school students, teachers frequently used the lecture method followed by group discussions, question and answer sessions, discovery learning, think-pair-share and inquiry-based learning. The researchers came to the conclusion that while teachers incorporated both learner-centred and teacher-centred strategies while teaching Mathematics, they lacked the competency to integrate them. However, both teachers and students perceived use of learner-centred strategies equally.

In the same vain, Halawa, et al. (2020) in a review of teaching strategies from 2008 to 2017 found out that student-centred strategies were the most often employed strategies. The review also revealed that learner-centred strategies were consistently integrated with teacher-centred strategies, leading teachers to consistently employ both strategies simultaneously. Another study by Sibomana et al. (2022) among S3 students in Burundi revealed that teachers primarily used the lecture method/teacher-centred teaching strategy—rated at 78.4%—where they talked and wrote on the chalkboard while students were listening mainly to prepare them for exams. This was discovered through the observational method. However, when the researchers used the survey questionnaire, teachers claimed to use question-and-answer sessions, which were rated at 90%, and cooperative teaching strategies, which were rated at 81.7%, even though these methods were not really used during teaching. The authors came to the conclusion that the disparities in the results originated from the limitations of employing surveys, where respondents might easily rate themselves highly in contrast to what they really were. That is why to evaluate the perceived usage of teaching strategies with both teachers and students as respondents, the current study used mixed methods.

In addition to classroom teacher practices, the school environment has a significant impact on students' learning. The literature on the subject of whether public or private schools are superior to one another gives a variety of results. For instance, Musbahu (2022) remarked that public schools were preferable since their teachers were well paid and constantly present, as opposed to the majority of private schools, which lacked well-paid teachers and might not always have teachers on hand when needed. In the same vain, Suprayogi et al. (2022) in Indonesia reported that due to an imbalance in learning resources and operational funds, public schools performed better than private schools.

On the other hand, Shah et al. (2022) observed that private schools might be superior to public schools because most students in private schools come from better families and pay tuition/fees that enable the school to function effectively as opposed to public schools, which rely solely on government funding. These factors allegedly had an effect on how teachers instructed their students. The discrepancies in literature needed to be investigated which this study aimed at. For instance, a study conducted in Pakistan by Shah et al. (2022) among secondary school students found there were significant differences in the use of different teaching strategies among private and public school teachers. Further, the study revealed that private teachers utilized demonstration more frequently than public teachers, while public teachers used brainstorming, small-group discussions, and individual study more frequently than private teachers. The study, however, focused on English language teaching.

Another study by Suprayogi et al. (2022) in Indonesia showed that there were considerable disparities in how teachers applied differentiated instruction in primary schools, with public schools having a higher mean than private schools and the rate of differentiated instruction was below average. The study was conducted in the teaching of all subjects and so, this research sought to see whether the results might be applied to Mathematics teaching. In addition, the results were from various levels and disciplines and therefore, this study sought to ascertain whether these results could be applied to Mathematics instruction among lower secondary school students using a mixed methods approach was a question the research aimed at answering.

When addressing the perceived use of teaching strategies, the location of the school should also be taken into account. According to Echazarra and Radinger (2019), the location of a school can interact with other factors such as socioeconomic status, ethnicity and gender to cause change in students' educational experiences. Literature shows that both urban and rural schools have a variety of challenges, some of which may have an impact on how teachers instruct. Most literature is biased to the disadvantages posed by a school being located in rural areas than in urban areas. For instance, Du Plessis and Mestry (2019) noted that rural schools lacked material provisions such as physical space, electricity, running water, proper toilet facilities, textbooks, and it appeared that curriculum issues were almost overshadowed by the more pressing need for resources for effective learning and teaching. The authors also noted that teachers and parents in rural areas had low expectations of what their children could learn, and many teachers concentrated on planning and completing lessons as quickly as possible (pointing to the lecture method), which did not produce quality teaching. As a result, the quality of teaching in rural areas might be lower than in urban areas. This was ascribed to rural schools receiving less pedagogical supervision and support than urban schools.

Echazarra and Radinger (2019) from the OECD, on the other hand, observed that rural schools had an advantage over urban schools due to their lower enrolment and student-teacher ratio. Because they had fewer students, according to teachers from various OECD nations, it was simpler to employ a variety of teaching strategies. This was corroborated with students' reports showing that science teachers in rural schools, where class sizes were smaller, were more likely to tailor their teaching to students' needs and knowledge. The authors pointed out that, on average, in OECD nations, teachers in rural schools were more encouraging than those in urban ones. However, the authors also found out that there were no significant differences in teaching between rural and urban schools in some OECD nations.

The aforementioned results contradicted Mostafa's (2018) OECD findings, which indicated that students in disadvantaged and rural schools reported that teachers utilized more inquiry-based teaching whereas students in privileged and urban schools reported more teacher-directed instruction (teacher-centred strategies). The researcher concluded that certain teaching strategies may be more appropriate for specific situations. Further it was noted that students in disadvantaged schools were more prone to underperforming and required additional assistance and guidance from teachers. Additionally, the researcher noticed that teaching strategies requiring frequent exchanges between students and teachers were more feasible in smaller class sizes, allowing for better management of these discussions. On the other hand, teacher-led instruction can be utilized in various settings without being influenced by the number of students in the class.

School location, type or the nature of teachers should not be the issue in the teaching and learning of Mathematics but the major concern of teachers and educators should be tailoring the teaching to the needs of students while at the same time training them to be autonomous 21st century learners. A number of issues were reported about STEM subjects in Uganda and the question was whether these issues were related to how teachers taught Mathematics. In order to minimize relying on self-report data from the teachers, the study used students to report about how they perceived their teachers' teaching strategies in Mathematics but also using teachers as key informants.

2.2.6 The mediating effect of interest in the relationship between mindset and Self-Regulated Learning

The third variable effect that explains how and why two variables relate is mediation. A mediation analysis implies a causal process that connects two variables and a mediation model looks at the impact of an intervening or mediator variable said to transfer the effect of an independent variable to a dependent or outcome variable (Fairchild & McDaniel, 2017). Interest plays a major role in education. Schweder and Raufelder (2021) posit that when students learn with interest, they work hard to acquire new knowledge and use beneficial learning strategies to understand more and solve problems. Further they contend that interest is important in learning because it supports use of elaborative learning strategies. When learners use better strategies and eventually succeed, they eventually believe in their abilities. Interest is thus important in education as it explains why different variables are affected by others.

Research on the mediating function of interest in the relationship between mindset and Self-Regulated Learning is uncommon, yet interest has been found to mediate various other factors. Masrom, et al. (2021) conducted research on how readiness, interest, and confidence mediate students' satisfaction with the DLP program in Malaysia. They discovered that interest played a mediating role between readiness and student satisfaction. In a study focusing on entrepreneurship instead of education, Hendrawijaya (2018) looked at how interest mediated the connection between demographic factors and the choice to become an entrepreneur. The study revealed that interest played a mediating role in the effect of age, education, gender, experience, and family size on the decision to be an entrepreneur. There seems to be unavailability of research on how interest mediates the relationship between mindset and Self-Regulated Learning, and existing literature on this topic is based on the causal paths a, b, and c. The mediating model discusses the relationships between mindset and interest, interest and Self-Regulated Learning, and mindset and Self-Regulated Learning.

2.2.6.1 Mindset and interest. One's psychology and way of life can be affected by a simple belief known as a mindset (Dweck, 2017). People's mindsets are how they view their own abilities and potential. Beliefs in one’s ability is linked to a variety of beliefs that are believed to aid students in learning more efficiently. According to literature, Mathematics contains whole new skills, concepts, or conceptual systems that may cause difficulties while learning, in contrast to other verbal subjects. This uncertainty leads students to doubt if their Mathematics ability are innate gifts or talents, or something that can be improved which affects their interest and engagement with the subject, (Dweck, 2007).Upon this background, the current study set out to investigate the connection between mindset and interest in Mathematics in a mediated model. Students who have a fixed mindset and think of intelligence as a gift begin to doubt their intelligence and get demotivated and uninterested when they experience setbacks. In contrast, those who adopt a growth mindset and regard intelligence as a quality that can be cultivated are more likely to seek out effective solutions to challenges (Dweck & Yeager, 2019).

Educational institutions put a lot of effort into promotion of students' interest in learning, especially in academic fields like Science, Technology, Engineering, and Mathematics (STEM), where many secondary students have low levels of interest (Xu et al., 2021). According to Dweck (2017), adopting a growth mindset can cause a person to modify their views about themselves practically all aspects of their life, including interests in all spheres of life. This is due to the fact that a fixed mindset forces a person to avoid trying new things or working harder because, if failure occurs, it denotes lack of intelligence, which is what those with fixed mindsets fear most. They always seek to prove their abilities.

Mindset can also refer to a view that a trait is innate or malleable. People with fixed mindsets feel that certain capacities, like Mathematics ability, are inherent traits or abilities, whereas people with growth mindsets think that these abilities can be developed through learning (Denker et al., 2022). Students that have a growth mindset are more likely to be enthusiastic about their academic work and have higher levels of enjoyement and interest in classroom activities unlike those with a fixed mindset (Schmidt et al, 2017). The aforementioned may result in the development of situational interest and, over time, a more deeper and enduring interest (Hidi & Renninger 2006). According to a quasi-experimental study by Schmidt et al. (2017), 9th grade students who received the mindset intervention demonstrated significantly different trajectories of control, skill, learning and interest as compared to those who did not receive the intervention. The study was conducted in science classrooms at two middle schools and one comprehensive school in the Midwestern Metropolitan area. Even though the intervention had no impact on 7th graders, partly the results highlighted the benefits of endorsing a growth mindset and how it fostered the development of interest.

O'keefe et al. (2018a) introduced implicit theories of interest. According to these theories, interests and passions can either be developed or have an innate, relatively stable nature. That is, whether a spark of interest can be developed through investment and persistence—a growth mindset of interest—or if interests are already present and just waiting to be discovered - fixed mindset of interest. This explains why some people are more likely than others to switch disciplines, such as the humanities to sciences. The reasoning by O'keefe et al. is that if interests are thought of as fixed and an interest is discovered, then exploring elsewhere may not seem worthwhile. However, if interests can be developed, then having an interest in one area may not preclude the development of an interest in another (O'keefe et al., 2018b). For example, students who are just interested in the arts, may not pay close attention or engage deeply in their Mathematics or science classes (O'keefe et al., 2021).

O'keefe et al. (2018a) conducted a study with Mechanical Turk workers between the ages of 18 and 30 to test the interest theory. Participants were asked to read two articles and provide a report on them. The study showed that less interest in the topic outside of individuals' preexisting interest was connected with a stronger fixed theory. People who subscribed to the growth interest theory reported more interest in topics outside their areas of interest and were open to various fields. Consequently, a growth mindset may increase people's interests in various fields, which may be beneficial for forming connections across fields. That is why this study sought to investigate whether mindsets were connected to interests in the mediation model.

Throughout primary school, students come across a variety of mathematical tasks with varied degrees of success and failure, which shapes their beliefs about themselves and Mathematics and has an impact on how well they do in post-primary Mathematics (Rothrock, 2019). Students who believe in their Mathematics ability or capacity to solve mathematical problems even when they struggle to discover solutions, are more driven to study and engage in mathematical tasks than those who do not believe in their ability. When students participate in engaging Mathematics lesson activities, their interest, knowledge, and skills eventually grow (Gjoka, 2022).

According to the literature, mindset interventions may help students who are at risk academically, such as those who are at risk of gender, racial or poverty stereotypes (Donohoe et al., 2021). However, mindsets can cause people to give group labels more significance and, as a result, to embrace them more quickly and cling to them more strongly. Mindsets can lead people to create group labels with greater meaning and hold on to them firmly (Dowdy, 2019). Further literature shows that having a fixed mindset is linked to paying more attention to information that supports and confirms preexisting stereotypes (Dweck & Yeager, 2019). Mathematics has been stereotyped to be masculine and for the highly brilliant which affects women's interest in it. The stereotype works more on females who are surrounded by stereotyped messages about women.

As a result, these children may feel threatened by stereotypes and worry that they are confirming a derogatory view of their group (O'keefe et al., 2021).

A study by VaraidzaiMakondo & Makondo (2020) on the factors contributing to poor Mathematics performance in Zimbabwe revealed that many students feel that Mathematics is for the exceptionally bright, which is why they show little interest in it and perform poorly. The study also showed that the society from which these students were from had a strong contribution to that way of thinking. Therefore, for improved Mathematics results, society needed to reform the deep rooted social construct. Mindset change increases motivation and interest in learning while decreasing stereotype threat and anxiety (Seo & Lee, 2021). Furthermore, a study by Plante et al. (2018) among French-speaking 6^{th} and 8^{th} graders in Canada about how stereotype support for abilities predicts differences in academic interests revealed that support for stereotypes favouring students' own gender in Mathematics predicted males to be more interested in Mathematics than language arts and females to be the opposite. They came to the conclusion that these findings might indicate that men's stronger interest in Mathematics may not be so much due to their perception of their superior Mathematics ability compared to women as it may be due to their perception of being more competent in Mathematics than Language arts. Previous findings indicate that mindsets can be endorsed by society due to stereotyped messages. Although the current study wasn't interested in stereotyping behaviour, it was important to investigate how the mindsets endorsed predicted interest in Mathematics.

In relation to situational interest, Xu et al. (2021) also proposed a mindset intervention as critical to enhancing situational interest. Development of situational interest is key in building an enduring interest also known as individual interest because situational interest occurring for a long time can result into individual interest (Renninger & Hidi, 2020). An experimental study by Xu et al. (2021) among high school students in Physics revealed that a growth mindset induction had a positive effect on maintained situational interest. Similarly Denker et al. (2022) in a study at a medium-sized public university in Midwestern US found that adopting a communication growth mindset positively predicted students' situational (emotional) and individual (cognitive) interest, participation and rapport in the public speaking classroom. The authors came to the conclusion that students would be more interested in learning if they believed that they could enhance their communication skills. In another experimental study by Dagmar (2022) on impact of developing a growth mindset among 7th and 8th grade primary schools in the Netherlands, it was found out that students who received mindset intervention performed better on the situational interest than children in the control group. Situational interest if sustained can lead to development of a well-built individual interest. Although these studies were not in lower secondary school and in Mathematics, they revealed that mindset played a role in developing students' interest and that's why this study investigated mindset and interest among lower secondary school students.

2.2.6.2 Interest and self-regulated learning. Interest has an affective and a cognitive component, with individual interest being more cognitive and situational interest being more affective aspect of individual interest (Bedford 2017). On the other hand, self-regulated learning refers to the capacity to actively participate in one's own learning behaviourally, motivationally, emotionally, cognitively, and meta-cognitively in order to be able to work efficiently, solve problems, persevere, regulate one's own effort, set one's own goals, and determine one's own method of achieving them (Muwonge et al., 2017).

At the heart of Self-regulated learning is the students' ability to employ a variety of learning strategies in different learning contexts (Ahmed, 2017; Dent & Koenka, 2016). This notion was further confirmed by Udemgbo and Onyinyechi (2019), who stated that using learning strategies to improve learning was a typical characteristic of self-regulated learners. Self-regulated learners in particular are aware of their academic strengths and weaknesses and have a variety of tactics they can use to effectively address the daily challenges of academic tasks (Zimmerman, 2002). Self-regulation in school learning involves being proactive and using a variety of SRL strategies. Strategies fall under the area of procedural knowledge, which means that a student should know how to study and learn (Merett, 2020). Chechi and Bhalla (2017) noted that poor performance in Mathematics is mainly affected by less interest in it and students' inability to regulate their learning. The current study, through a mediational relationship, sought to investigate whether interest in Mathematics was related to Students' SRL.

Abdullahi and Umeano (2020) note that when performing an activity or task, interest adds enjoyment and satisfaction and eases the burden on the brain's limited cognitive resources. However, if students have less value, interest, and enjoyment for a domain or subject, they are more likely to employ shallow strategies like memorization than using meta-cognitive self-regulatory strategies. Students who value tasks or domains, such as Mathematics, out of enjoyment may become more engaged in self-regulation (Ahmed, 2017). Furthermore, Rothrock (2019) points out that students who lack interest in Mathematics tend to restrict their self-regulation to relying on memorization as a strategy, as they perceive it to be less time-consuming and effortful compared to other self-regulated learning strategies linked to success. Dan and Todd's (2014) research in China with seventh-grade students revealed that higher historical interest corresponded to greater utilization of deep-learning strategies, including meaningful learning and extensive reading. Greater historical interest was linked to reduced surface-learning strategies.

According to Hidi and Renninger (2020), interest is a phenomenon that arises from an individual's involvement with a particular object, event, or activity and acts as a motivator and an explanation for particular tasks or activities. It encourages students to take initiative and develop self-regulation skills by using a variety of strategies that teach them how to do, how to study, and, in general, how to learn (Merett et al., 2020). According to a meta-analysis by Dent and Koenka (2016), there is a link between interest and self-regulated learning. Additionally, a study by Ahmed (2017) found a link between interest and self-regulated learning, and indicated that students may not use self-regulated learning if they are not interested in the subject. In the same line, a study by Fomina and Morosanova (2017) found out that self-regulation mediates the link between interest and final academic achievement. According to the findings, learning outcomes are higher when a subject's interest is backed by a high level of academic self-regulation. Furthermore, the researchers suggested that interest was an independent predictor of self-regulated learning rather than a factor in it. Therefore, this study saw it necessary to investigate whether interest was related to SRL in Mathematics among lower secondary school students in the mediated model.

Students with greater interest are anticipated to be more motivated to devote their time and mental energy to SRL activities, which are frequently time- and effort-consuming (Teng, 2024). A study by Ahmed (2017) on motivation and self-regulated learning in the USA, showed that intrinsic value (interest) was a better predictor of memorization, elaboration and control SRL strategies. The findings suggest that if students are not interested in their work, they may not engage in self-regulation. Similary, a study conducted in primary schools in Hong Kong by Zhu and Mok (2018) found that students who showed a greater interest in Mathematics were more willing to engage in self-regulated learning. The authors suggested that improving students' interest in Mathematics might be a successful strategy for facilitating individuals' self-regulated learning processes.

Interest has been documented to be a motivational factor that propels students towards successful learning and situational interest has been identified as one of the instruments for successful learning (Harefa, 2023). Situational interest is a psychological state that is experienced at a certain time and is characterized by enhanced attention, effort, and affection (Renninger & Hidi, 2011), can motivate people to engage in different tasks (Toli & Kallery, 2021) and engage in self-regulated behaviours (Harackiewicz et al., 2016). In their investigation into the impact of situational interest dimensions on students' self-regulated learning strategies in physical education (PE) among French students in the tenth grade, Roure et al. (2019) discovered that the key situational interest dimension of exploration intention is crucial for encouraging students to use self-regulated learning strategies in PE. According to the study, when students are exploring their environment's potential, they tend to pay attention to pertinent details within the task, think about and try to understand the material when looking for the best way to accomplish it, and mentally picture their performance when attempting a new skill—all of which are self-regulatory processes.

While conceptualizing situational interest, literature suggests two types of situational interest that is; triggered situational interest and maintained situational interest. According to Linnenbrink-Garcia et al. (2010), triggered situational interest is similar to situations because both processes involve arousing/initiating a person's interest. On the other hand, maintained situational interest, also known as hold, is a deeper kind of situational interest in which people start to develop a meaningful relationship with the material and comprehend its deeper relevance. The self-determination theory emphasizes situational interest as the only form of intrinsic motivation (Deci & Ryan, 2015), but when combined with other extrinsic motivators, situational interest may cause someone to engage in a behaviour they are not interested in. Over time, the person may integrate these extrinsic motivators, leading to self-determined regulation of the behaviour, which in turn may lead to increased interest in that particular behaviour (Darlington, 2017).

A student's interest in studying a particular academic subject, such as Mathematics, tends to be more of individual interest, driving them to examine the material more closely, expand their understanding of the subject, work to develop new mathematical skills, and strive for excellence (Fomina & Morosanova, 2017). Individual interest can also have a profoundly positive effect on a person's attention levels, memory of information, enabling the integration of prior knowledge, and effort in the pursuit of knowledge, as well as a positive impact on a variety of abilities like recognition, recall, persistence, effort, academic motivation, and the capacity for self-control (Renninger & Hidi, 2022). According to Renninger and Riley (2013), interest is linked to cognition and is a correct orientation for every act of mental assimilation such as focal attention, easy recognition, and recall of items and texts, An illustration of reading a text was provided, and the authors noted that reading more fascinating texts uses fewer cognitive resources than reading less interesting texts. According to Monem (2010), metacognition is also sparked by interest, and taking into account students' interests can help them develop metacognitive skills like strategic knowledge, knowledge of cognitive tasks, and self-knowledge. According to a study by Wang et al. (2021), interest helped students with low metacognitive abilities to become more engaged.

Students' interest is important in self-regulated learning as suggested by literature and previous studies. However, studies were not done in Uganda and specifically not in Mathematics at lower secondary school level. Therefore, whether results apply to the Ugandan context was a question to be answered by the current research in a mediated model.

2.2.6.3 Mindset and self-regulated learning. According to Bai and Wang (2023), better mindsets can help students apply metacognitive, motivational, and behavioral strategies effectively during the different stages of learning - forethought, performance, and reflection - leading to more successful learning outcomes. Students often choose to use self-regulated learning strategies to assist with their planning and learning procedures (Rothrock, 2019). This research focused on examining students' beliefs in the form of mindsets and their self-regulated actions at the lower secondary school level within a mediation framework.

Kachnowski (2019) suggests that students with a growth mindset are more likely to be involved in Self-Regulated Learning and choose better learning strategies compared to students with a fixed mindset. This is due to the fact that they are more inclined to think that skills can be developed with effort, which leads them to exert effort and employ effective strategies for improvement. In contrast, students who have a fixed mindset believe that ability is a fixed trait, failure indicates low aptitude, and practice and effort are futile (Dweck, 2017). They avoid undertaking tasks that they find difficult, exhibit more self-handicapping behaviours, and are more prone to give up, all of which are associated with poor performance (Yeager & Dweck, 2012). Multiple researches have provided support for this claim. In a study by Bai et al. (2021) in Hong Kong, a growth mindset for example was found to have a positive relationship with six self-regulated learning writing strategies in English writing among Primary school students aged 8 to 12, such as planning, text generation, self-monitoring, revising, acting on feedback, self-initiating, and collaborative learning. Similarly, Hassanzadeh et al. (2020) carried out research in Iranian schools focusing on the language mindsets and English performance of EFL students. They found that learners' mindsets had a positive impact on self-regulation, and concluded that having a growth mindset is more advantageous than a fixed mindset in second language acquisition as the latter does not recognize the learner as an active agent in their own learning process through the use of Self-Regulated Learning strategies. A study by Widyastuti & Djono (2022) showed that, students' mindsets influenced how they regulated their learning, which further demonstrated the necessity to improve self-regulation by first fostering a proper mindset.

Further, Lalhriatpuii (2018) in a study about the role of growth mindset, self-regulated learning and parental involvement in the academic adjustment of college students in Mizoram, found out that a fixed mindset and academic self-regulated learning had a significant negative relationship; meaning that a fixed mindset shifts towards growth mindset with an increase in Self-Regulated Learning. All of these findings demonstrate the significance of mindset, particularly the growth mindset, for students' self-regulated learning. However these studies were done at different levels of learning i.e. primary and college other than lower secondary level and in different countries not Uganda where students' characteristics and environment could have been different. This made it pertinent for the current study to establish the association between mindset and self-regulated learning strategies in Uganda in a mediation model.

One of the research directions is mindset intervention in education, and many benefits have been cited out, including improving the performance of underachievers and reducing the achievement gap between high and low achievers

(Snipes & Loan, 2017), having a strong predictive power for achievement gains even with controlled students' backgrounds, prior performance and other social and emotional skills (Claro and Loeb, 2019), and raising classroom motivation and self-regulation skills (Kachnowski, 2019).

Instilling a growth mindset in the classroom, according to Widyastuti & Djono (2022), is also important for improving students' resilience, motivation, problem-solving abilities, peer cooperation and learning-oriented attitudes that lead to successful achievement, including the use of learning strategies and general self-regulation abilities. Students who have a fixed mindset about Mathematics are less likely than students who have a growth mindset to feel that their mathematical skills may be increased by improving their learning process (Montalbano, 2021). As a result, it is suggested that altering people's mindsets to a growth mindset—in which qualities and talents are seen as flexible and capable of development rather than as stable and fixed—might be a potential strategy for changing people's views of effort and improving self-regulation (Mrazek et al., 2018). The current study was not aimed at carrying out a mindset intervention which is experimental in nature but to investigate both students' fixed and growth mindset effect on their self-regulated learning using mixed methods in Mathematics.

Students need to believe that they are capable of learning Mathematics in order to participate in self-regulated learning (Ahmed, 2017). According to literature, students with a mathematical growth mindset actively look for learning chances, are unbothered by mistakes, see themselves as Mathematics learners who analyse and comprehend mathematical concepts and relationships (Boaler, 2019). These learners do not have a particular mental aptitude, as stated by Zimmerman

(2002), but rather rely on a self-regulated approach to consolidate their mental abilities into academic skills, as mentioned by Rothrock (2019). These students often choose to use self-regulated learning strategies to help with their learning. Nonetheless, students who prioritize creating precise Mathematics work may overlook opportunities to enhance their mathematical thought process and are limited by their fixed mindset-driven desire to exhibit or showcase high performance (Hertel, 2024).

The fundamental psychological processes and ideas people use to understand their environment are what underlie the cognitive, emotional and behavioural elements of SRL. Whether students believe that such acts will be helpful will affect whether or not they adopt constructive self-regulating ideas and behaviours (Dweck & Yeager, 2019). For instance, one student might believe that they can develop their Mathematics abilities, but another might believe that their Mathematics ability is fixed and that there is little they can do to change it. The students are likely to apply various SRL strategies very differently because of their divergent underlying beliefs about mathematical competence and aptitude (Montalbano, 2021). According to literature, learners employ several cognitive strategies in various ways. For instance, Ahmed (2017) noted that students were more likely to report using memorization, elaboration and control strategies when they believed that they could master Mathematics. According to Kachnowski (2019), students who have a growth mindset and feel that intelligence is flexible will not be concerned with proving their intelligence, which increases the likelihood that they will use higher order strategies. Conversely, those who have a fixed mindset and feel that intellect is fixed will worry about demonstrating their intelligence and will utilize lower order strategies like rehearsal that don't involve much work. In the same vain, Jia et al. (2022) asserts that people with a fixed mindset tend to use shallower tactics like copying and memorization whereas people with a growth mindset tend to use deeper methods like paraphrasing and note making.

Research findings from numerous studies produced different results. For instance, a study by Hertel & Karlen (2021) among teacher education students in Germany found a positive correlation between the incremental theory (growth mindset) of self-regulation and habitual use of cognitive strategies of elaboration and structuring. Jia et al. (2022) also found a positive relationship between a growth creative mindset and divergent thinking and a negative relationship between a fixed mindset and divergent thinking. In contrast, Wilkins (2014) found out that there was no correlation between mindsets and the use of cognitive strategies including rehearsal, elaboration and organizational strategies among California seventh graders in a study about science interest and usage of learning strategies in Mathematics and science. Garland, (2018) also found no association between a growth mindset and critical thinking in a study about the relationship between motivational orientation mindsets and critical thinking among college students at Midwestern universities. These contradictions in findings and studies from different countries not based specifically on Mathematics in lower secondary called for more investigation about mindsets and students' use of different cognitive strategies in a mediated model.

Students' mindset beliefs have also been linked to the use of metacognitive learning strategies. Metacognition constitutes Students' ability to govern their cognition and understanding of how they think. According to Kachnowski (2019), students with a growth mindset are more likely to use metacognitive learning strategies than those with a fixed mindset. This is because students with a growth mindset were more likely to self-test and go over the material again to make sure that they understood it. Previous research has shown mixed results, although Hertel and Karlen (2021) discovered a link between implicit theories of self-regulated learning (growth mindset), and employment of metacognitive processes for evaluation and adaptation. On the other hand, Kachnowski (2019) discovered no connection between university students' usage of metacognitive learning strategies and a growth mindset.

The learners' capacity to employ resource management strategies such as effort regulation, peer learning and help seeking is also influenced by their mindset views (Dweck 2017). Kiger (2017) elaborates the advantages of promoting a growth mindset in the classroom, where it is thought to be a good tool for enhancing student problem-solving and peer cooperation skills. According to a study by Stump et al. (2009) about mindsets and learning among engineering students in the US, there is a positive relationship between a growth mindset and collaboration skills. The researchers concluded that students with a growth mindset are more likely to work well with others, for example in discussions and sharing material, because they are less concerned with hiding their weaknesses in front of others. Hertel and Karlen (2021), too found a positive relationship between a growth mindset and resource management strategies of time management and organization. Lackey (2013) also found a positive relationship between a growth mindset and effort regulation among freshmen.

Although implicit theories don't directly influence people's behaviours, they do have a big impact on how people make decisions, create objectives and react to life's occurrences. The study of mindsets helps in understanding student motivations and how to use them to inspire students to reach their potential and perform to the best of their abilities (Dweck, 2015). A study by Mrazek et al. (2018), suggested that developing self-regulation had to begin with adopting the right mindset. The extent to which students believe that they can succeed in school plays a crucial part in determining their learning outcomes. Lalhriatpuii (2018) asserted that students' learning was not primarily determined by their intelligence but by a set of abilities that could be developed. The current study investigated mindsets and interest and how they affected SRL in Mathematics using mixed methods among lower secondary school students so as to add on literature on the benefits of non-cognitive factors in students' learning

2.2.7 The moderating effect of teaching strategies in the relationship between mindsets and Self-Regulated learning.

A third variable, which can be quantitative or qualitative in character, is referred to as a moderator when it influences the direction and/or strength of the association between an independent and dependent variables. A moderator effect is an interaction between a primary independent variable and a determinant that specifies the proper conditions for its operation. According to Baron and Kenny (1986), one characteristic of a moderator is that it, and an independent variable both play the same level in terms of their function as causal factors antecedent to some criteria effects.

Although studies on the moderating effect of teaching strategies in the relationship between mindset and learning strategies are uncommon, studies where teaching strategies moderate other psychological variables do exist which shows that teaching strategies can work as moderators in the current study variables. For example, a study by Biunno (2019) was conducted to investigate the moderating effect of teacher practices on the relationship between prior academic performance and current student academic performance in a New Jersey public school district. The districts examined the teaching methods of the teachers in terms of their abilities and aptitude and the link was discovered to be strongly moderated by teacher practices. Studies specifically on the moderating effect of teaching strategies on the relationship between mindset and SRL appear to be lacking and therefore, literature and discussions depend on the literature of the relationship between mindset and SRL and the interaction of mindset and teaching strategies.

It's not an easy task to select a teaching and learning strategy that suits all learners; but in order to best aid the students' learning, teaching strategies must be carefully chosen. Students learn in a deeper and more meaningful way to apply knowledge to other areas of their lives whenever they are actively involved in learning, exploring new ideas and understanding the conceptual nature of the discipline. Bolton (2018) states that interactive and learner-centred teaching strategies, such as group discussions, the use of learning resources outside textbooks and two-way questioning improve student learning results. Apple et al. (2018) notes that while using learner-centred strategies, the educator serves as a guide with the idea that students should learn to actively construct knowledge. The authors also suggest that it is crucial to understand how students learn in addition to selection of methods, the nature of the subject matter, design and delivery of content. Results by Gouedard (2021) from OECD 2018 results show that teachers who not only impart knowledge but also show unwavering support for their students create a safe learning environment that fosters the emergence of a growth mindset and eventually strengthens students' SRL.

Among the many ways of fostering a growth mindset among learners is through a growth mindset training which is normally done through experimental research. However, Seaton (2018) point out that mindset training may not be successful if it is isolated from regular lessons. Zeeb et al. (2020) add that the influence of mindset training interacts with classroom behavioural norms and instructional practices to bring better results. In a review of mindset, Dweck and Yeager (2019) state that long-lasting change in mindset requires a culture shift among educators that promotes growth mindset. According to Ronkainen et al. (2019), a growth mindset pedagogy entails teachers to encourage the students' process-focused thinking and to support their particular learning processes. It also encourages mastery orientation and persistence on the part of the teacher. According to Olugbenga (2021), employing learner-centred strategies makes the students to demonstrate their own prior knowledge, experiences, education and ideas, which affects how they assimilate the new material and learn. During learner-centred learning, teachers take a more passive role while students actively participate in their learning.

According to Zeeb et al. (2020), instructional strategies and behavioural norms that emphasize students' characteristics and academic achievement are more likely to encourage fixed mindsets than strategies and expectations that focus on the learning process which emphasize students' growth mindset. Their research featured a mindset intervention in which teachers employed learner-centred strategies such as cooperative learning, brainstorming, writing good intentions about physics, group discussions and the adoption of positive classroom norms, which led to the formation of a growth mindset belief. According to Seaton's (2018) study in Scotland, student-teacher interactions and teachers' instructional strategies have an impact on students' mindsets and therefore, teachers are vital to the success of classroom interventions.

The beliefs of learners play a key role in SRL as they assist learners in understanding their experiences and forming the cognitive structure that influences how they view their knowledge and skills, regulate their motivation and learning approach, and give significance to learning. Beliefs can serve as a reference point for students when establishing specific tasks, impacting their Self-Regulated Learning (Karlen et al., 2020). Teachers' competency, like their beliefs about their own intelligence, is a significant factor. (Aragon et al. 2018), the value they place on a particular topic, their motivation for teaching, and enthusiasm can support mindset beliefs, which in turn can lead SRL (Xu, 2022). Gouedard (2021) asserts that when teachers convey that mistakes are opportunities to learn rather than diminish their efforts, students' psychological processes are favourably impacted and thus enables them to interact with the content cognitively. According to Gouedard (2021) findings from 2018 OECD United States results, revealed that teacher practices moderated the relationship between a growth mindset and academic performance. Results implied that at low levels of teacher practices in form of levels of teacher support, adaptive instruction and feedback, students with a growth mindset performed poorer than at higher levels of teacher practices. This implies that SRL is related to students' performance.

Teaching students to be independent learners is not easy. This is because it necessitates significant modifications in the conventional approach to teaching, which is majorly concerned with delivering subject matter (Vosniadou, 2020). According to Sibomana et al. (2022), teacher-centred instruction strategies for teaching Mathematics, such as the lecture method, drill and practice, are very unreliable and rife with flaws that prevent students from actively building their mathematical knowledge, prevent students from developing a conceptual understanding of Mathematics, and are linked to students' poor performance. Furthermore, according to Kaymakamoglu (2018), a teacher who believes in knowledge transmission will employ teacher-centred strategies, provide students with frontal instruction and exercise dominance over the class. Most teachers who employ this style of teaching have low expectations for their students, which causes academic failure that, in turn, causes a self-fulfilling prophecy. According to Farrington et al. (2012), prior performance can emphasize different mindsets in students.

Although majority of the research has criticised teacher-centred strategies, findings show that teachers employ them in their education and find them to be more user-friendly. For instance, research conducted in Tanzania by Mavumba and Mtitu (2022), in Burundi by Sibomana et al. (2022), Mostafa et al. (2018) report from OECD all found that instructors employ teacher-centred strategies when teaching Mathematics. Studies by Mavumba and Mtitu (2022) and Kaymakamoglu (2018) in Turkey also showed that teachers incorporated both teacher- and learner-centred strategies while instructing, with teacher-centred strategies being more obvious in the classroom than learner-centred strategies. However, teachers were aware of the advantages of employing learner-centred strategies. A systematic review by Khalaf and Zin (2018) revealed that traditional classes that use teacher-centred strategies produced learners with limited knowledge, skills and competence and who did not believe in their abilities. The authors recommended using methods like inquiry-based learning and collaborative learning to mitigate the challenges brought about by traditional classrooms.

Gouedard (2021) findings in the United States support the aforementioned notion. This because the results showed that effective teaching methods and practices promoted the growth of a growth mindset. On the contrary, findings by Govorova et al. (2020) based on PISA 2018 results showed that school factors in form of teaching styles such as adaptive instruction, teacher-directed instruction, teacher feedback and teacher instruction, did not show any significant direct effects on students' cognitive wellbeing as measured in terms of a growth mindset. In other words, whatever strategy a teacher used, it had no influence on development of a growth mindset.

However, literature shows that effective teaching methods support students' SRL as well as the development of a growth mindset. Dignath and Veenman (2021) point out that encouraging students to self-regulate their learning by fostering a positive learning environment assist students to develop higher-order thinking skills and metacognition. In the same vain, Keiler (2018) points out that studies on constructivist, student-centred classrooms show improvements in the students' higher order thinking, learning and motivation, particularly in STEM programs.

Additionally, Brenner (2022) posited that educators should employ a variety of strategies to promote the growth of metacognition, motivation and strategic action. When teachers, for instance, make learning visible, give students chances to reflect on and learn more about themselves as learners, use visual prompts, involve students in group discussions and encourage metacognitive questioning to interpret tasks, they are supporting students' metacognition. According to a study by Matsuyama et al. (2019), the use of learner-centred strategies in the classroom can assist students in transitioning from the memorizing learning strategy to the control of their learning beliefs and the application of a variety of learning strategies, like elaboration and organization.

Furthermore, Brandisauskiene (2022) found a correlation between students' belief in growth mindset and how they view their teachers' support in the classroom. The author concluded that students with a stronger growth mindset were more proactive in using learning strategies, as their belief in their ability to grow encouraged greater personal effort in learning and mastering new material. A study by Yeager et al. (2022) found that students in classrooms with teachers promoting a fixed mindset did not experience the same benefits from mindset intervention as students with supportive teachers fostering a growth mindset. Based on the findings, it was concluded that students could not simply take their newly developed growth mindset and apply it in any setting. Instead, the learning environment in the classroom must promote, or at least permit the mindset by providing the required affordances,

The literature shows that teachers play a vital role in aiding students in cultivating a growth mindset. Literature also indicates that teachers can support the development of self-regulated learning by establishing a positive learning atmosphere in their classrooms with the implementation of efficient teaching strategies. A research conducted by Dignath and Buttner (2018) found that even though teachers' teaching strategies could enhance self-regulated learning, teachers seldom dedicated time to directly teach self-regulated learning strategies. They focused mainly on cognitive strategies, teaching very few metacognitive ones. Interviews with teachers revealed that they mostly appreciated the cognitive and motivational aspects of Self-Regulated Learning but lacked awareness of metacognition as an essential component of SRL and were hesitant to support its implementation. The research found that primary and secondary school teachers required further training to enhance their teaching of both direct and indirect SRL strategies. Specifically, they could benefit from learning more about the direct instruction of self-regulated learning techniques and metacognition.

In a systematic review conducted by Wang and Sperling (2020) examining effective Self-Regulated Learning interventions in Mathematics for secondary school students, it was found that interventions utilizing a combination of metacognitive and motivational strategies were more successful than those concentrating only on cognitive strategies. Providing students with training in multiple strategies can improve their ability to effectively utilize them, as different strategies can enhance students' comprehension of each other. This research examined how teaching strategies moderated the relationship between mindsets and Self-Regulated Learning.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter explains the methods and approaches that were employed during the study. It covers the philosophical viewpoints, the research paradigm, the study design, the population, the sampling method and size, the data collection instruments, their validity and reliability, the data collection procedure, the management of the data, the analysis of the data, and ethical consideration.

3.1 Philosophical Perspectives

These are the crucial factors that influence the choice of a research paradigm (Kivunja & Kiyuni, 2017; Saunders et al., 2009). Ontology, epistemology, methodology and axiology are the four philosophical stances. These viewpoints comprise the beliefs, norms and values of which each paradigm presumes (Creswell, 2014). Ontology deals with the nature of reality that one seeks to prove that exists in the social world. It aids the researcher's understanding of reality's scope and what can be known about it (Tashakkori & Creswell, 2007). In this study, objective ontology was reached using statistical techniques and calculations. Similar to this, the narratives of the respondents, explanations and self-expressions were employed to obtain subjective ontology.

Further, epistemology refers to how we come to know what we do and how to portray reality to other readers in a way that is easy. Both objective and subjective epistemology apply to it (Rosida et al., 2023). Quantitative methods of data collection and analysis were used in this study to obtain objective epistemology and produce empirical findings.

Furthermore, subjective epistemology used qualitative study in order to develop explanations and statements of the issues under inquiry. The research methodology adopted a pragmatic world view combining both quantitative and qualitative methods in a convergent parallel mixed methods design. The researcher maintained a distance from the subjects so that they could independently complete questionnaires and provide data based on their perceptions of reality under the quantitative approach. The qualitative approach involved collecting data using focus group discussions and key informants' interviews in order to obtain a comprehensive understanding of the social phenomena. Finally, ethical considerations related to this research's axiology, such as privacy, confidentiality, assent and informed consent, were taken into account throughout the entire investigation.

3.2 Research philosophy

The study took a pragmatic approach which is about putting what works into practice and finding answers to problems. The researcher used a variety of methods to collect and analyse data rather than sticking to one method because the world was not perceived as an absolute oneness. Truth was defined as what worked at a given point in time. It was not founded on a dichotomy between reality outside of the mind and reality within the mind, therefore the researcher combined quantitative and qualitative data because both combined, provided the greatest understanding of the research problem. The researcher believed in both an external world outside of the mind and one that logged in the mind, and such research always takes place in the context of social actors. As a result, pragmatism was chosen since it allowed for a variety of methods, world views, assumptions, as well as data collection and analysis (Creswell, 2014).

3.3 Research approach

The study used a mixed methods approach that combined quantitative and qualitative research, reducing the drawbacks of both, resulting in a better understanding of a research problem or question. Further, psychological traits are better understood when examined from different angles (Creswell, 2014).

3.4 Research Design

The study employed a cross-sectional survey design and a correlational design. The study adopted a convergent-parallel mixed methods approach following a QUAN + qual technique following a side-by-side approach of analysis. The intention was to gather both qualitative and quantitative data during one phase of the study, analyse each kind individually, and then, compare the results to determine whether they supported or deviated from each other. This implied that both quantitative and qualitative data were collected concurrently (Creswell, 2014). The quantitative research involved gathering numerical data using closed-ended questionnaire items to test research hypotheses. On the other hand, the qualitative research used interviews to address the research questions. This took into account opinions that were subjective and difficult to quantify. The major advantage of mixed methods approach was that it enabled triangulation of findings, where convergence of meaning was understood to be an indication of validity of findings and confirmation of reality. Furthermore, triangulation of data from multiple sources and research methods minimized limitations of each method and offered a rich data for comprehensive understanding of a research phenomenon (Walliman, 2021).

3.5 Target Population

The study population included 2673 students from 16 schools drawn from eight sub counties of Wakiso District (Uganda schools Guide, 2022). Wakiso district was comprised of two counties and 17 sub counties. The sub counties and schools were given Pseudonyms S-Z and A-P respectively. The eight sub counties from which the population was drawn from were five sub counties from Kyadondo county 1, 2, 3, 4, 5 and three sub counties from Busiro county 6, 7 and 8. Each county contributed two schools that is one government and one private school.

3.5.1 Inclusion and exclusion criteria

For the inclusion criteria of the study, participants were being in S.3 and further being a teacher of Mathematics in S.3 in Wakiso District in Uganda. S1 and S.2 were not included because of limited experience with the new lower secondary school's curriculum. S.4 was not included because it was under the old curriculum. A level was not included because it was only the lower secondary school students that were targeted for the study. Furthermore, the exclusion of A level was that students chose willingly to continue with mathematics or not and therefore their mindset was not easily shaken as compared to O level students where Mathematics was compulsory and affected grading in case one failed it. Wakiso District was included because it had been ranked as one of the best performing district but learners were still struggling with Mathematics according to different reports.

3.6 Sample size and strategy

3.6.1 Quantitative sample

The sample size for the quantitative data was 335 S.3 students from the 16 schools based on Krejcie and Morgan's table of determining the sample size. This was drawn from the two counties of Wakiso district. S.3 students were chosen because they would have familiarized with the teaching of Mathematics especially under the new lower secondary school curriculum. By the time of data collection, S.1 had just reported andS.2 was left out because of the less familiarization with the new curriculum yet S.4 were still under the old curriculum. In this case, the study used a multistage sampling strategy. Wakiso district was purposively chosen from all the districts of Uganda and it had 2 counties i.e. Kyadondo and Busiro which were both included in the study. Eight sub counties were selected using simple random sampling from the 17 sub counties. Kyadondo had 10 sub counties but of them were selected using simple random sampling while three sub counties were selected using simple random sampling from the 7 sub-counties of Busiro County. From each of the eight sub counties, one government school and one private school were selected using simple random sampling. The school lists with respective sub counties were obtained from the Uganda national schools electronic registry. Wakiso District had 580 secondary schools where 57 were government aided while 523 schools were private. However, the Uganda national schools electronic registry had 186 schools with 152 private and 34 government these were the ones included in the study because the registry could give the location of the school.

Sub county S had 20 private and 3 government, T had 12 private and 2 government, U had 16 private and two government aided, V had 7 private and 2 government aided, W had 8 private and 3 government X had seven private and 2 government aided, Y had five private and 2 government aided then Z had ten private and 2 government aided. The schools considered were, day schools, boarding schools and day and boarding schools. Single sex schools were not considered to avoid biasing the sample to either males or females. The schools' class teachers provided the lists of students from where systematic sampling was used to obtain the sample by assigning numbers to the students on the lists depending on the number required in the given schools. The final sample was therefore arrived at using systematic sampling. While choosing the sample, sex was put into consideration. The summary of the sample size according to the population is given in the table 1

Table 1

The sample size table

School	Population	How the estimated sample is got	Estimated sample	Sampling strategy
A	94	$\frac{94}{2673}X$ 335=	12	Systematic random sampling
B	280	$\frac{280}{2673}X$ 335=	35	Systematic random sampling
C	132	$\frac{132}{2673}X$ 335=	17	Systematic random sampling
D	89	$\frac{89}{2673}X$ 335=	11	Systematic random sampling
E	110	$\frac{110}{2673}X$ 335=	14	Systematic random sampling
F	186	$\frac{186}{2673}X$ 335=	23	Systematic random sampling
G	94	$\frac{94}{2673}X$ 335=	12	Systematic random sampling
H	250	$\frac{250}{2673}X$ 335=	31	Systematic random sampling
I	400	$\frac{400}{2673}X$ 335=	50	Systematic random sampling
J	300	$\frac{300}{2673}X$ 335=	38	Systematic random sampling
K	108	$\frac{108}{2673}X$ 335=	14	Systematic random sampling
L	90	$\frac{90}{2673}X$ 335=	11	Systematic random sampling
M	120	$\frac{120}{2673}X$ 335=	15	Systematic random sampling
N	120	$\frac{120}{2673}X$ 335=	15	Systematic random sampling
O	100	$\frac{110}{2673}X$ 335=	12	Systematic random sampling
P	200	$\frac{200}{2673}X$ 335=	25	Systematic random sampling
TOTAL	2673		335	

3.6.2 Qualitative sample

The study conducted a qualitative inquiry in lower secondary for S.3 students and Mathematics teachers using focus group discussions and key informants interviews respectively. The sample involved a total of 96 students and 16 S3 Mathematics teachers from 16 schools. These were purposively selected to participate in the Focus Group Discussions (FGDs) and interviews respectively. From each school, six students and one Mathematics teacher were chosen to participate in FGDs and interviews respectively.

3.7 Data Collection Methods

This research utilized questionnaire survey, focus group discussions (FGDs) and interviews for the data collection. The three methods were meant to complement each other to attain rich information.

3.7.1 Questionnaire Survey

A questionnaire survey was selected as an appropriate method for gathering quantitative data. One of the benefits of a questionnaire was giving participants the freedom to express their emotions objectively while being led by the predefined options which lessened shyness. The questionnaire also helped the researcher to collect large amounts of quantitative data from the lower secondary S.3 students.

3.7.2 Focus group discussions

FGDs were used to collect qualitative data from the students to supplement quantitative data. Purposive sampling was used to select participants that participated in the focus group discussions. Each focus group discussion was made up of 6 participants and lasted for averagely 45 minutes and one focus group discussion was done in each school. In this case a total of 12 FGDs were carried out each lasting for an average of 45 minutes. FGDs were chosen because students might be more comfortable talking in a group than in an individual interview. Interactions generated more discussions and, therefore, more information (Gibbs, 1997). A total of 12 FGDs were conducted and saturation was reached.

3.7.3 Key informants' Interviews

The interviews were used to collect data from 16 S.3 Mathematics teachers as key informants. The interviews lasted for averagely 30 minutes. These interviews provided in-depth information from the perspectives and experiences of the participants to produce richer results. A total of 16 interviews were conducted and saturation was reached.

3.8 Data collection instruments

The data was obtained using three tools. A self-administered questionnaire, a focus group interview guide and a key informants' guide

3.8.1 Self-administered questionnaire

Quantitative data was collected using a self-administered questionnaire. According to Creswell (2014), a questionnaire is a popular and effective tool for gathering survey data because it offers organized numerical data that is frequently very easy to analyse. In order to gather information from senior three students, a structured, closed-ended questionnaire that was adapted and modified was employed. A simple modification was done by changing the tense and some wordings to fit the research context. The key benefit of employing a questionnaire was its efficiency in gathering reliable data that was simple to interpret and understand.

A five-point Likert scaled questionnaire was used in the study where each item had a response scale. The questionnaire was composed of five sections (A-E). (A) Demographic characteristics of the respondents, (B) Mindset (C) Interest, (D) Teaching strategies and (E) Self-Regulated Learning strategies. The rating scale of the responses included, (1) Strongly Disagree, (2) Disagree, (3) Not sure, (4) Agree, (5) Strongly Agree. Mindset was measured with 8 items from Burgoyne & Macnamara (2021). Fixed mindset was measured with 4 items 1, 3, 5 and 7 (negatively stated items). These were not reverse coded because fixed mindset was measured separately from growth mindset and growth mindset was also measured with 4 items- 2, 4, 6 and 8. Interest was measured using 18 items adopted from Darlington (2017). Individual interest was measured with 8 items. 8, 9, 10, 13, 14, 15, 17 and 18. Items 13 and 18 were negatively stated and reverse coded during data analysis. Situational interest was measured with 10 items- 1, 2, 3, 4, 5, 6, 7, 11, 12 and 16. Items 3, 12 and 16 were negatively stated and reverse coded during data analysis. However, the original attached questionnaire had 28 items and after factor analysis, 10 items were removed that is (items 3, 4,5,6,7,8, 10, 11, 20 and 26). From the original questionnaire, individual interest was measured with items 3, 4, 5, 8,11,16,17,18,20,22,23,24,26,27, and 28 and situational interest was measured with items 1, 2, 6, 7, 9, 10, 12, 13, 14, 15, 19, 21, 25.

Teaching strategies was measured using 33 items adopted form Costa (2014). Lecture method was measured using items 1, 14, 21 and 27 this measured the teacher-centred strategies. The learner-centred strategies were measured using 6 methods (demonstration, problem solving, project method, inquiry method, cooperative learning and use of audio-visual aids). Demonstration was measured with items 2, 8, 15, 22 and 28. Problem solving was measured using items 3, 9, 16, 23 and 29. Project method was measured with 4, 10, 17, 24 and 30. Inquiry method was measured with items 5, 11, 18 and 31. Cooperative learning was measured with 6, 12, 19, 25 and 32. And use of audio-visual media was measured using 7, 13, 20, 26 and 33. The original attached questionnaire had 35 items and after factor analysis, two items were removed that is item 8 under lecture method and 26 under inquiry method. Student-teacher interactive strategy was measured using both teacher-centred and learner-centred methods.

Self-Regulated Learning was measured using the improved motivated strategies for learning questionnaire by Jackson, (2018) consisting of 34 items. Cognitive SRL was measured using 4 learning strategies (rehearsal, elaboration, organization and critical thinking) rehearsal was measured with items 1-4, elaboration with items 5-9, Organization with items 10-11, Critical thinking with items 12-15, Meta-cognitive Self-Regulated Learning was measured using Meta-cognitive self-regulation using 6 items 16-21, Resource management was measured using 4 learning strategies (time and study environment, effort regulation, peer learning and help-seeking) time and study environment with items 22-25, Effort regulation with items 26-27, peer learning with items 28-30 and help seeking with items 31-34. Item 31 was negatively stated and reverse coded during data analysis. The final score was the mean response to the items.

On the other hand, qualitative data was collected using focus group discussions and key informants’ interviews.

3.8.2 Focus group interview guide.

A focus group interview guide containing 10 items was used to collect qualitative data from the senior three students. The research objectives and questions were based on to structure the items in a way that they would produce results that would complement the quantitative findings. The sample questions are attached in Appendix D.

3.8.3 Key informants' interview guide

A key informants' interview guide containing 10 items was used to collect qualitative data from S3 Mathematics teachers. The questions were structured according to the study objectives, research questions and according to the focus group interview guide. This was to enable the researcher to collect the same kind of data from the teachers and students, compare it to find out whether they had the same information about the topic or not. The sample questions are attached in Appendix E.

3.9 Operationalisation of variables

The study variables were mindset, interest, teaching strategies and Self-Regulated Learning. According to the study, they were operationalised as in the table 2

Table 2

Operationalisation of variables

Variable	Nature of variable	Constructs	Source and reliability	Definition
Mindset	Independent	Fixed mindset Growth mindset	Burgoyne & Macnamara, (2021) α=0.94	People's beliefs about their abilities
Interest	Mediating variable	Individual interest Situational interest	(Darlington, 2017)	A psychological state and a tendency to reengage with particular activities, objects, or knowledge over time that emerges as a result of a person's relationship with his/ her environment.
Teaching strategies	Moderating variable	Teacher-centred strategy Leaner centered strategy Student-teacher strategy (Measured using different teaching methods)	Costa (2014) α=0.82	A broad range of procedures spanning from the organization of classrooms and resources to the moment-by-moment actions taken by teachers and students to improve learning.
Self-Regulated Learning	Dependent variable	Cognitive SRL Meta-cognitive SRL and resource management (Measured using different SRL strategies)	Jackson, (2018) α=0.75	An active, constructive process in which students identify learning goals and then work to monitor, regulate, and manage their cognition, metacognition, motivation, and behaviour, guided and led by their goals and the environmental context.

Source: Literature Burgoyne & Macnamara, (2021); Darlington, (2017); Costa (2014); Jackson, (2018)

3.10 Quality control

Quality control was attained through validity and reliability tests. These guaranteed the collection of reliable and consistent data from study participants.

3.10.1 Validity for the quantitative questionnaire

To ensure validity, the draft questionnaire was given to the three supervisors. This was done for the purpose of examining the items in the questionnaire for clarity, ambiguity, language, tenses, suitability and simple modification to fit the respondents' context. The comments and corrections about items were made, and the ones that were suggested for modification were changed. Further, exploratory factor analysis was carried out in order to improve the overall validity of the instrument.

Factor analysis was carried out to ensure construct validity. Items with loadings of 0.3 and above were retained. The factors were rotated using Varimax rotation with Kaiser Normalisation. The results are presented in Appendix B. Regarding mindset, the rotation yielded 2 factors and all items were retained because they were loading above 0.3. Regarding interest, rotation with fixed number of factors indicated that 10 items were loading below 0.3. These were items 3, 4, 5, 6, 7, 8, 10, 11, 20 and 26 according to the original questionnaire attached. These were removed and factor analysis re-run. All the remaining items measured above 0.3 and were retained.

Teaching strategies loadings showed that 2 items 8 and 26 had loadings below 0.3. These were removed and factor analysis re-run. All the items remaining measured above 0.3 and were retained. Lastly, Self-Regulated Learning loadings showed that all items were loading above 0.3. Given that all the items retained loaded above 0.3, they were confirmed to be good measures of the study variables.

3.10.2 Reliability for the quantitative questionnaire

The study used Cronbach's Coefficient to assess how the questions linked with one another in order to guarantee the reliability of the quantitative questionnaire. A pretest test was conducted in Kampala district from two schools with a sample size of 146 students to establish reliability. Due to Kampala District's similarity to Wakiso District in terms of both geographical location and performance, it was chosen. According to UNEB statistics, Kampala was at the same level with Wakiso in performance so testing the tool from Kampala gave a good generalization of the questionnaire to the study area.

After pretesting testing the questionnaire in the first school, the researcher realized that learning strategies which were the dependent variable could not be aggregated into one variable. Since the study adopted a correlational research design, there was need for the dependent variable constructs to be aggregated into one variable. So, with consultation from literature, the researcher changed to Self-Regulated Learning that could be aggregated and used learning strategies to measure SRL. Following the pretest, SPSS was used to analyse the quantitative data, and a reliability test was conducted to determine the Cronbach's alpha coefficients. According to Bonnet and Wright (2015), a coefficient of 0.7 and higher is considered reliable and Taber (2018) states that a coefficient of 0.64-0.85 is adequate. The results are shown in Table 3

Table 3

Reliability of the Questionnaire using Cronbach Alpha Coefficient Values

Reliability of the Questionnaire Cronbach Alpha Coefficient Values			
Variable	No. of Items	Before Factor analysis	After factor analysis
Fixed mindset	04	0.65	0.65
Growth mindset	04	0.71	0.71
Mindset	08	0.74	0.74
Interest	28	0.92	0.93
Teaching strategies	35	0.89	0.89
Self-Regulated Learning	34	0.92	0.92
Overall	105	0.92	0.92

Source: Survey data (2023)

Table 3 results indicate reliability coefficients for the study instrument. The Cronbach alpha coefficients for all the study variables before and after factor analysis were above 0.70 apart from the fixed mindset coefficient 0.65. This implies that the study instruments were more than 70% reliable. After factor analysis; fixed mindset α =.65, Growth mindset α = .71 Overall mindset α =.74. Interest α =.0.93, Teaching strategies α = .89 and Self-Regulated Learning α =0.92. The overall coefficient alpha for the study instruments was 0.92.

According to Tavakol and Dennick (2011), instruments should have a Cronbach Alpha score of 0.6 and above to be considered reliable. As a result, the tools were considered reliable for collecting data.

3.10.3 Validity and reliability of the focus group interview guide and the key informants' interview guide.

According to Korstjens and Moser (2018), credibility, dependability, conformability and transferability are used to determine the validity and reliability of qualitative data. Credibility is related to truth value, thus the researcher made sure that there was prolonged interaction with the respondents. Respondents were also urged to provide examples to back up their statements, and there was also triangulation. The researcher used a variety of data collection methods and research assistants were employed in focus group interviews and data analysis. Regarding dependability, the items were pretested to determine their reliability before being removed or substituted as necessary to fit the conceptual and theoretical parameters of the study.

The first qualitative interview of the focus group interview guide was including all science subjects and learning strategies use because the dependent variable was use of learning strategies in science subjects. However, the first interview revealed that students would narrate about all variables including all subjects. It therefore became difficult for the researcher to concentrate on one science subject and students had differing experiences about the study variables in the different science subjects. The researcher, with consultation of literature, decided to concentrate on only Mathematics because it was required in the study of all science subjects (Duru & Okeke, 2021).

By publicly outlining the study procedures followed from the beginning of the research to the development and reporting of the findings, an audit trail was used to assure confirmability. Transferability was achieved by collecting rich and detailed contextual data that was relevant to the study's situation. Additionally, it was made definite by detailed descriptions of the data and experiences of the respondents.

3.11 Research Procedure

Prior to the start of data collection effort, permission from Kyambogo University was obtained. A pre-visit was made to determine the necessary requirements, challenges and procedures required for reaching the study population. In order to assist with data collection, two research assistants were chosen and trained. The research assistants were involved in pretesting the tool. The head teachers of each of the chosen schools were contacted and given a thorough explanation of the study's objectives. Following approval, the exercise was given to the directors of studies, who in turn worked with the appropriate class teachers. A list of senior three students was sent to the class teacher(s) for sampling purposes after describing the study's procedure and purpose to them. The students were then given comprehensive information regarding the survey. The students were then asked if they would be willing to volunteer for the study. Students who had agreed to participate were then arranged, given questionnaires in a designated classroom, and given guidance from the lead researcher and the research assistants.

The class teacher helped in choosing students for the focus group discussions. The focus group discussions took place in a comfortable location provided by the school. Data collecting and focus group discussions were scheduled for lunch periods and extracurricular activities, or as decided by the school, to prevent disruption of classroom activities. A pre-developed and pre-validated interview guide was utilized, and the interviews were carried out in English. The average duration of the interviews was 45 minutes, and they were recorded with the consent of both the participants and school administrators.

In addition to audio recordings, a notepad was utilized to jot down participant nonverbal traits related to sex, the type, foundation and location of the school as well as any new concerns and themes that emerged throughout the interviews. After collecting data from the students, key informants were interviewed. These included Mathematics teachers who had been reached out to for appointments before data collection. Similar to the focus group discussions, the interviews were audio recorded. Participants' non-verbal characteristics, such as sex and the type, foundation and location of their school, were also noted in a notebook. Interviews with teachers took place in convenient locations that were recommended by the teachers themselves.

3.12 Data management

The data collected was managed through two processes, namely data screening and carrying out diagnostic tests.

3.12.1 Quantitative data management

3.12.1.1 Data screening. Verifying surveys, finding missing data, and managing outliers were all included in the data screening procedure. Questionnaires with a significant number of omissions or incomplete answers were eliminated during the error-checking process to avoid potential effects on the results. Next, the information was inputted into SPSS using Hayes version 4.2's processing plugin. Three questionnaires had to be left out due to inadequate responses. Missing data was managed with series means and reverse coding to items that were negatively stated.

Missing data in the study was observed at an item level. The amount of missing values was assessed using frequencies. Three of the 335 respondents did not fully complete the surveys and left numerous questions unanswered and these were excluded. The remaining surveys were fully completed, and six of them revealed a 0.3% missing rate according to the frequencies. Series means were used to replace the missing values. The distribution of the missing values across the various variables showed that the data was completely missing at random.

3.12.1.2 Outlier Analysis. Boxplots were employed in this study to make it easier to identify outliers by respondent number. Due to the small sample size, outliers were not removed and other tests including normality and linearity tests were run to determine whether or not the outliers were significant.

3.12.1.3 Diagnostic Tests. These examine the sensitivity and specificity of information (Flinton & Malamateniou, 2020). The elements covered were testing for normality, checking for linearity and homoscedasticity, conducting exploratory factor analysis, addressing collinearity and multicollinearity.

3.12.1.4 Normality of data. Normality was tested with a A P-P scatter plot and linearity test was done to establish whether the variables were fit for further analysis. A P-P plot is presented in Figure 2

A P-P plot

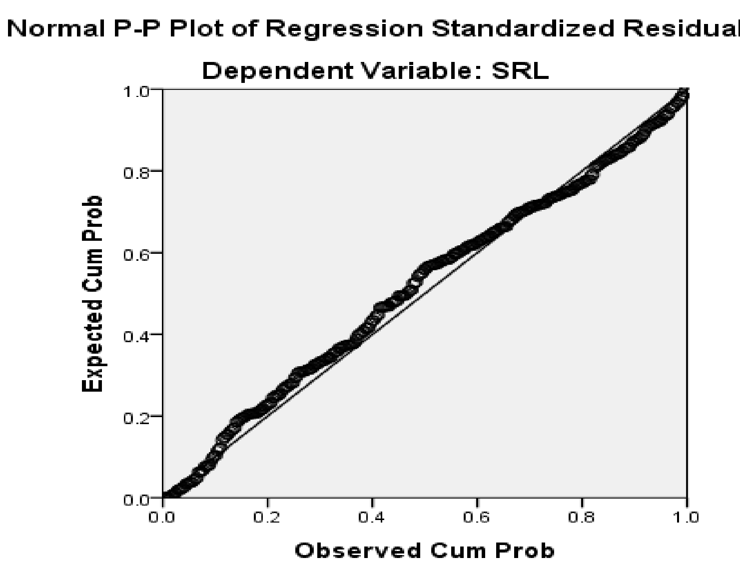


Figure 2: ***P-P plot***

The data in this study was determined to be normal based on the Normal P-P plot in Figure 2, as most dots aligned closely with the straight line, despite some minor deviations. This meant that the data was suitable for additional statistical analyses as the normality assumptions were confirmed and supported by the normal P-P plot.

3.12.1.5 Linearity. A Deviation score from linearity was used to test linearity. According to Knief and Forstmeier (2021), using the ANOVA table, the variables are linearly related if the value of the deviation score from linearity is greater than 0.05. The variables under investigation were Growth mindset and SRL, Fixed mindset and SRL, Interest and SRL, Growth mindset and Interest, and Fixed mindset and Interest. These variables were evaluated to see if they supported the assumption that the relationship between the continuously measured variables was linear. Table 4 displays the linearity results.

Table 4

Linearity tests among variables

ANOVA Table					
			Sum of Squares	F	Sig.
SRL * Growth mindset	Between Groups	(Combined)	9251.27	1.691	.05
		Linearity	4093.02	11.968	.001
		Deviation from Linearity	5158.25	1.006	.45
SRL * Fixed mindset	Between Groups	(Combined)	7406.63	1.331	.18
		Linearity	215.20	.619	.43
		Deviation from Linearity	7191.43	1.378	.16
SRL * Interest	Between Groups	(Combined)	44002.84	2.898	.00
		Linearity	26344.75	98.91	.00
		Deviation from Linearity	17658.08	1.184	.19
Interest * Growth mindset	Between Groups	(Combined)	6302.34	2.289	.00
		Linearity	2116.03	12.299	.00
		Deviation from Linearity	4186.31	1.622	.07
Interest * Fixed mindset	Between Groups	(Combined)	3315.43	1.142	.31
		Linearity	31.32	.173	.68
		Deviation from Linearity	3284.12	1.206	.27

Source: Survey data (2023)

Results in table 4 indicate that the values for deviation from linearity between all the measured variables was non-significant (P>.05) indicating that the samples distribution did not deviate considerably from a linear distribution. Thus, data met a required linear distribution condition and was thus, suitable for further statistical test.

3.12.1.6 Collinearity and Multicollinearity. Fixed mindset, Growth mindset, interest and teaching strategies which were the independent variables of the study were tested to find out whether these independently predicted SRL the dependent variable. Table 5 shows the test results.

Table 5

Collinearity among the variables

		Collinearity Statistics	
Model		Tolerance	VIF
1	(Constant)		
	Growth mindset	.658	1.520
	Interest	.945	1.058
	Fixed mindset	.689	1.450
	Teaching strategies	.968	1.033

Source: Survey data (2023)

The findings displayed in Table 5 indicate that there was no Collinearity (high correlation) among the independent variables, as all variables had Variance Inflation Factor (VIF) values exceeding 0.5, which is the threshold recommended by Hair et al. (2021) for measuring collinearity. Therefore this implies that the independent variables have the ability to predict the dependent variable independently.

3.12.1.7 Homoscedasticity. This was tested using regression standard residuals.

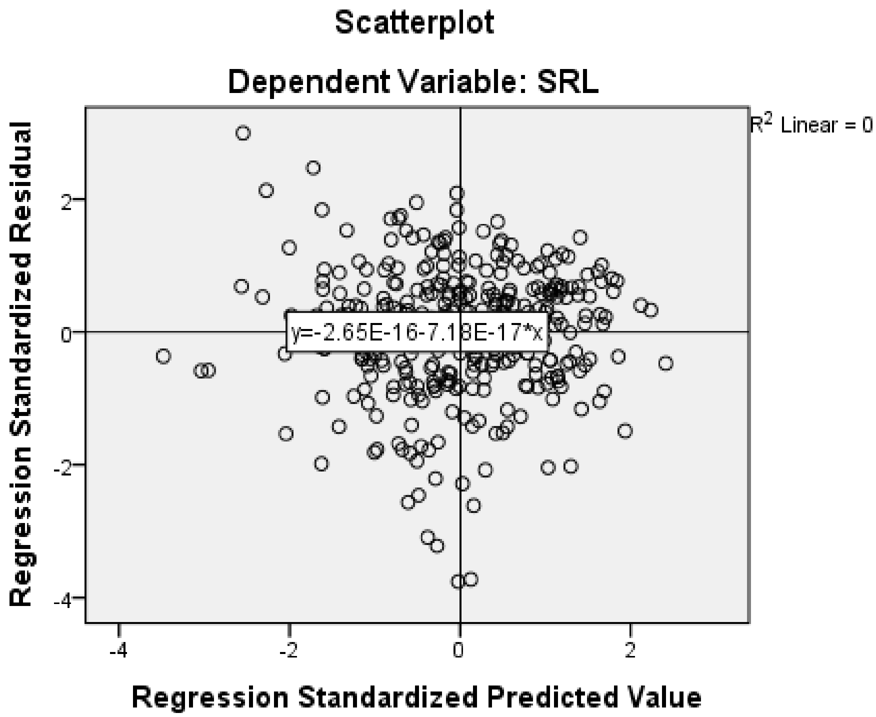


Figure 3: Homoscedasticity

Results in Figure 3 Show that there were no obvious patterns followed by the data and points were equally distributed above and below zero on the x-axis and to the left and right of zero on the y axis. Therefore, there was no homoscedasticity among variables

3.12.2 Qualitative data management

The researcher assigned a central location with lock and key for the storage of the data. The senior researcher and the research assistants would get together every evening to discuss their days' experiences. Daily checks were made to make sure that the data was complete. To prevent forgetting important concepts, qualitative data was always transcribed a few days after it was collected.

3.13 Data analysis

3.13.1 Quantitative data analysis:

To analyse quantitative data, questionnaires were crosschecked for completion of responses and any omissions were noted Questionnaires containing numerous gaps were excluded as they could affect the results. Data was inputted into the Statistical Package for Social Scientists (SPSS) Version 4.2 using a PROCESS macro procedure by Hayes after coding the questionnaires. Demographics were analysed using frequencies and percentages. The study was guided by 6 hypotheses. Hypotheses 1, 3, and 4 were analysed using mean, standard deviation, t-test and ANOVA. Hypothesis 2 was analysed using frequency counts, mean, standard deviation, t-test and ANOVA. The mean and the standard deviation were used because they showed the differences in performance of the variables. T-test and ANOVA were used because they gave the differences in variables according to demographics.

Hypotheses 5 and 6 were analysed using PROCESS macro procedure for SPSS Version 4.2 by Hayes regression procedures. Process Macro was chosen because it employed the bootstrapping technique, which was suggested as the most effective and practical way to determine confidence limits for indirect effects under most conditions. Resampling was used in the bootstrapping method to estimate statistical parameters like standard errors and confidence intervals (Lourenço 2016).

*3.13.2 Qualitative Analysis***.**

Qualitative data from focus group discussions and key informant interviews were analyzed. The initial examination started with making notes and contemplating the gathered data to identify the saturation point throughout data collection. Data were analysed using the six theme analysis techniques listed by Braun and Clarke (2006). Due to solid familiarity, manual analysis was chosen over software analysis tools. Manual analysis allowed the researcher to become completely engrossed in the data. Manually displaying data on result sheets can help people to get more comfortable with the material, although it was time-consuming and labour-intensive (Maguire & Delahunt, 2017). Listening to audio recordings and transcribing the data was essential for getting familiar with the data. Everything that was recorded was transcribed without leaving out a thing. This was done in an effort to become completely absorbed in the data. The data sets were read and revised multiple times and the researchers took note of emerging codes and themes. The actual coding began by expanding a code structure created during familiarization. The remaining transcripts were coded using this system, which was left open to any future codes that could emerge.

The inductive coding approach was used where the researcher read through each interview's transcript in its entirety. The pertinent and maybe distinctive phrases and sentences that matched the codes were similarly highlighted as they were being coded. Some of the preexisting codes were altered as coding developed, while others collapsed as new codes appeared. Codes that were deemed ambiguous or irrelevant because they didn't frequently appear anywhere else were eliminated. A few codes were also combined to make sense of them. In order to determine whether the established and generated themes accurately reflected the facts gathered, they were reviewed. This was ensured by revisiting the data set. The themes were carefully examined to determine whether they accurately told a compelling and convincing story about the data. Verbatim quotes were utilized to give the data some personality.

3.14 Ethical Considerations

Throughout the course of conducting this research, the researcher was conscious of ethical principles. The researcher obtained ethical clearances from Mbarara Research Ethical Committee and National Council for Science and Technology. Permission to collect data was obtained from Kyambogo University and Wakiso District (DEO). As stated by Colosi et al. (2019), confidentiality involves preventing the disclosure of participant information that could lead to the participant being traced or identified. The researcher utilized distinctive features of specific cases, institutions, or locations to make them identifiable even without names. In this case, pseudonyms names were utilized. Before collecting data, consent and assent were obtained, with no recordings taken without participants' approval and their viewpoints were honoured. The researcher agreed with the participants that data would only be used for research purposes. For their participation in and contributions to the study, each participant received recognition and appreciation in a variety of categories. All contributions from various sources, literature, and other relevant items or resources were utilized, and care was taken to ensure that they were properly acknowledged. In addition, references are included at the end of the thesis and plagiarism was also tested by the researcher.

CHAPTER FOUR: RESEARCH FINDINGS

4.0 Introduction

This chapter presents findings obtained from field research. The chapter is divided into two sections. Section 1 contains demographic data on the participants, while Section presents the combined quantitative and qualitative findings of the study. The results are presented based on the study's hypotheses and research questions that directed the research.

4.1 Response Rate

The response rate for the quantitative sample was 99.1% because three questionnaires were left out since they were not well filled. Pielsticker and Hiebl (2020), underline that a response rate of 50% is optimal for social scientific studies. For qualitative data, 12 FGDs were carried out because saturation was reached. This gave 75% response rate. Fourteen (14) S3 Mathematics teachers took part in interviews and as key informants making up 87.5% response rate. This is because16 teachers were expected for the study, however two were unable to participate because of prior obligations during the time of interviews. These were not contacted later since saturation had been attained.

4.2 Socio-Demographic Data of the Respondents

This section provides background information on the respondents. It outlines the characteristics of the study participants at lower secondary level. Sex, religious affiliation, parents' or guardians' occupation, tribe (region), school type, school foundation, and school location are the categories in which the information is presented. The summary is presented in Table 6.

Table 6

Respondents' socio-demographic characteristics

Variable	Categories	Frequency n (%)
Sex	Male	164 (49.4)
	Female	168 (50.6)
Total		332
Religious affiliation	Catholic	117 (35.2)
	Protestant	78 (23.5)
	Muslim	76 (22.9)
	Pentecostal	52 (15.7)
	Adventist	9 (2.7)
Total		332
School type	Day	11 (3.3)
	Boarding	120 (36.1)
	Day and boarding	201 (60.5)
Total		332
School Foundation	Government aided	152 (45.8)
	Private school	180 (54.2)
Total		332
School location	Urban	253 (76.2)
	Rural	79 (23.8)
Total		332
Parents'/guardian's occupation	Formal sector	123 (37)
	Informal sector	209 (63)
Total		332
Tribe (Region)	Central region	155 (46.7)
	Western region	97 (29.2)
	Eastern region	48 (14.5)
	Northern region	32 (9.6)
Total		332

Source: Survey data (2023)

The results in Tables 6 show that the total sample comprised of 168 female and 164 male S.3 students. Although females (50.6%) were more than males (49.4%) the numbers show that both females and males were almost equally represented in the study. In addition, results show that Catholics in terms of religious affiliation were the most represented group (35.2%) and the lowest number was from Adventists with 2.7%. Furthermore, most students that participated in the study were in day and boarding schools (60.5%) followed by boarding only (36.1%) and day only (3.3%). Single sex schools were not considered in the study to avoid biasing the sample to either many males or females. In addition, results show that majority of the participants were from private schools (54.2%) while government schools were represented by (45.8%). Urban schools were more represented with (76.2%) while rural were (23.8%). The tribes being many were grouped according to the regions they fall. The Central region was more represented (46.7 %). Numbers vary according to the region but they show that most tribes and all regions in Uganda were represented. Lastly, results show that most participants had parents or guardians working in the informal sector (63%). The jobs being many were grouped into the formal and informal sector for easy analysis.

Wakiso District being in the Central region, and borders Kampala, the capital city, there were more urban schools than rural schools represented in the study. Rural schools were nevertheless included in the study to allow for generalization to other rural schools across the nation. Due to the fact that Wakiso district was located in Buganda's core region, the Central region had most representation. However the population of Wakiso was diverse, and the findings indicate that all the regions were represented. The demographic characteristics show that the findings in this study were typical of the majority of the features of the educational environment in Uganda. In the presentation of the findings, the demographic factors were taken into further consideration to see how they related to the research variables.

4.3 Presentation of Findings

The field survey's findings are presented in this section. The results of the qualitative and quantitative studies are presented concurrently. The findings are given in accordance with the research questions and study hypotheses as they are derived from the study objectives. Both quantitative and qualitative results are integrated for complementarity and robustness.

4.3.1 Differences in mindsets exhibited by students in Mathematics

To investigate whether there existed differences in mindsets exhibited by students in Mathematics, it was hypothesized that "*There are significant differences in the mindsets held by lower secondary school students in Mathematics".* Descriptive statistics with, means and standard deviations were used to establish whether there were significant differences between fixed mindset and growth mindset, t-test was used to test for significance differences in mindsets across gender and ANOVA was used to test for significant differences in fixed and growth mindset across different demographic variables. A research question for the qualitative study was presented as; "*What differences exist in mindsets held by lower secondary school students in Mathematics*?" The descriptive narratives were used to compliment and explain the quantitative results.

4.3.1.1 Differences in fixed and growth mindset in Mathematics. This was investigated using Frequency counts, mean and standard deviation. The results are described in Table 7

Table 7

Differences in fixed and growth mindset in Mathematics

	Fixed mindset	Growth mindset
Mean	11.63	14.86
Std. Deviation	3.88	3.81
Range	16.00	16.00
Minimum	4.00	4.00
Maximum	20.00	20.00

Source: Survey data (2023)

Table 7 results show mean values compared for fixed mindset and growth mindset. The mean was higher for growth mindset (M=14.86, SD=3.81) than for the fixed mindset (M=11.63, SD= 3.88). The results suggest that students held a more growth mindset in Mathematics than a fixed mindset. The results show that most students believed that their ability to do Mathematics was something that could be improved. This suggests that they believed that they could develop their ability for Mathematics. These students persevered in their efforts, did not give up easily, and were motivated by others' achievements. They did not care about proving their ability if it could be improved through learning.

The quote below illustrates the view about a growth mindset

> *…..Even this belief where they say you will not make it because you don't have the ability to pass Mathematics, it makes you read hard saying let me show them that I can make it. So you read hard.* (Female student 1, FGD 2).

The verbatim suggests that students with a growth mindset keep trying instead of quitting when faced with negative feedback. Another student stated that;

> *Now my friends say that Mathematics is for those with a high IQ and so if you have a low IQ you cannot, but the fact is that if you concentrate, you can pass Mathematics.* (Male student 4, FDG 1).

This narrative demonstrates that students thought their Mathematics abilities were not innate, but with hard work and focus, they could always enhance and attain the desired outcome.

Despite the majority of students having a growth mindset in Mathematics, a significant number still held a fixed mindset, believing that ability in Mathematics was innate and unchangeable. Students with a fixed mindset felt threatened by others' performance and were quick to give up when faced with challenges. They constantly sought to demonstrate their skills because of a fixed mindset, and the following narratives provide further explanation.

One student said;

> *Some people don't like Mathematics. but I think it depends. If someone performs better than the person, he or she will get to know that this one is better, what am I doing? I am trying but it is not working so they give up.* (Female student 6, FGD 4)

The narrative indicates that students with a fixed mindset sought to prove themselves and felt threatened by the achievements of others. If they couldn't show they were superior, they easily gave up. Another respondent had this comment to share;

*Now for me I want to become a Doctor, but when you talk about science subjects of which Mathematics is part of them my friends are like oh my God will you manage? Now you will say who am I? will I do it? So you end up losing the hope. (*Female student 3, FDG 10).

Another student said…

*Some times our fellow students have this belief that no matter how much you read, when you are not meant for a subject you will not pass. So sometimes let's say when it comes to revising, you say, no matter how much I read, I will not pass, you lose interest. So, at times you give up (*Male student 1, FDG 7*).*

The narratives demonstrate that students who have a fixed mindset were very sensitive to negative feedback and would often quit when their abilities were doubted. Other students said;

Students don't like Mathematics because it is not their natural ability (Female student 3, FDG 11)

Everyone has his/ her natural ability. So, if your natural ability is not in Mathematics you can't do it. (Male student 3, FDG3)

The narratives indicated that students believed one must possess Mathematical ability to succeed in it.

4.3.1.2 Differences in fixed and growth mindset in Mathematics across gender and parents'/guardians' occupation. This was investigated using t- test. The results are described in Table 8

Table 8

t-test results for fixed and growth mindsets across gender and parents'/guardians' occupation.

Comparison variables		N	Mean	SD	F	t	p
	Gender						
Fixed mindset	Male	164	11.41	3.80	0.33	-1.00	0.32
	Female	168	11.84	3.95			
Growth mindset	Male	164	15.32	3.48	0.08	1.38	0.17
	Female	168	14.78	3.59			
	Parents'/guardian's occupation						
Fixed mindset	Formal sector	123	11.59	3.94	0.05	-0.16	0.87
	Informal sector	209	11.66	3.73			
Growth mindset	Formal sector	123	15.01	3.92	0.17	0.55	0.58
	Informal sector	209	14.77	3.87			

Source: Survey data (2023)

The results in Table 8 indicate that there was no significant difference in a fixed and a growth mindset in Mathematics between males and females. The results implied that whether a student had a fixed mindset or a growth mindset he/she had nothing to do with whether they were a male or female. Otherwise, one's gender did not lead one to believe that one's ability for Mathematics was innate or could be developed. However, qualitative narratives revealed that, depending on their sex, some students had either a fixed or a growth mindset. One student had this to say;

Some of my friends say that I can't do Mathematics because I am a girl. That Mathematics and science subjects are for boys. They say that because I have told them I want to be a doctor (Female student 2, 4).

One teacher said this on the issue of gender and mindsets

Some students especially girls believe that Mathematics is for boys. As teachers we are trying to change this mentality and I think it is easier for me as a female Mathematics teacher to help them change it. (Female teacher 2)

The narratives revealed that certain students maintained a fixed mindset towards Mathematics due to their gender. Results indicated that there were no significant differences in fixed and growth mindsets based on the parents'/guardians' occupation. Nevertheless, some narratives indicated that the mindsets of certain students were influenced by the career or occupation of their parents/guardians.

One student said this;

I want to continue with Mathematics because I want to be a doctor which requires one to study Mathematics. My father is a doctor so I want to be like him. I feel I can be it. In my family there are no lawyers so I can't be a lawyer.(Male student 1, FDG 1)

Another student said;

I feel I am best in Arts because even my Dad is not a doctor, he is a lawyer. That is why I feel that way (Male student 5, FDG 5).

The narratives indicated that the belief in doing Mathematics was more emphasized by what the parents were in terms of occupation.

4.3.1.3 Differences in fixed and growth mindset in Mathematics across religion, region (tribe) parents' guardians' occupation, school foundation and location and school type. This was investigated using ANOVA. The results are described in Table 9

Table 9

ANOVA table for fixed and growth mindset across the different demographics

Demographic		Growth mindset			Fixed mindset		
Religion	N	Mean	SD	Sig	Mean	SD	Sig
Catholic	117	14.66	3.68	0.05	11.81	3.73	0.55
Protestant	78	15.95	3.48		11.26	3.95	
Muslim	76	14.18	4.13		12.08	3.79	
Pentecostal	52	14.61	3.72		11.31	4.14	
Adventist	9	15.11	4.65		10.56	4.59	
Total	332	14.86	3.81		11.63	3.88	
School type							
Day only	11	15.09	3.96	0.94	9.82	4.56	0.11
Boarding only	120	14.93	3.56		12.08	3.88	
Mixed day and boarding	201	14.81	3.96		11.46	3.82	
Total	332	14.86	3.81		11.63	3.88	
School foundation and location							
Urban-Government	116	14.97	3.66	0.81	11.81	3.57	0.32
Rural-Government	36	14.97	3.69		11.22	3.85	
Urban-Private	138	14.63	3.98		11.86	4.18	
Rural-private	42	15.19	3.83		10.71	3.68	
Total	332	14.86	3.81		11.63	3.89	
Region							
Central Region	155	14.77	3.68	0.96	11.38	3.67	0.22
Western Region	97	14.85	3.95		12.28	4.10	
Eastern Region	48	15.0	3.79		11.58	4.34	
Northern Region	32	15.13	4.16		10.94	3.311	
Total	332	14.86	3.81		11.63	3.88	

Source: Survey data (2023)

Results in Table 9 show that there were no statistically significant differences in fixed mindset across religion. For the growth mindset, there were statistically significant differences in growth mindset across religions (P=0.05). This implies that the beliefs associated with religion probably accorded one a chance to always improve him/herself in Mathematics. Results further showed that there were no statistically significant differences in a growth and fixed mindsets across the different demographics

This means that factors such as religion, tribe, parents' occupation, type of school (day, boarding, both), school foundation, and location (government or private, rural or urban) did not influence the development of a fixed or growth mindset for students.

The findings from the qualitative analysis indicated that there were no differences in students' mindsets as fixed or growth across different factors such as religion, school location and foundation, and school types.

4.3.2 Levels and differences in Mathematics interest among students

In order to investigate the levels of interest in Mathematics, it was hypothesized that; "*There are significant differences in the levels of Mathematics interest among lower secondary students".* Descriptive statistics with frequency counts, percentages and mean were used to test for levels of interest t-test was used to test for significance differences in overall Mathematics interest, individual interest and situational interest across gender and parents'/guardians' occupations. Further, ANOVA test was used to test for significant differences in overall interest, individual interest and situational interest across other demographic variables. A research question for the qualitative study was presented as; "*What are the levels and differences in*

Mathematics interest among lower secondary school students?" The descriptive narratives were used to compliment and explain the quantitative results where necessary.

4.3.2.1 Levels of interest in Mathematics. Mean values and frequency counts were used to establish the levels of Mathematics interest. A mean of 18-53.99 indicated low interest in Mathematics and a mean of 54.01 to 90 indicated high interest in Mathematics and a mean of 54 indicated that one was unsure (Darlington. 2017). The results are described in Table 10.

Table 10

Levels of interest

Level	N(%)	Mean
Low interest	46 (13.9)	67.67
High interest	279 (84)	
Not sure	7(2.1)	
Total	332	

Source: Survey data (2023)

Results in Table 10 show that majority of the students had high interest in Mathematics.

> *….because science teachers are paid highly I am willing to continue with Mathematics after O level* (Female student, FDG 8).

> *…for me I am interested in Mathematics because every time I see new buildings in Kampala, I want to be the engineer who has drawn the plan for the building. My Father told me engineers are mathematicians* (Female student FDG 1).

> *…I am interested in Mathematics because everything in this world involves mathematics (Male student FDG 2).*

However, a good number of qualitative narratives indicated that students had low interest in Mathematics. For example, twelve of the 14 teachers rated their students as having low interest in Mathematics and majority of the students in qualitative interviews rated students in their schools as having low interest in Mathematics. Below are the qualitative narratives which rate students' interest and reasons for the low interest

Different students had this to say;

Not all students in our class are interested in Mathematics, few are interested in it. (Female student 5, FDG 7)

Most students are not interested in Mathematics because they say Mathematics is not a joking subject, it is difficult (Male student 2, FDG 2)

Because some see math to be interesting while some see Mathematics to be boring. (Male student 1, FDG 6)

> *Some students are not interested in Mathematics because they think what we are studying in Mathematics can't be used anywhere but the fact is Mathematics is everywhere from counting money, time, running businesses and others.* (Female student 1, FDG 8)

The narratives indicate that some students had low interest because of the conceptions they had about Mathematics.

One student said;

Some students are not interested in Mathematics because they say it is not their natural ability (Male student FDG 4).

The narratives showed that some students were not interested in Mathematics because of their fixed mindset.

Another student had this to say;

> *Some are interested in Mathematics because some are interested in their teachers while some are not. I mean the way teachers teach, dress and handle us.* (Male student 6, FDG 9)

Another student said;

> *……because of boring teachers (*Female student 4, FDG 11*)*

The narratives showed that some students were not interested in Mathematics because of reasons related to their teachers

Teachers also said the following on students having low interest

> *Some are interested some are not. You know students have the mentality that math is hard and complicated so it makes them less interested in it.* (Male teacher 1)

Another teacher said;

> *Learners are not so interested because there is a slogan that math is hard and we all know that if you don't give math time, then it becomes hard.* (Male teacher 5).

Another teacher said;

> *My students are average learners and are not interested. For example you write a number on the chalkboard and you hear a student saying, that is why I hate math (*Female teacher, 7)

The narratives from the teachers and students showed that most students had low interest in Mathematics citing out different reasons like Mathematics being boring, difficult, hard, complicated, cannot be applied in real life and reasons pointing to their mindsets, significant others like peers, and parents, teacher factors, and previous performance.

4.3.2.2 Differences in individual and situational interest in Mathematics. This was investigated using means. The results are shown in Table 11.

Table 11

Differences in individual and situational interest

	N	Minimum	Maximum	Mean	Std. Deviation
Situational interest	332	1.38	5.00	3.83	.73
Individual interest	332	1.20	5.00	3.70	.81

Source: Survey data (2023)

Table 11 results showed mean values compared for individual interest and situational interest. The mean was higher for situational interest (M=3.83, SD=0.83) than for individual interest (M=3.70, SD=0.81). The results suggested that students had more situational interest in Mathematics than individual interest.

4.3.2.3 Differences in individual and situational interest in Mathematics across gender and parents'/ guardian's occupation. This was investigated using t-test. The results are shown in Table 12.

Table 12

Differences in individual and situational interest across gender and parents'/guardians' occupation

Comparison variables	Demographic	N	Mean	SD	F	t	P
	Gender						
Individual interest	Male	164	3.92	.72	0.04	2.04	0.04
	Female	168	3.75	.73			
Situational interest	Male	164	3.82	.78	0.43	2.68	0.01
	Female	168	3.58	.82			
Overall interest	Male	164	3.86	.70	0.04	2.59	0.01
	Female	168	3.66	.72			
	Parents'/guardians' occupation						
Individual interest	Formal sector	123	30.81	5.67	0.08	0.35	0.73
	Informal sector	209	30.58	5.92			
Situational interest	Formal sector	123	36.79	8.38	0.51	-0.36	0.72
	Informal sector	209	37.12	7.93			
Overall interest	Formal sector	123	67.61	13.11	0.18	-0.07	0.95
	Informal sector	209	67.70	12.86			

Source: Survey data (2023)

The results in Table 12 indicated that there was a difference in the means between males (M=3.86, SD= .70) and females (M= 3.66, SD= .72) in terms of overall interest. The difference was statically significant p= 0.01. Results further indicated that there was a difference in the means between males (M=3.92, SD= .72) and females (M= 3.75, SD= .73) for individual interest. This difference was also statistically significant. P = 0.04. Further, in terms of situational interest, males had a higher mean (M= 3.82, SD= .78) than females (M= 3.58, SD= .82). This difference was statistically significant. P = 0.01. Overall, the results in Table 12 indicated that males had higher interest in Mathematics than females. They also had higher individual and situational interest in Mathematics than females. Results further indicated that there were no significant differences in individual, situational and overall interest regarding parents'/guardians' occupation. The qualitative narratives showed that some females had lower interest because Mathematics was said to be for boys. The narratives further indicated that some students' interest in Mathematics was affected because of their parents'/guardians' occupations

Teachers had this to say;

> *To me gender influences students' interest. Some girls think that math is for boys and relax leaving it for boys. They are in lessons but not minding* (Male teacher 3)

Another teacher said;

> *Also gender bias, some girls have a mentality that girls cannot do math, like here, girls wonder how* (me a female teacher) *I can be good in math* (Female teacher 4).

Regarding parents'/guardians' occupation, one students had this to say;

> *Some students are interested in Mathematics because of the inspiration of their parents and other guardians. Like the father being an engineer.* (Male student 4, FDG 12).

Another student added;

> *I am a bit interested in Mathematics because I want to be a surgeon like my mum. She actually encourages me a lot. Although I find Mathematics hard and I am not performing so well in it.* (Female student 2, 12)

On the same issue, one teacher said;

> *Another thing is the family background for example some parents talk ill about Mathematics because some students say that their parents tell them*

they can't do Mathematics because it is hard and advise them to take easier arts subjects they can pass like them and students take those conceptualizations too which impacts on their Mathematics interest (Male teacher 3)

The above narratives indicated that some students' interest in Mathematics depended on their parents' occupations.

4.3.2.4 Differences in overall interest in Mathematics across, religion, tribe (region), school foundation and location, school type and parents/guardians' occupation. This was investigated using ANOVA. The results are shown in Table 13.

Table 13: ***ANOVA table for differences in overall interest across different demographics***

Demographic	Interest			
Religion	N	Mean	SD	Sig
Catholic	117	67.16	11.89	0.22
Protestant	78	70.44	12.03	
Muslim	76	65.83	15.23	
Pentecostal	52	66.96	12.35	
Adventist	9	69.78	14.44	
Total	332	67.67	12.9	
School type				
Day only	11	67.91	14.54	0.81
Boarding only	120	68.26	13.04	
Mixed day and boarding	201	67.30	12.83	
Total	332	67.67	12.93	
School foundation and location				
Urban-Government	116	68.05	13.32	0.82
Rural-Government	36	66.31	11.79	
Urban-Private	138	68.04	13.40	
Rural-private	42	66.52	11.42	
Total	332	67.67	12.93	
Region				
Central Region	155	67.98	12.70	0.79
Western Region	97	67.53	13.44	
Eastern Region	48	68.31	11.26	
Northern Region	32	65.59	15.08	
Total	332	67.67	12.93	

Source: Survey data (2023)

Results in Table 13 show that there was no statistically significant differences in overall interest among the students across tribe (region), religion, school foundation and location and school type. This implied that students’ tribe, religion, school type like day, boarding and day and boarding or school foundation and location like being in a government school or private, rural or urban did not provide any benefits or cause a deficiency in students' interest in Mathematics.

4.3.2.4 Differences in individual and situational interest in Mathematics across religion, school foundation and location or school type. This was investigated using ANOVA. The results are shown in Table 14.

Table 14:

ANOVA table for differences in individual and situational interest across different demographics

Demographic		Individual interest			Situational interest		
Religion	N	Mean	SD	Sig	Mean	SD	Sig
Catholic	117	30.41	5.56	0.15	36.74	7.32	0.37
Protestant	78	32.05	5.24		38.38	7.78	
Muslim	76	29.71	6.58		36.12	9.43	
Pentecostal	52	30.58	5.80		36.38	7.86	
Adventist	9	30.56	6.26		39.22	9.12	
Total	332	30.67	5.82		36.99	8.09	
School type							
Day only	11	30.46	6.95	0.76	37.45	8.80	0.87
Boarding only	120	30.98	5.54		37.28	8.26	
Mixed day and boarding	201	30.49	5.94		36.81	7.98	
Total	332	30.67	5.82		36.99	8.09	
School foundation and location							
Urban-Government	116	31.10	5.79	0.64	36.96	8.65	0.89
Rural-Government	36	29.89	5.57		36.42	7.28	
Urban-Private	138	30.70	5.96		37.35	8.17	
Rural-private	42	30.07	5.71		36.45	7.03	
Total	332	30.67	5.82		36.10	8.09	
Region							
Central Region	155	30.79	5.59	0.82	37.19	8.046	0.70
Western Region	97	30.86	6.10		36.67	8.36	
Eastern Region	48	30.50	5.34		37.81	7.06	
Northern Region	32	29.78	6.84		35.81	9.07	

Source: Survey data (2023)

Results in Table 14 showed that there were no significant differences in individual interest, situational interest and overall interest in Mathematics across the different demographics. The qualitative results showed that there were no differences in individual or situational interest depending on religion, school type, school foundation and location.

4.3.3 Extent of Self-Regulated Learning in Mathematics

In order to investigate the extent of Self-Regulated Learning, it was hypothesized that; i) *There are differences in Self-Regulated Learning in Mathematics among lower secondary school students.* *T*he extent of Self-Regulated Learning was measured using mean. T-test was used to measure the differences in SRL across the different demographics. A research question for the qualitative study was presented as; "*What differences exist in SRL among lower secondary school students*?" The descriptive narratives where necessary were used to compliment and explain the quantitative results.

4.3.3.1 Extent of Self-Regulated Learning in Mathematics. This was investigated using mean. Overall SRL, cognitive, meta-cognitive and resource management SRL were investigated and extent of use of different Self-Regulated Learning strategies. Scores for the bottom 25% meant low SRL (below 1.25), scores in the middle 50% meant moderate SRL (1.251-3.749) and scores in the upper 75% meant high SRL (3.75-5.0) (Pintrich et al, 1991). The results are shown in Table 15.

Table 15

Extent of Self-Regulated Learning and use of learning strategies

Variable	Minimum	Maximum	Mean	Std. Deviation	Extent
Self-Regulated Learning	2.03	4.88	3.80	.55	High
Cognitive SRL	1.33	4.93	3.75	.62	High
Metacognitive SRL	1.67	5.00	3.85	.76	High
Resource management SRL	1.62	5.00	3.82	.63	High
Rehearsal	1.00	5.00	3.67	.80	Moderate
Elaboration	1.20	5.00	3.87	.76	High
Organization	1.00	5.00	3.81	.98	High
Critical thinking	1.00	5.00	3.67	.81	Moderate
Time and study environment	1.50	5.00	3.90	.86	High
Effort regulation	1.00	5.00	3.88	1.02	High
Peer learning	1.00	5.00	3.80	.84	High
Help seeking	1.25	5.00	3.67	.75	Moderate

Source: Survey data (2023)

Results in Table 15 showed the extent of Self-Regulated Learning and use of different learning strategies. Overall, results showed that students had high Self-Regulated Learning in Mathematics (M=80, 0.55). The mean scores indicated that learners were more Meta-cognitively self-regulated in Mathematics (M= 3.85, SD= 0.55) followed by resource management (M=3.82, SD= 0.63) and cognitive Self-Regulated Learning (M= 3.75, SD= 0.62).

Results further showed that learners highly used all learning strategies apart from rehearsal, critical thinking and help seeking that were used moderately. However, means show that time and study environment were more used than other strategies followed by effort regulation and other strategies followed in the order according to their means. Critical thinking and rehearsal were less used according to the results. Moderate and high results showed that students relied on more than one learning strategy. The qualitative narratives showed that students employed different strategies. However, they revealed that most students used rehearsal, peer learning and help seeking. For example, students said the following;

> *I think through practicing. I think the more you practice the more you become better. So by practicing, someone can be better in Mathematics* (Female student 6, FDG 9)

Another students said;

> *..it is better to discuss with others and make practice daily (*Female student 1, FDG, 3)

While others said;

> *…by practicing Mathematics and introducing new concepts and consulting teachers.* (Female student 2, FDG 1)
>
> *…one should always practice calculating Mathematics number because practice makes perfect (Male).*
>
> *I practice a lot and also try to ask my friends or teachers when I get stuck.* (Female student5, FDG 7).
>
> *In life we have the master mind. This mind is not about one person but it is constructed by many people so I think cooperating with others it can help you to understand more about Mathematics* (Male student 2, FDG 2).

Teachers too said the following;

Students practice a lot, discuss with friends and consult me when they fail to figure out some calculations (Male teacher 6).

Through doing at least a number every day in Mathematics (Male teacher 9).

I always find students in discussions calculating numbers (Female teacher, 10)

The narratives showed that students practice materials they have a lot which indicates rehearsal, making discussions showed that students used peer learning and consulting teachers and fellow students showed help seeking. The narratives further showed that students used more than one strategy.

Students also had the following to say;

> *I think one can do better in Mathematics if he/she gets a comfortable place and revises, and also through going an extra mile like going to the library to research and get more ideas* (Female student 4, FDG 10).

Another student said;

> *For me when I read something and I don't understand it I go to the internet and look for it. My dad has taught me how to use you tube.* (Female student 4, FDG 8)

Another student said;

> *I think the best way to revise math is like use internet. it would be better if the school has internet, so when you learn about something and you don't get it, you go and get more information about it. It can easily stick in your head* (Female student 5, FDG 6).

Teachers also said;

> *Students say they can't revise Mathematics from their class where there is noise, they look for a quiet place to read from* (Male teacher, 8).

Another one said;

> *Searching notes from the library. Teacher give a small percentage. The biggest percentage should be by the student.* (Male teacher 1*)*

The narratives indicated that students regulated their time and study environment well by getting a quiet place to revise from, used elaboration through supplementing on class notes and had metacognitive self-regulation because they could figure out when they did not understand something and figured out another way to read it. The narratives also revealed that students employed more than one strategy depending on the task.

4.3.3.2 Differences in SRL in Mathematics according to gender, school foundation and location. This was investigated using t-test. The overall SRL, cognitive, meta-cognitive and resource management SRL were investigated across the different demographics. Results are in Table 16

Table 16

t-test results for Overall SRL, cognitive SRL, meta-cognitive SRL and Resource management SRL across different demographics

Comparison variables	Gender	Mean	SD	F	T	P
Self-Regulated Learning	Male	3.80	.55	0.14	0.41	0.69
	Female	3.78	.56			
Cognitive SRL	Male	3.79	.59	1.08	1.16	0.25
	Female	3.71	.64			
Metacognitive SRL	Male	3.84	.77	0.18	0.13	0.89
	Female	3.85	.74			
Resource management SRL	Male	3.81	.63	0.35	0.31	0.76
	Female	3.83	.64			
			School type			
Self-Regulated Learning	Government aided	3.83	.57	0.91	0.91	0.33
	Private	3.77	.54			
Cognitive SRL	Government aided	3.79	.57	1.16	1.05	0.3
	Private	3.72	.65			
Metacognitive SRL	Government aided	3.84	.80	2.79	0.77	0.29
	Private	3.86	.71			
Resource management SRL	Government aided	3.87	.68	3.45	1.19	0.24
	Private	3.78	.59			
			School location			
Self-Regulated Learning	Urban	3.80	.58	2.92	0.17	0.86
	Rural	3.79	.45			
Cognitive SRL	Urban	3.76	.64	3.57	1.02	0.31
	Rural	3.74	.54			
Metacognitive SRL	Urban	3.87	.77	0.42	-0.38	0.70
	Rural	3.7	.72			
Resource management SRL	Urban	3.81	.67	4.97	0.17	0.86
	Rural	3.85	.53			
		Parents'/guardians' occupation				
Self-Regulated Learning	Formal sector	127.94	19.14	0.04	-0.87	0.39
	Informal sector	129.79	18.61			
Cognitive SRL	Formal sector	55.64	9.41	0.02	-1.02	0.31
	Informal sector	56.71	9.19			
Metacognitive SRL	Formal sector	22.83	4.70	0.38	-0.87	0.42
	Informal sector	23.25	4.44			
Resource management SRL	Formal sector	49.46	8.59	0.443	-3.97	0.69
	Informal sector	49.83	8.07			

Source: Survey data (2023)

Results in Table 16 show the extent of Self-Regulated Learning according to the different demographics. Results indicate that there were no significant differences in Self-regulated learning, cognitive SRL, meta-cognitive SRL and resource management SRL across gender, school type and school location and parents'/guardians' occupation. This implies that one's gender, parents'/guardians' occupation, location of the school or type does not hinder or improve the development of SRL. The qualitative narratives did not show any differences in SRL or use of different learning strategies depending on any of the demographics.

Table 17

ANOVA results for differences in Overall SRL, cognitive SRL, meta-cognitive SRL and Resource management SRL across different school types

	School Type	N	Mean	SD	P
SRL	Day only	11	123.64	14.34	0.49
	Boarding only	120	128.36	21.25	
	Mixed day and boarding	201	129.85	17.42	
	Total	332	129.11	18.80	
Cognitive SRL	Day only	11	52.27	8.40	0.16
	Boarding only	120	55.62	10.08	
	Mixed day and boarding	201	56.96	8.75	
	Total	332	56.32	9.27	
Metacognitive SRL	Day only	11	22.73	3.69	0.84
	Boarding only	120	23.28	4.70	
	Mixed day and boarding	201	23.01	4.489	
	Total	332	23.10	4.53	
Resource management SRL	Day only	11	48.64	8.45	0.83
	Boarding only	120	49.46	9.15	
	Mixed day and boarding	201	49.89	7.69	
	Total	332	49.69	8.25	

Source: Survey data (2023)

Results in Table 17 showed that there were no significant differences in Self-Regulated Learning depending on whether a student was in day, boarding or mixed day and boarding school. The qualitative narratives did not show any differences in SRL or use of different learning strategies depending on the school type.

4.3.4 Perceived use of teaching strategies in Mathematics

In order to investigate perceived use of teaching strategies, it was hypothesized that; i) *There are differences in the perceived use of teaching strategies in Mathematics among lower secondary school students.* Perceived use of different teaching strategies was measured using mean and standard deviation. t-test was used to test for differences in perceived use of teaching strategies in different school types. A research question for the qualitative study was presented as; "*What differences exist in the perceived use of different teaching strategies in Mathematics at lower secondary level*?" The descriptive narratives were used to compliment and explain the quantitative results. Teacher-centred strategies, learner centred strategies and student-teacher interactive strategy were investigated and use of different teaching methods. The scores were interpreted as follows; 1-1.79 (very low), 1.80-2.59 (low), 2.60-3.39 (average), 3.40-4.19 (Very high), 4.20-5.00 (high) Costa, (2014).

Table 18

Perceived use of different teaching strategies and methods while teaching Mathematics

Variable	Minimum	Maximum	Mean	Std. Deviation	Use of the strategy
Learner-centred strategies	1.79	4.93	3.65	.56	High
Student-teacher interactive strategies	1.70	4.94	3.65	.55	High
Teacher-centred strategy	1.00	5.00	3.70	.74	High
Demonstration	1.00	5.00	3.80	.67	High
Problem solving	1.60	5.00	3.68	.75	High
Project method	1.60	5.00	3.67	.68	High
Inquiry method	1.00	5.00	3.83	.75	High
Cooperative learning	1.00	5.00	3.75	.79	High
Use of audio-visual aids	1.00	5.00	3.16	.96	Average

Source: Survey data (2023)

Results in Table 18 showed that learners perceived their teachers to use learner-centred and student-teacher interactive strategies (M=3.65, 0.55) equally but teacher-centred strategies were more used (M=3.70, 0.55). Mean results above 3 showed that students perceived their teachers to use all strategies highly. Results further showed that inquiry method was more used (M=3.83, 0.75) followed by demonstration (M=3.80, 0.67) and the least used method was use of audio-visual aids (M=3.16, 0.96). The qualitative narratives showed that students perceived their teachers to use different teaching strategies and methods.

The different students had this to say;

> *Some teachers come to class knowing that these students hate Mathematics and they perform very poorly in Mathematics, no improvement is being made, teacher comes, gives work, leaves, teacher comes gives tests, yes tests,*

still failing, give work leaves, again gives work, leaves. (Male student 3, FDG 3).

Another student said

Some teachers are too talkative. Instead of teaching, they can just talk, instead of going an extra mile to explain the concept for us to get it, they just talk and talk. Plus sometimes some teachers are too speedy like some teachers in math they can give the concept and the teacher is like, hurry and work out this, but for you, you are back and you fail to catch up with him. Eventually you relax and let him continue with others following (Female student 1, FDG 1)

Another student said;

Some teachers when they are teaching and one student shows that he/she have understood, they leave the topic and asks you to continue yet there are those who may not have understood. If you try one number and fail, you lose morale. For me I prefer when the teacher does the hard calculations instead of giving them to us as an exercise (Male student 5 FDG 10)

On the same issue, another student said;

Like, some teachers tend to cater/mind about those ones who perform best leaving out the other ones that perform poorly. But the ones who perform poorly need more attention but concentrate on only the good performers who do the subjects well so that they can improve their marks yet what they should do is to concentrate on the other ones who are backward so that they *can also improve their marks. So they go with only that understand what they are teaching* (Female student, FDG 8)

The narratives showed that some teachers used teacher-centred strategies

Teachers also had this to say;

Some teachers just project yet for us we believe that math should be calculated you find a teacher comes with a projector and just points this one should be done like this and this one like this and most of the learners are not following. At the end of the day the learners fail. And lose the morale of doing Mathematics (Male teacher 3).

Another teacher said;

…if I am overqualified, I cannot go for a low pace job. If you are on masters I don't advise you to go for secondary teaching. These guys think everyone knows everything, a teacher comes to teach and assumes everyone knows, jumps like five steps and then expect students to figure out everything. I think teachers should bring themselves to the level of the learners, assume that you are the one learning but over weighing yourself and assume everything is normal all students are the same, you leave out many students.(Male teacher, 1)

The narratives indicated that teachers used teacher-centred strategies to teach Mathematics

Other students said the following

Teacher tells us to be in groups and then teach us. This has helped me pick interest in Mathematics because when I fail I ask my friends to help me out (Female student 1, FDG 8).

The narrative showed that teachers use cooperative learning method under the learner-centred strategy

Teachers tell us to present our findings (Female student 6, FDG 5)

The narrative showed that teachers used the demonstration method and students demonstrated their findings.

Other students had this to say;

> *In some calculations teacher tells us to look for raw materials and solve them for better understanding. That has helped me become more interested because I see how I can apply Mathematics in real life* (Male student 3, FDG 9).

> *Teachers give us assignments to search such that we can understand* (Female student 4, FDG 8).

> *Different teachers teach differently, some calculate numbers on the chalkboard and ask learners to also calculate but some do all the calculations themselves. Some teachers do modelling for example our teacher told us to make a pyramid using sticks and banana fibres. So that model helped us recognize the angles* (Female student 4, FDG 8)

The narratives showed that teachers used project method while teaching which was learner-centred.

Further, one teacher said the following;

> *..Different methods of teaching are used because each method has its advantages and disadvantages. The teachers should know which method is to be used and at what time and which learners. Otherwise, there is no very bad or very good method. Actually teachers should not be tied by one method. So if a teacher is going to teach, he or she should figure out the right method to use and how it will help him achieve the set targets. Like according to the topic to be taught or according to the learner. Some learners if you tell them to go and research about something they will not, they will wait for you to come to class and do the calculations for them* (Male teacher 1).

The narrative indicated that teachers integrated different methods while teaching (student-teacher interactive strategies)

Generally, the narratives showed that teachers used all the strategies while teaching Mathematics.

4.3.4.1 Differences in the extent of use of different teaching strategies while teaching Mathematics by school foundation and location, and school type. This was investigated using t-test. Teacher centred, learner-centred, student-teacher interactive strategies across the different demographics were investigated. Results are in Table 19.

Table 19

t-test results for different teaching strategies across the different school types

Comparison variables	School type	Mean	SD	F	t	P
Learner-centred strategies	Government aided	3.64	.60	1.70	-0.32	0.75
	Private	3.66	.53			
Student-teacher interactive strategies	Government aided	3.64	.59	1.01	-0.15	0.88
	Private	3.65	.52			
Teacher-centred strategies	Government aided	3.68	.75	0.16	-0.85	0.40
	Private	3.61	.74			
			School location			
Learner-centred strategies	Urban	3.60	.58	3.65	-2.66	0.01
	Rural	3.79	.48			
Student-teacher interactive strategies	Urban	3.61	.57	2.98	-2.42	0.02
	Rural	3.78	.46			
Teacher-centred strategies	Urban	3.63	.77	1.61	-0.31	0.75
	Rural	3.67	.66			

Source: Survey data (2023)

Results in Table 19 showed that there were no significant differences in the perceived use of teaching strategies across different school types of government aided or private. Results further indicated that there were significant differences in the perceived use of learner centred strategies and student-teacher interactive strategies depending on school location. Students perceived their teachers to use learner-centred strategies more in rural schools (M= 3.79, P=0.01) as compared to urban schools. Rural schools were also perceived to use student-teacher interactive strategies more than in urban schools (M=3.78, P=0.02). Qualitative results did not reveal any differences in teaching strategies across the different schools.

Table 20

ANOVA results for differences in teaching strategies across different school types

Teaching strategies	School Type	N	Mean	SD	P
Teacher-centred strategies	Day only	11	13.73	1.56	0.62
	Boarding only	120	14.54	3.11	
	Mixed day and boarding	201	14.63	2.96	
	Total	332	14.57	2.98	
Learner-centred strategies	Day only	11	96.00	14.84	0.09
	Boarding only	120	105.02	16.59	
	Mixed day and boarding	201	106.78	16.22	
	Total	332	105.79	16.39	
Student-teacher interactive strategies	Day only	11	109.73	15.49	0.10
	Boarding only	120	119.57	18.70	
	Mixed day and boarding	201	121.41	18.03	
	Total	332	120.36	18.28	

Source: Survey data (2023)

Results in Table 20 showed that there were no significant differences in the perceived use of different teaching strategies according to either being in a day school, boarding school or mixed day and boarding school. Qualitative narratives also did not give any difference in the perceived use of teaching strategies basing on demographics.

4.3.5 The Mediation effect of interest on the relationship between mindset and Self-Regulated Learning

Baron and Kenny (1986) propose a mediation model with three variables and paths a, b, and c. For a variable to serve as a mediator, it must satisfy the following criteria.

1. Differences in the levels of the independent variable are significantly associated with differences in the assumed mediator (Path a).

2. Changes in the mediator account for substantial changes in the dependent variable (path b).

3. When controlling paths a and b, the previously significant relationship between the independent and dependent variables becomes non-significant if path c is either reduced or remains significant. Path C shows one mediator when it is zero.

For the mentioned conditions to be met, it required that variables were significantly correlated. Pearson correlation was therefore run to establish relationships between the variables. Mindset was tested as fixed and growth mindset. And therefore, correlation ran for the fixed and growth mindset on individual interest, situational interest, overall interest, overall Self-Regulated Learning, cognitive Self-Regulated Learning, meta-cognitive Self-Regulated Learning, and resource management Self-Regulated Learning. The results are presented in Table 21

Table 21

Correlation results for the variables

	Growth mindset	Fixed mindset	Individual interest	Situational interest	Overall interest	SRL	Cognitive SRL	Metacognitive SRL	Resource management SRL
Growth mindset	1								
Fixed mindset	-.551**	1							
Individual interest	.180**	-.023	1						
Situational interest	.173**	-.030	.722**	1					
Overall interest	.189**	-.029	.901**	.950**	1				
Self-regulated Learning	.187**	-.043	.405**	.472**	.477**	1			
Cognitive SRL	.158**	-.016	.412**	.421**	.449**	.873**	1		
Metacognitive SRL	.140*	-.070	.326**	.409**	.403**	.790**	.561**	1	
Resource management SRL	.172**	-.042	.279**	.377**	.361**	.863**	.557**	.620**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Source: Survey data (2023)

Results in Table 21 showed that there were significant relationships between different variables. However, fixed mindsets did not significantly relate with any variable and therefore they were not included in mediation analysis.

The last condition for significant mediation to hold was that the boot strap confidence interval did not have to contain a zero. Mediation analysis was tested with Hayes Process version 4.2. This was chosen because, the bootstrapping technique was less susceptible to outliers and non-normality of the data. In 95% of samples, the 95% confidence intervals contained the true value of the parameter. As a result, it was presumed that the sample, which was used to estimate the population value of an effect, was not one of the 5% that did not represent the true value. Since b = 0 would indicate that there was no effect, the fact that the confidence interval did not include zero indicated that there was probably a real indirect effect. Thus, the interval between BootLLCI and BootULCI should not contain zero.

In order to investigate the mediation effect of interest on the relationship between growth mindset and SRL, it was hypothesized that interest mediates the relationship between growth mindset and SRL and 12 sub hypotheses were tested; i) *Interest mediates the relationship between a growth mindset and SRL*, ii) *Interest mediates the relationship between a growth mindset and Cognitive SRL*, iii) *Interest mediates the relationship between a growth mindset and meta-cognitive SRL*, iv) *Interest mediates the relationship between a growth mindset and Resource management*, v) *Individual Interest mediates the relationship between a growth mindset and SRL*, vi) *Individual Interest mediates the relationship between a growth mindset and cognitive SRL*. vii) *Individual Interest mediates the relationship between a growth mindset and meta-cognitive SRL*, viii) *Individual Interest mediates the relationship between a growth mindset and resource management*, ix) *Situational Interest mediates the relationship between a growth mindset and SRL*, x) *Situational Interest mediates the relationship between a growth mindset and cognitive SRL*, xi) *Situational Interest mediates the relationship between a growth mindset and meta-cognitive SRL*, xii) *Situational Interest mediates the relationship between a growth mindset and resource management*. Regression models using Process macro for SPSS version 4.2 (Hayes) were used to analyse the hypotheses. Results are shown in tables 22- 25 and figures 4- 7. Additional results for the sub hypotheses are presented in tables 29-36 and figures in 11-18 in the additional analysis section

4.3.5.1 The mediation effect of interest on the relationship between growth mindset and SRL. The results are presented in Table 22 and figure 4.

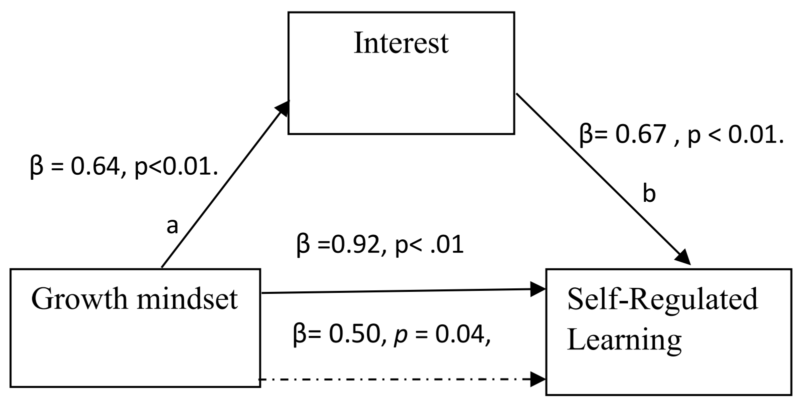
Table 22

Mediation effect of interest on the relationship between growth mindset and SRL

Model	Outcome variable	Independent variable	β	t	P	R	R^2	F	SE	LLCI	ULCI
1	Interest	Growth mindset	0.64	3.50	<. 01	0.19	0.04	12.21	0.18	0.28	1.00
2	SRL	Growth mindset	0.50	2.05	0.04	0.49	0.24	50.59	0.24	0.02	0.97
		Interest	0.67	9.34	<. 01				0.07	0.53	0.81
3	SRL	Growth mindset	0.92	3.46	<. 01	0.19	0.04	11.96	0.27	0.40	1.45
4	a*b		0.42							0.14	0.73

Source, survey data (2023)

From Table 22, Model 1 indicated that growth mindset positively (+β) and significantly predicted interest (a path), β = 0.64, t=3.50, p <. 01. The R^2 indicated that growth mindset explained the 4% of the variance in interest. Model 2 showed the results of the regression of SRL predicted from both growth mindset and interest. Growth mindset significantly predicted SRL with reduced effect with interest in the model (Paths c’), β= 0.50, t=2.05, *p* = 0.04, and interest significantly predicted Self-Regulated Learning (b path), β= 0.67, *t* = 3.46, p < 0.01. The R^2 value indicated that the model explained 24% of the variance in SRL. Model 3 showed the total effect of growth mindset on Self-Regulated Learning when interest was not present in the model. When interest was not in the model, growth mindset significantly predicted Self-Regulated Learning, β =0.92, t =9.34, p =0.00. The R^2 value indicated that mindset explained 4% of the variance in SRL. So when interest was added in the model, the effect of the growth mindset on SRL increased from 4% to 24%. The indirect effect (a*b) was significant because the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI of 0.14-0.73. Therefore, interest mediated growth Mindset and SRL. Therefore, the hypothesis that interest mediates the relationship between growth mindset and Self-Regulated Learning was retained. Figure 4 shows paths a, b, c and c' and their effect sizes.



Source: survey data, (2023)

Figure 4. *Mediation effect of interest on the relationship between growth mindset and SRL*

The results in Figure 4 indicated that "a" and "b" paths coefficients were both statistically significant. Using bias-corrected bootstrapping, the indirect effect BootLLCI and BootULCI were 0.14 and 0.73. Since they did not contain zero, there was a statistically significant mediation. The indirect effect being statistically significant implied partial mediation. Therefore, interest partially mediated the relationship between growth mindset and SRL. This implied that mindset and interest together played an important role in influencing students' SRL in Mathematics.

4.3.5.2 The mediation effect of interest on the relationship between growth mindset and cognitive SRL. The results are presented in Table 23 and figure 5.

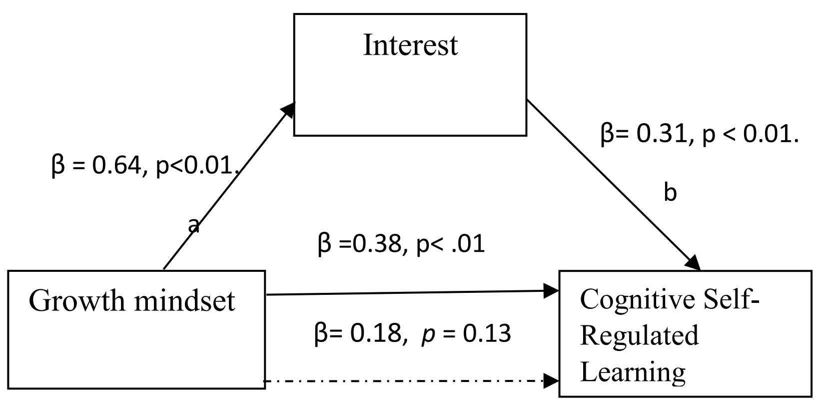
Table 23

Mediation effect of interest on the relationship between growth mindset and cognitive SRL

Model	Outcome variable	Independent variable	β	t	P	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Interest	Growth mindset	0.64	3.50	< .01	0.19	0.04	12.21	0.18	0.28	1.00
2	Cognitive SRL	Growth mindset	0.18	1.58	0.13	0.46	0.21	42.87	0.12	-0.06	0.42
		Interest	0.31	8.69	< .01				0.04	0.24	0.38
3	Cognitive SRL	Growth mindset	0.38	2.90	< .01	0.16	0.03	8.42	0.13	0.12	0.64
4	a*b		0.20							0.06	0.35

Source: Survey data (2023)

From Table 23, Model 1 indicated that there was a significant positive predictive effect of a growth mindset (+β) on interest (path a), β = 0.64, t=3.50, p < .01. The R^2 showed that a growth mindset accounted for 4% of the variance in interest. Model 2 showed the results of the regression of cognitive Self-Regulated Learning predicted from both growth mindset and interest. Interest significantly predicted cognitive Self-Regulated Learning (b path), β= 0.31, *t* = 8.69, p < 0.01 although growth mindset did not significantly predict cognitive Self-Regulated Learning with interest in the model (Paths c'), β= 0.18, t=1.58, $p = 0.13$. The R^2 value indicated that the model explains 21% of the variance in cognitive Self-Regulated Learning. Model 3 showed the total effect of growth mindset on cognitive Self-Regulated Learning when interest was not included in the model. When interest was not in the model, growth mindset significantly predicted cognitive Self-Regulated Learning, β =0.38, t =2.90, $p < .01$. The R^2 value indicated that mindset explains 3% of the variance in cognitive Self-Regulated Learning. So when interest was added in the model, the effect of the growth mindset on cognitive Self-Regulated Learning increased from 3% to 21%. The indirect effect (a*b) was significant because the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI, 0.06-0.35. Therefore, interest mediated growth mindset and cognitive Self-Regulated Learning. Therefore, the hypothesis that interest mediates the relationship between a growth mindset and cognitive SRL was retained. Figure 5 shows paths a, b, c and c' and their effect sizes.



Source: Survey data (2023)

Figure 5. ***Mediation effect of interest on the relationship between growth mindset and cognitive SRL***

Figure 5 results showed statically significant coefficients of paths “a” and “b”. The bias-corrected bootstrapping, intervals in table 23 (BootLLCI and BootULCI) are 0.06 and 0.35. Since the confidence interval did not include zero, it implied that there was mediation and because the indirect effect was not significant it implied full mediation. Therefore, interest fully mediated the relationship between growth mindset and cognitive Self-Regulated Learning. This implied that a growth mindset worked better in predicting students’ cognitive Self-Regulated Learning when learners had interest in Mathematics.

4.3.5.3 The mediation effect of interest on the relationship between growth mindset and Meta-cognitive SRL. The results are presented in Table 24 and figure 6.

Table 24

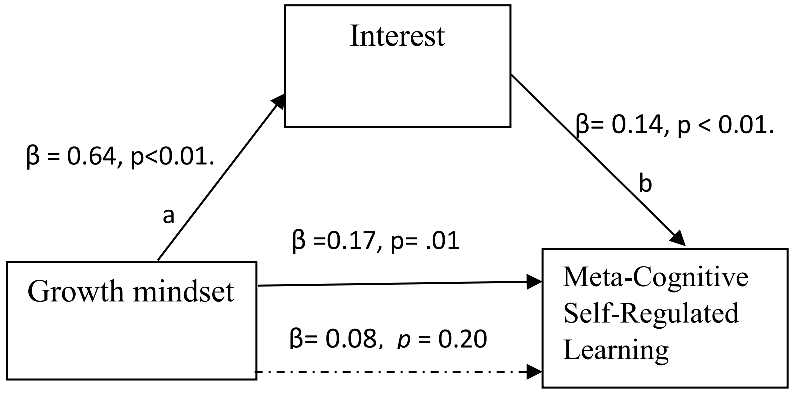
Mediation effect of interest on the relationship between growth mindset and Meta-cognitive SRL

Model	Outcome variable	Independent variable	β	T	P	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Interest	Growth mindset	0.64	3.50	< .01	0.19	0.04	12.21	0.18	0.28	1.00
2	Meta-Cognitive Self-Regulated Learning	Growth mindset	0.08	1.30	0.20	0.41	0.17	33.1	0.06	-0.04	0.20
		Interest	0.14	7.61	< .01				0.17	0.10	0.17
3	Meta-Cognitive Self-Regulated Learning	Growth mindset	0.17	2.57	0.01	0.14	0.02	6.61	0.07	0.03	0.15
4	a*b		0.09							0.03	0.15

Source: Survey Data (2023)

According to results in Table 24, there was a significant positive predictive effect of growth mindset on interest as shown by model 1 (path a) +β = 0.64, t=3.50, p < .01. The R^2 of 0.04 showed that a growth mindset explains 4% of the variation in interest. Further, Model 2 showed the results of the regression of meta-cognitive Self-Regulated Learning on both growth mindset and interest. Paths c' showed a non-significant predictive effect of a growth mindset on meta-cognitive SRL with interest in the model β= 0.08, t=1.30, *p* = 0.20. However, interest significantly predicted meta-cognitive Self-Regulated Learning (b path), β= 0.14, *t* = 7.61, p < 0.01. The R^2 value indicated that both mindset and interest explained 17% of the variance in meta-cognitive Self-Regulated Learning.

Then, Model 3 showed that a growth mindset significantly predicts meta-cognitive Self-Regulated Learning when interest was not present in the model, β =0.17, t =2.57, p =0.01. The R^2 value showed that a growth mindset explained 2% of the variation in meta-cognitive Self-Regulated Learning. Therefore, when interest was added in the mediation model, the effect of the growth mindset on meta-cognitive Self-Regulated Learning increased from 2% to 17%. The indirect effect (a*b) was significant because the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI, 0.03-0.15. Interest therefore mediated growth mindset and meta-cognitive Self-Regulated Learning. The hypothesis that interest mediates the relationship between growth mindset and cognitive SRL was therefore upheld. The different paths are explained by figure 6.



Source: Survey data (2023)

Figure 6. ***Mediation effect of interest on the relationship between growth mindset and Meta-cognitive SRL***

Figure 6 showed that paths "a" and "b" coefficients were both statistically significant and basing on the bias-corrected bootstrapping, confidence interval of (BootLLCI and BootULCI) of 0.03 and 0.15 from table 51 that did not contain zero, there was significant mediation. Since the indirect effect was not statistically significant, it implied full mediation. Therefore, interest fully mediated the relationship between growth mindset and meta-cognitive Self-Regulated Learning. Full mediation therefore implied that a growth mindset explained meta-cognitive Self-Regulated Learning through interest in Mathematics.

4.3.5.4 The mediation effect of interest on the relationship between growth mindset and Resource management. The results are presented in Table 25 and figure 7.

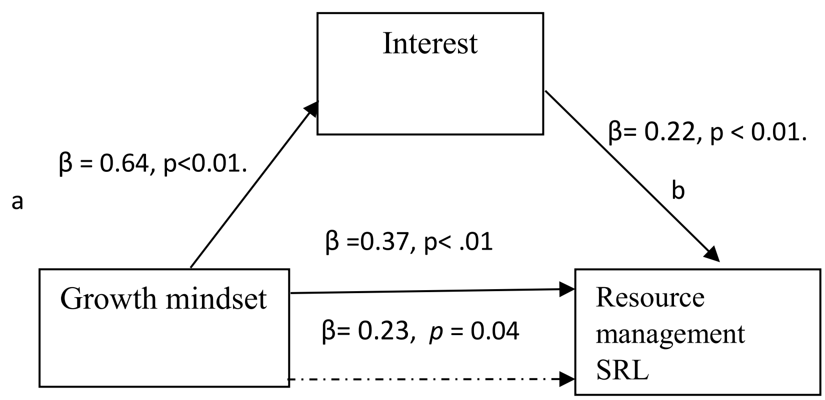
Table 25

Mediation effect of interest on the relationship between growth mindset and Resource management

Model	Outcome variable	Independent variable	β	t	P	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Interest	Growth mindset	0.64	3.50	< .01	0.19	0.04	12.21	0.18	0.28	1.00
2	Resource management	Growth mindset	0.23	2.10	0.04	0.38	0.14	27.16	0.11	0.01	0.46
		Interest	0.22	6.50	< .01				0.03	0.15	0.28
3	Resource management	Growth mindset	0.37	3.17	< .01	0.17	0.03	10.06	0.12	0.14	0.60
4	a*b		0.14							0.04	0.25

Source: Survey Data (2023)

From Table 25, Model 1 indicated that growth mindset positively and significantly predicted interest (a path), +β = 0.64, t=3.50, p < .01. A growth mindset explained a variance of 4% in interest according to the R^2 value. According to Model 2 a combined effect of both growth mindset and interest showed that, a growth mindset significantly predicted resource management with reduced effect when interest was added in the model (Paths c'), β= 0.23, t=2.10, *p* = 0.04, and interest significantly predicted resource management (b path), β= 0.22 , *t* = 6.50, p < .01. Model 2 further showed that both a growth mindset and interest explained 14% variance in resource management. Model 3 showed the total effect of growth mindset on resource management when interest was not present in the model. When interest was not in the model, mindset accounted for only 3% variation in resource management, β =0.37, t =3.17, p < .01. Therefore when interest was added in the model, the effect of the growth mindset on resource management changed from 3% to 14%. Because the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI of 0.04 and 0.25, the indirect effect (a*b) was significant. Interest further played a partial mediation role between a growth mindset and resource management because the indirect effect was significant. Therefore, the hypothesis that interest mediates the relation between growth mindset and resource management was retained. Paths effects are illustrated in figure 7.



Source: Survey data (2023)

Figure 7. ***Mediation effect of interest on the relationship between growth mindset and resource management***

The results in Figure 7 indicated that "a" and "b" path coefficients were both statistically significant. The indirect effect too was statistically significant which implied a partial mediation. Therefore, interest partially mediated the relationship between growth mindset and resource management. This implied that a growth mindset explains students' ability to manage resources in Mathematics learning directly and through interest.

4.3.6 The Moderation effect of teaching strategies on the relationship between mindset and Self-Regulated Learning

In order to investigate the moderation effect of teaching strategies on the relationship between growth mindset and SRL, it was hypothesized that teaching strategies moderate the relationship between growth mindset and SRL. A fixed mindset was excluded because correlation results showed that a fixed mindset was not related to SRL and all the models involving the fixed mindset were non-significant. Therefore 12 sub-hypotheses involving the growth mindset were tested;

i) *Learner-centred strategies moderate the relationship between a growth mindset and SRL*, ii) *Learner-centred strategies moderate the relationship between a growth mindset and Cognitive SRL,* iii) *Learner-centred strategies moderate the relationship between a growth mindset and meta-cognitive SRL*, iv) *Learner-centred strategies moderate the relationship between a growth mindset and Resource management*, v) *Teacher-centred strategies (Lecture method) do not moderate the relationship between a growth mindset and SRL*, vi) *Teacher-centred strategies (Lecture method) do not moderate the relationship between a growth mindset and cognitive SRL*. vii) *Teacher-centred strategies (Lecture method) do not moderate the relationship between a growth mindset and meta-cognitive SRL*, viii) *Teacher-centred strategies (Lecture method) do not moderate the relationship between a growth mindset and resource management*, ix) *Student-teacher interactive* *strategies moderate the relationship between a growth mindset and SRL*, x) *Student-teacher interactive strategies moderate the relationship between a growth mindset and cognitive SRL*, xi) *Student-teacher interactive strategies moderate the relationship between a growth mindset and meta-cognitive SRL*, xii) *Student-teacher interactive strategies moderate the relationship between a growth mindset and resource management*. Regression models using Process macro for SPSS version 4.2 (Hayes) was used to analyse the hypotheses. The results are shown in tables 26-28 and figures 8-10. Additional results for the sub hypotheses are presented in tables 37-45 and figures in 19-27 in the additional analysis section

4.3.6.1 The moderation effect of learner-centred strategies on the relationship between growth mindset and SRL. Table 26 and figure 8 present the results.

Table 26

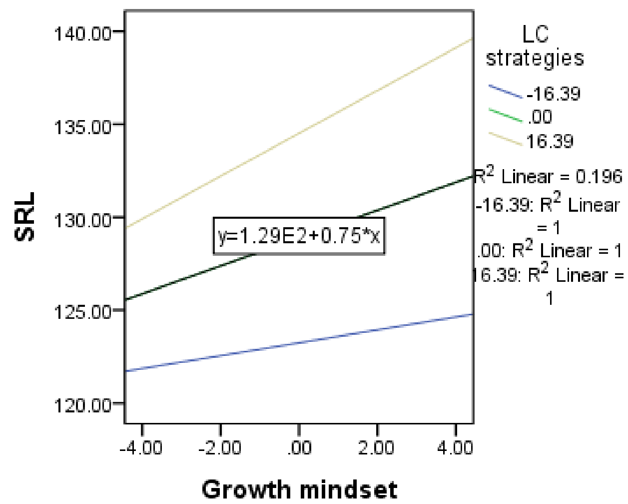
Moderation effect of learner-centred strategies on the relationship between growth mindset and SRL

Model	Outcome variable	Independent variable	β	SE	T	P	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 15.34, p= < .01, $R^2 = 0.12$								
2	SRL	Growth Mindset	0.75	0.26	2.89	< .01		0.24	1.26
		LC-Teaching strategies	0.34	0.06	5.65	< .01		0.22	0.46
		Interaction	0.03	0.01	1.94	0.05	0.01	-0.0004	0.05
3	LC-Teaching strategies	Growth Mindset							
	-16.39		0.34	0.32	1.07	0.28		-0.29	0.98
	0.00		0.74	0.26	2.89	< .01		0.24	1.26
	16.39		1.15	0.34	3.37	< .01		0.48	1.82

Source: Survey data (2023)

From Table 26, model 1 represented the overall model and it was statistically significant F= 12.72, $R^2 = 0.12$ $p < .01$. Model 2 showed that the regression of growth mindset and SRL was statistically significant, β= 0.75, t=2.89, p< .01. The regression of learner-centred teaching strategies and SRL was also statistically significant β= 0.34, t= 5.65, p< .01. The R^2 value indicated that there was a 1% variance explained by adding the interaction term to the model. However, the overall interaction effect was not statistically significant because the bootstrap confidence interval contains a zero (BootLLCI and BootULCI) -0.0004 and 0.05, β= 0.03, t= 1.94, p= 0.05. Therefore, Learner-centred teaching strategies did not significantly moderate the relationship between growth mindset and SRL. While the overall model was predictive ($R^2 = 0.12$), it could not be said that Learner-centred strategies moderated the predictive relationship between growth mindset and SRL for the entire population of subjects in this study. In this case the hypothesis that learner-centred strategies moderate the relationship between a growth mindset and SRL was rejected. However, the conditional effects showed some moderation effects. This is shown in model 3.

The Johnson-Neyman region was used to probe for interaction and to identify ranges of values of the moderator for which the interaction effect is significant. The region indicated that at very low levels of use of learner-centred strategies, the effect of growth mindset on SRL was not significant and vice versa. The region of significant moderation ranged from -8.54; β= 0.54, t=1.97, p=0.05, BootLLCI and BootULCI= > .00- 1.08 to 37.2; β= 1.66, t=3.01, p <.01 BootLLCI and BootULCI= 0.58- 2.75 values of LCTS (in z scores). The general increase in the conditional effect indicated that the lower the use of learner-centred strategies, the less effect of growth mindset on SRL in Mathematics and vice versa (Appendix A). The moderation effect is graphically presented in Figure 8



Source: Survey data (2023)

Figure 8. ***Moderation effect of learner-centred strategies on the relationship between growth mindset and SRL***

Figure 8 showed the simple slopes for the relationship and interaction. At low levels of use of learner-centred teaching strategies, SD= -16.39, the effect of the growth mindset on SRL was not significant, β= 0.34, t=1.07 p= 0.28 BootLLCI and BootULCI is -0.29 and 0.98 at a moderate value of learner-centred teaching strategies, SD=00, the effect of growth mindset on SRL was significant and increased β= 0.74, t=2.89, p< .01, BootLLCI and BootULCI is 0.24 and 1.26 and on high levels of the effect of learner-centred teaching strategies, SD=16.39, the effect of mindset on SRL increases β= 1.15, t=3.37, p< .01 BootLLCI and BootULCI is 0.48 and 1.82. The SRL scores diverged from growth mindset scores at different levels of use of learner-centred strategies but since the interaction effect was not significant, it could not be said that the predictive change was brought about by the moderator, so there was no moderation.

4.3.6.2 The moderation effect of teacher-centred strategies on the relationship between growth mindset and SRL. Table27 and figure 9 present the results.

Table 27

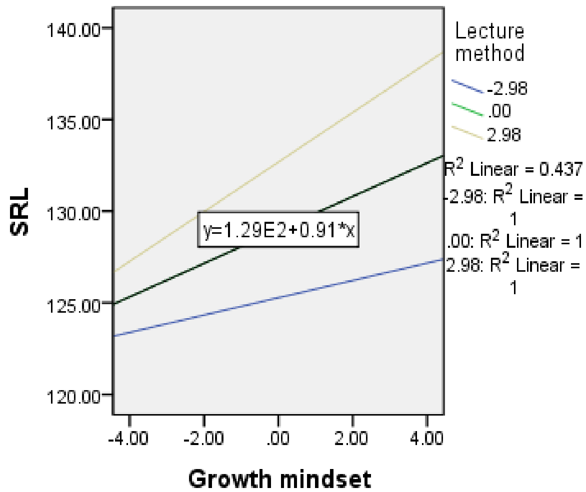
Moderation effect of teacher-centred strategies on the relationship between growth mindset and SRL

Model	Outcome variable	Independent variable	β	SE	t	P	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 9.32 $R^2 = 0.08$, $p < .01$								
2	SRL	Growth Mindset	0.91	0.26	3.46	p< .01		0.39	1.43
		Teacher-centred strategies	1.24	0.34	3.66	p< .01		0.58	1.91
		Interaction	0.15	0.07	1.99	0.05	0.01	0.002	0.29
3	Teacher-centred strategies	Growth Mindset							
	-2.98		0.47	0.33	1.45	0.15		-0.17	1.11
	0.00		0.91	0.26	3.46	p< .01		0.39	1.43
	2.98		1.35	0.36	3.74	p< .01		0.64	2.07

Source: Survey data (2023)

From Table 27, model 1 showed that the overall model was statistically significant F= 9.32, $R^2 = 0.08$, $p < .01$. Model 2 showed that the regression of SRL on the growth mindset and teacher-centred teaching strategies were all statistically significant, β= 0.91, t=3.46, p < .01 and β= 1.24, t= 3.66, p< .01 respectively. The R^2 value indicated that by adding the interaction term to the model, there was a 1% variance in SRL. The overall interaction effect was also statistically significant β= 0.05, t= 1.99, p< .05 because the bootstrap confidence interval contains did not contain zero (BootLLCI and BootULCI) (0.002 and 0.29). Therefore, teacher-centred teaching strategies significantly moderated the relationship between growth mindset and SRL. The hypothesis that teacher-centred strategies did not moderate the relationship between a growth mindset and SRL in this case it was rejected. As shown by Positive t (1.99) of the interaction effect teacher-centred teaching strategies positively increased the effect of growth mindset on SRL. This implied that the more teachers applied teacher-centred teaching strategies in their Mathematics teaching, the more the change in learners' growth mindset and more Self-Regulated Learning. The conditional effects also showed the moderation effects. This is illustrated in model 3 and figure 9

The Johnson-Neyman region enabled the identification of interaction and ranges of values of the moderator for which the interaction effect is significant. The region shown in Appendix A as ranging from -2.24, β= 0.58, t=1.97, p=0.05, BootLLCI and BootULCI (>0.00-1.17), to 5.43, β= 1.72, t=3.40, p <.01 BootLLCI and BootULCI (0.72- 2.71) values of teacher-centred teaching strategies (in z scores). The region indicated that at very low levels use of teacher-centred teaching strategies by teachers, the effect of growth mindset on SRL was not significant and vice versa. The moderation effect is graphically presented in Figure 9.



Source: Survey data (2023)

Figure 9. ***Moderation effect of teacher-centred strategies on the relationship between growth mindset and SRL***

Figure 9 illustrated the simple slopes for the relationship and interaction. As illustrated, at low levels of use of teacher-centred teaching strategies ,SD= -2.98, the effect of the growth mindset on SRL was not significant, β= 0.47, t=1.45, p= 0.15 BootLLCI and BootULCI is -0.17 and 1.11, at a moderate value of lecture method (teacher-centred teaching strategy), SD=00, the effect of growth mindset on SRL was significant and increased β= 0.91, t=3.46, p< .01, BootLLCI and BootULCI is 0.39 and 1.43 and at high levels of the effect of lecture method (teacher-centred teaching strategy), SD= 2.98, the effect of mindset on SRL increased β= 1.35, t=3.74, p< .01 BootLLCI and BootULCI is 0.64 and 2.07. Because SRL scores diverged from growth mindset scores at various levels of use of teacher-centred strategies and the interaction effect was significant, it showed moderation.

4.3.6.3 The moderation effect of student-teacher interactive strategies on the relationship between growth mindset and SRL. Table 28 and figure 10 present the results.

Table 28

Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and SRL

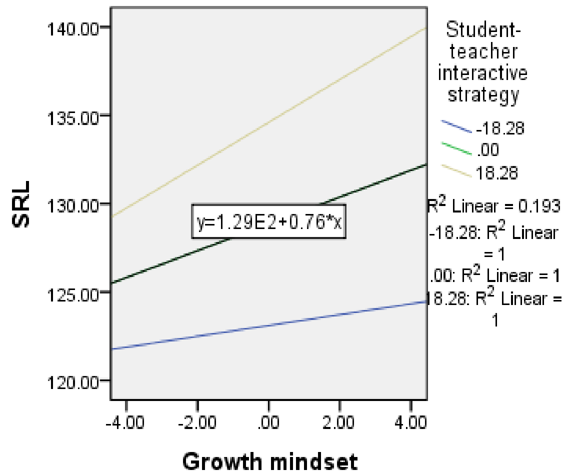
Model	Outcome variable	Independent variable	β	SE	T	p	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 15.82 $R^2 = 0.13$, $p < .01$								
2	SRL	Growth Mindset	0.76	0.26	2.94	p< .01		0.25	1.27
		Student-teacher interactive strategy	0.32	0.06	5.75	p< .01		0.21	0.42
		Interaction	0.03	0.01	2.22	0.03	0.01	0.003	0.05
3	Student-teacher interactive strategy	Growth Mindset							
	-18.28		0.30	0.32	0.96	0.34		-0.32	0.93
	0.00		0.75	0.26	2.94	p< .01		0.25	1.27
	18.28		1.21	0.34	3.57	p< .01		0.54	1.88

Source: Survey data (2023)

According to Table 28, model 1 showed that the overall moderation model was statistically significant F= 15.82, $R^2 = 0.13$, $p < .01$. Model 2 showed that the regression of growth mindset and SRL was statistically significant, β= 0.76, t=2.94, $p < .01$. The regression of student-teacher interactive strategy and SRL was also statistically significant β= 0.32, t= 5.75 p< .01. The R^2 value indicated a small 1%

variance explained by adding the interaction term to the model. The overall interaction effect was also statistically significant β= 0.03, t= 2.22, p= 0.03. Since the bootstrap confidence interval did not contain zero (BootLLCI and BootULCI) 0.003 and 0.05 student-teacher interactive strategy significantly moderated the relationship between growth mindset and SRL. In this case the hypothesis that student-teacher interactive strategies moderated the relationship between a growth mindset and SRL was retained. A positive value t(2.22) of the interaction effect showed that student-teacher interactive strategy positively increased the effect of growth mindset on Self-Regulated Learning. This implied that the more teachers used student-teacher interactive strategies, the more the change in learners' growth mindset and more SRL. The conditional effects showed the moderation effects. This was shown in model 3 and figure 10.

The Johnson-Neyman region was used to investigate for interaction and to identify ranges of values of the moderator for which the interaction effect was significant. The region indicated that at very low levels use of student-teacher interactive strategy, the effect of growth mindset on SRL was not significant and vice versa. The region of significant moderation ranged from -9.13, β= 0.53, t=1.97, p=0.05, BootLLCI and BootULCI (>0.00-1.07), to 42.65 β= 1.82, t=3.26, p <.01 BootLLCI and BootULCI (0.72- 2.71) values of student-teacher interactive strategy (in z scores) according to Appendix A The general increase in the conditional effect indicated that the lower the use student-teacher interactive strategy), the less effect of growth mindset on SRL in Mathematics and vice versa. The moderation effect was graphically presented in Figure 10.



Source: Survey data (2023)

Figure 10. ***Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and SRL***

Figure 10 showed the simple slopes for the relationships and interaction. According to the illustration, at low levels of use of student-teacher interactive strategy, SD= -18.28, the effect of the growth mindset on SRL was not significant, β= 0.31, t=0.96, p= 0.15 BootLLCI and BootULCI was (-0.32-0.93, whereas at a moderate value of student-teacher interactive strategy, SD=00, the effect of growth mindset on SRL was significant and increases β= 0.75, t=2.94, p< .01, BootLLCI and BootULCI is (0.25-1.27) and at high levels of the effect of student-teacher interactive strategy, SD= 18.28, the effect of mindset on SRL increaseds β= 1.21, t=3.57, p< .01 BootLLCI and BootULCI was (0.54-1.88). Because there existed a change in SRL scores at various levels of use of student-teacher interactive strategies and the interaction effect was significant, it showed moderation.

4.3.7 Additional analysis on mediation and moderation

4.3.7.1 Mediation additional analysis

This section presents additional analysis of the mediation effect of the sub constructs of interest (individual interest and situational interest) in the relationship between a growth mindset and the sub constructs of Self-Regulated Learning (cognitive SRL, meta-cognitive SRL and resource management SRL). It further presents additional analysis on the mediation effect of teaching strategies on the relationship between a growth mindset and sub constructs of Self-Regulated Learning.

4.3.7.2 The mediation effect of individual interest on the relationship between growth mindset and SRL. The results are presented in Table 29 and figure 11.

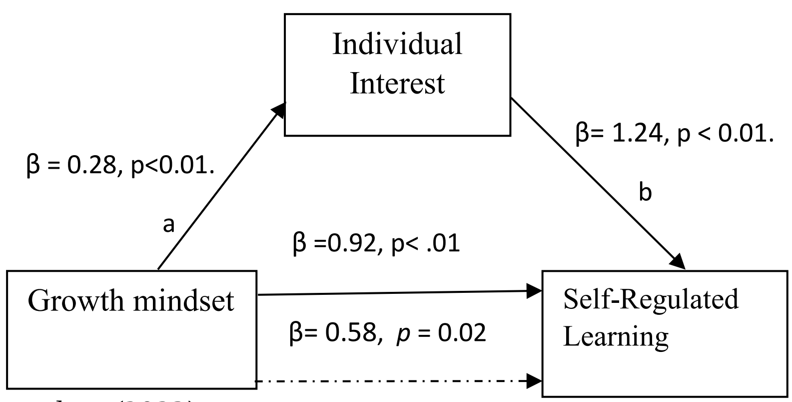
Table 29

Mediation effect of individual interest on the relationship between growth mindset and SRL

Model	Outcome variable	Independent variable	β	T	p	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Individual Interest	Growth mindset	0.28	3.32	< .01	0.18	0.03	11.02	0.08	0.11	0.44
2	SRL	Growth mindset	0.58	2.32	0.02	0.42	0.18	35.44	0.16	0.08	1.08
		Individual Interest	1.24	7.54	< .01				0.16	0.92	1.56
3	SRL	Growth mindset	0.92	3.46	< .01	0.19	0.04	11.97	0.27	0.40	1.45
4	a*b		0.34							0.11	0.61

Source: Survey data (2023)

From Table 29, growth mindset positively (+β) and significantly predicted individual interest (a path) according to Model 1, β = 0.28, t=3.32, $p < .01$. Basing on the R^2 value in Model 1, growth mindset explained 3% of the variation in individual interest. Model 2 showed the predictive results of both a growth mindset and individual interest on SRL. With individual interest in the model, growth mindset significantly predicted SRL with reduced effect (Paths c'), β= 0.58, t=2.32, p = 0.02, and individual interest significantly predicted SRL (b path), β= 1.24, t = 7.54, p < 0.01. The R^2 value of 0.18 showed that both a growth mindset and individual interest explained 18% variance in SRL. Furthermore, the total effect of growth mindset on SRL when individual interest was not present in the model, growth mindset significantly predicted SRL, β =0.92, t =3.46, p< .1. The R^2 value indicated that mindset explained 3% of the variance in SRL. The results therefore indicated that when individual interest was added in the mediation model, the effect of the growth mindset on SRL rose from 4% to 18%. Because the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI of 0.11 and 0.61, the indirect effect (a*b) was significant. Therefore, individual interest partially mediated growth mindset and SRL. Therefore, the hypothesis that individual interest mediates the relationship between a growth mindset and SRL was retained. Figure 8 explains the paths effects of the mediation model.



Source: Survey data (2023)

Figure 11: ***Mediation effect of individual interest on the relationship between growth mindset and SRL***

As shown by Figure 11, "a" and "b" path coefficients were both statistically significant. There was partial mediation because the indirect effect was also significant. Therefore, individual interest partially mediated the relationship between growth mindset and SRL. This signified that both a growth mindset and individual interest played a role in students' SRL.

4.3.7.3 The mediation effect of individual interest on the relationship between growth mindset and cognitive SRL. Table 30 and figure 12 present the results

Table 30

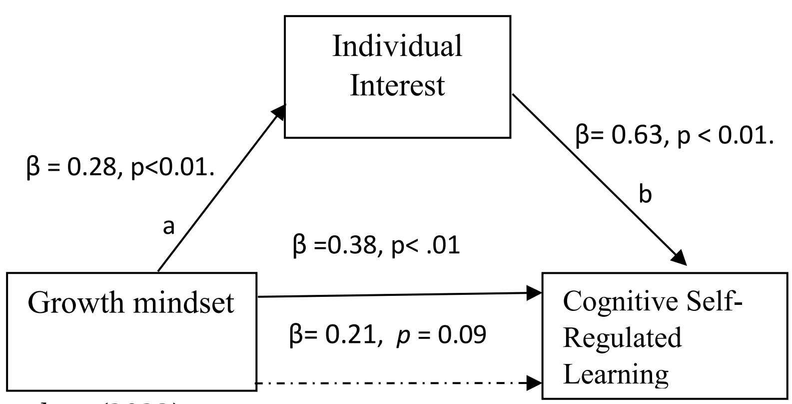
Mediation effect of individual interest on the relationship between growth mindset and cognitive SRL

Model	Outcome variable	Independent variable	β	T	p	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Individual Interest	Growth mindset	0.28	3.32	p< .01	0.18	0.03	11.02	0.08	0.11	0.44
2	Cognitive SRL	Growth mindset	0.21	1.70	0.09	0.42	0.17	35.46	0.12	-0.03	0.45
		Individual Interest	0.63	7.81	p< .01				0.08	0.47	0.79
3	Cognitive SRL	Growth mindset	0.38	2.90	p< .01	0.16	0.02	8.42	0.13	0.12	0.64
4	a*b		0.17							0.05	0.31

Source: Survey data (2023)

According to Table 30, results in model 1 showed that individual interest was significantly predicted by a growth mindset (+β), β = 0.28, t=3.32, p< .01 (path a) and a growth mindset predicted 3% variation in individual interest as shown by the R^2 value. Model 3 also showed the total effect of growth mindset on cognitive Self-

Regulated Learning when individual interest was excluded from the model, β =0.38, t =2.90, p< .01. Model 3 further revealed that mindsets explained 2% of the variance in cognitive Self-Regulated Learning according to the R^2 value. Further, Model 2 showed the predictive effect of both the growth mindset and individual interest on cognitive Self-Regulated Learning. Individual interest significantly predicted cognitive Self-Regulated Learning (b path), β= 0.63 , t = 7.81, p < 0.01 but on the other hand a growth mindset did not significantly predict cognitive Self-Regulated Learning with individual interest included in the model (Paths c'), β= 0.21, t=1.71, p = 0.09. The R^2 value indicated that the model explained 17% of the variance in cognitive Self-Regulated Learning. Therefore, with individual interest in the model, the effect of the growth mindset on cognitive Self-Regulated Learning rose from 2% to 17%. The bootstrap confidence interval that did not contain a zero BootLLCI and BootULCI, 0.05-0.31 indicated that the indirect effect (a*b) was statistically significant. Therefore, individual interest mediated growth mindset and cognitive Self-Regulated Learning. The hypothesis that individual interest mediates the relationship between a growth mindset and cognitive SRL was retained. The mediation model in figure 12 explains the paths effects.



Source: Survey data (2023)

Figure 12: ***Mediation effect of individual interest on the relationship between growth mindset and cognitive SRL***

Figure 12 showed that paths a and b path were both statistically significant. However, the indirect effect was not statistically significant, which implied a full mediation. Therefore, individual interest fully mediated the relationship between growth mindset and cognitive Self-Regulated Learning. This implied that for growth mindset to effectively predict cognitive Self-Regulated Learning, students should have a well built and enduring interest in Mathematics.

4.3.7.4 The mediation effect of individual interest on the relationship between growth mindset and Meta-cognitive SRL. Table 31 and figure 13 present the results.

Table 31

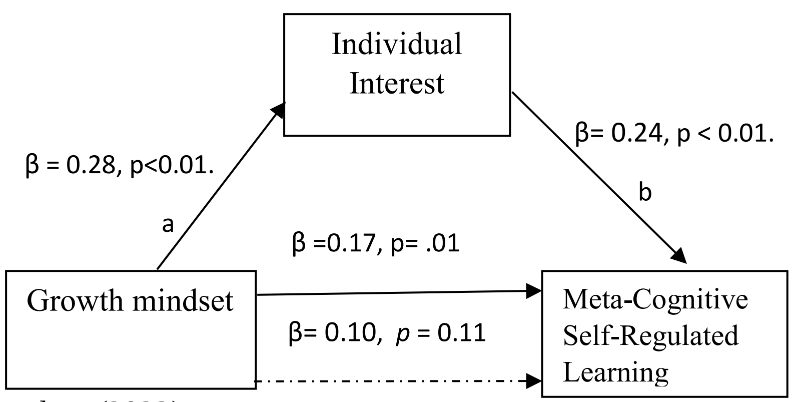
Mediation effect of individual interest on the relationship between growth mindset and Meta-cognitive SRL

Model	Outcome variable	Independent variable	β	t	p	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Individual Interest	Growth mindset	0.28	3.32	< .01	0.18	0.03	11.02	0.08	0.11	0.44
2	Meta-Cognitive SRL	Growth mindset	0.10	1.59	0.11	0.34	0.11	21.05	0.04	-0.02	0.22
		Individual Interest	0.24	5.90	< .01				0.04	0.16	0.32
3	Meta-Cognitive SRL	Growth mindset	0.17	2.57	0.01	0.14	0.02	6.6	0.07	0.04	0.29
4	a*b		0.06							0.02	0.11

Source: Survey data (2023)

From Table 31, Model 1 showed that a growth mindset positively and significantly predicted individual interest (a path), +β = 0.28, t=3.32, p < .01 and basing on the

R^2 value, a growth mindset explained 3% of the variation in individual interest. Model 2 indicated that a growth mindset did not significantly predict meta-cognitive Self-Regulated Learning with individual interest in the model (Paths c'), β= 0.10, t=1.59, *p* = 0.11 but individual interest significantly predicted meta-cognitive Self-Regulated Learning (b path), β= 0.24, *t* = 5.90, p < 0.01. The R^2 value showed that both a growth mindset and individual interest explained 11% of the variation in Meta-cognitive Self-Regulated Learning. Model 3 showed the total effect of growth mindset on Meta-cognitive Self-Regulated Learning without individual interest in the model, β =0.17, t =2.57, p =0.01. The R^2 value indicated that mindset explained 2% of the variance in meta-cognitive Self-Regulated Learning. So when individual interest was added in the model, the effect of the growth mindset on cognitive Self-Regulated Learning changed from 2% to 11%. Model 4 showed that the indirect effect (a*b) was significant because the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI, 0.02-0.11. Therefore, individual interest mediated growth mindset and meta-cognitive Self-Regulated Learning. The hypothesis that individual interest mediates the relationship between a growth mindset and meta-cognitive SRL was retained. Fig 13 shows the paths effects.



Source: Survey data (2023)

Figure 13: ***Mediation effect of individual interest on the relationship between growth mindset and meta-cognitive SRL***

Figure 13 showed statistically significant coefficients for paths a and b path and a non-significant indirect effect, path c'. Because the indirect effect was not significant, therefore individual interest fully mediated the relationship between growth mindset and meta-cognitive Self-Regulated Learning.

4.3.7.5 The mediation effect of individual interest on the relationship between growth mindset and resource management. Table 32 and figure 14 present the results

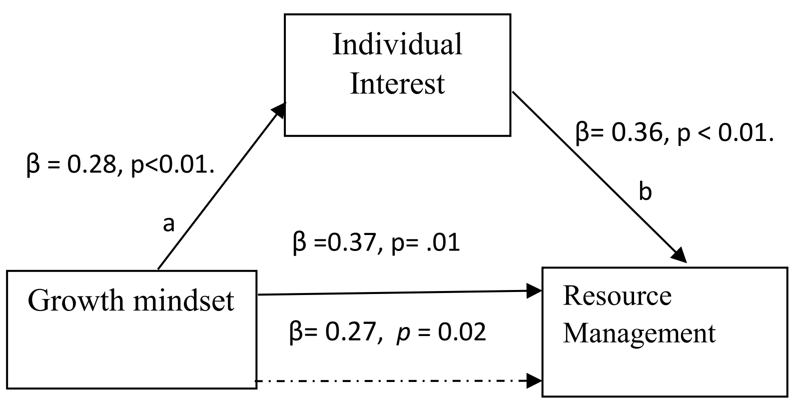
Table 32

Mediation effect of individual interest on the relationship between growth mindset and Resource management

Model	Outcome variable	Independent variable	β	t	p	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Individual Interest	Growth mindset	0.28	3.32	p< .01	0.18	0.03	11.02	0.08	0.11	0.44
2	Resource management	Growth mindset	0.27	2.36	0.02	0.31	0.09	16.90	0.12	0.05	0.50
		Individual Interest	0.36	4.81	p< .01				0.08	0.22	0.50
3	Resource management	Growth mindset	0.37	3.17	p< .01	0.17	0.03	10.06	0.12	0.14	0.60
4	a*b		0.10							0.03	0.19

Source. Survey data

According to Table 32, a growth mindset significantly predicted individual interest (path a), +β = 0.28, t=3.32, p< .01 and a growth mindset accounted for 3% variation in individual interest as shown by the R^2 value. Model 2 showed that a growth mindset significantly predicted resource management with reduced effect with individual Interest in the model (Paths c'), β= 0.27, t=2.36, p = 0.02, and individual interest significantly predicted resource management (b path), β= 0.36 , t = 4.81, p < 0.01. The R^2 value showed both a growth mindset and individual interest accounting for 9% variation in resource management. Model 3 showed the total effect of growth mindset on resource management when individual interest was not present in the model, β =0.37, t =3.17, p p< .01. It further showed that a growth mindset explained 3% of the variance in resource management. So when interest was added in the model, the effect of the growth mindset on resource management rose from 3% to 9%. Since the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI of 0.03 and 0.19 the indirect effect (a*b) was significant. Therefore, individual interest mediated growth mindset and resource management. Therefore, the hypothesis that individual interest mediates the relationship between a growth mindset and resource management was upheld. The mediation model in figure 14 explains the paths effects.



Source: Survey data (2023)

Figure 14. ***Mediation effect of individual interest on the relationship between growth mindset and resource management***

Figure 14 showed significant coefficients for paths a, b and c'. Since the indirect effect (c') was statistically significant, it implied partial mediation. Therefore, individual interest partially mediated the relationship between growth mindset and resource management. This implies that a growth mindset with an enduring interest in Mathematics predict students' ability to regulate their resources.

4.3.7.6 The mediation effect of situational interest on the relationship between growth mindset and SRL. Table 33 and figure 15 present the results.

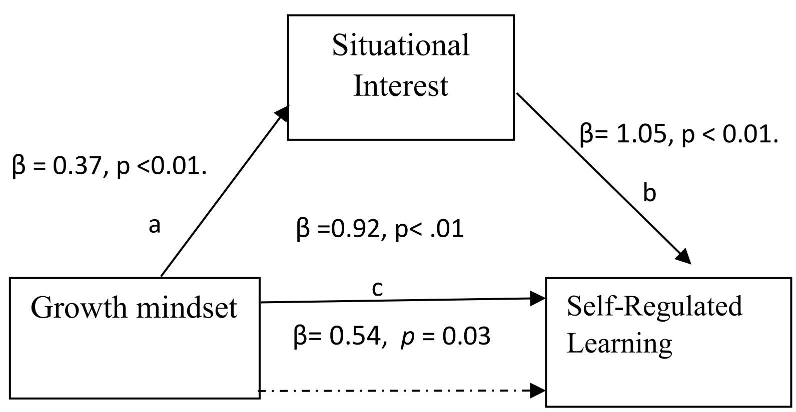
Table 33

Mediation effect of situational interest on the relationship between growth mindset and SRL

Model	Outcome variable	Independent variable	β	t	p	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Situational Interest	Growth mindset	0.37	3.19	P< .01	0.17	0.03	10.14	0.12	0.14	0.59
2	SRL	Growth mindset	0.54	2.22	0.03	0.48	0.23	50.25	0.24	0.06	1.01
		Situational Interest	1.05	0.25	P< .01				0.11	0.83	1.28
3	SRL	Growth mindset	0.92	3.46	P< .01	0.19	0.04	11.97	0.27	0.40	1.45
4	a*b		0.39							0.11	0.69

Source. Survey data

According to Table 33 situational interest was positively and significantly predicted by a growth mindset as shown by model 1 (path a), β = 0.37, t=3.19, p <.1 and the R^2 value of 0.04 indicated that a growth mindset accounted for 4% variance in situational interest. Model 3 showed the total effect of a growth mindset on SRL when situational interest was not in the model and it was significant, β =0.92, t =3.46, p< .01. The R^2 value indicated that mindset explained 4% of the variance in resource management with the absence of situational interest in the model. Model 2 showed the predictive effect of both growth mindset and individual interest on SRL. Growth mindset significantly predicted SRL with reduced effect with situational interest included in the model (Paths c'), β= 0.54, t=2.22, *p* = 0.03, and situational interest significantly predicted SRL (b path), β= 1.05, *t* = 0.25, p < 0.01. The R^2 value indicated that the model explained 23% of the variance SRL. Therefore, there was a rise in the effect of the growth mindset on resource management from 4% to 23% when situational interest was added in the model. The indirect effect (a*b) was significant because the bootstrap confidence interval did not contain a zero (BootLLCI and BootULCI) 0.11 and 0.69. Therefore, situational interest partially mediated growth mindset and SRL. The hypothesis that situational interest mediates the relationship between growth mindset and SRL was retained. Paths effects are further illustrated in figure 15.



Source: Survey data (2023)

Figure 15. ***Mediation effect of situational interest on the relationship between growth mindset and SRL***

The results in Figure 15 showed significant coefficients for paths a and b and c'. Since the confidence interval in model 4id not contain a zero and the indirect effect was significant, it implied partial mediation. Therefore, situational interest significantly mediated the relationship between growth mindset and SRL.

4.3.7.7 The mediation effect of situational interest on the relationship between growth mindset and cognitive SRL. Table 34 and figure 16 present the results

Table 34

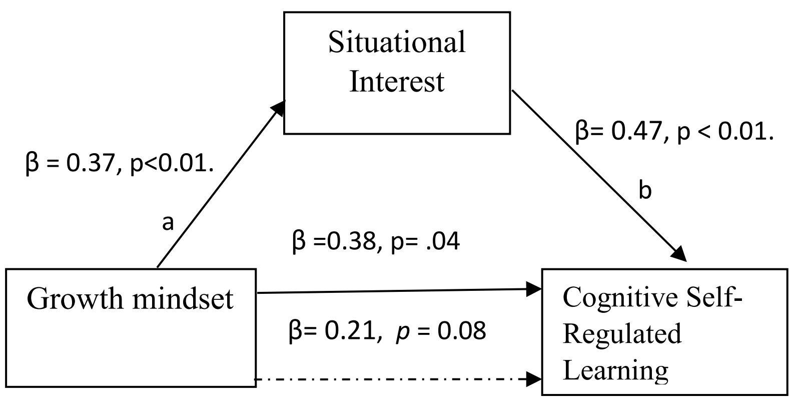
Mediation effect of situational interest on the relationship between growth mindset and cognitive SRL

Model	Outcome variable	Independent variable	β	T	p	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Situational Interest	Growth mindset	0.37	3.18	p< .01	0.17	0.03	10.14	0.12	0.14	0.59
2	Cognitive SRL	Growth mindset	0.21	1.73	0.08	0.43	0.19	37.24	0.12	-0.03	0.46
		Situational interest	0.47	8.03	p< .01				0.06	0.35	0.58
3	Cognitive SRL	Growth mindset	0.38	2.90	0.04	0.16	0.03	8.42	0.13	0.12	0.64
4	a*b		0.17							0.05	0.31

Source: survey data (2023)

From Table 34, Model 1 showed that growth mindset significantly predicted situational interest, β = 0.37, t=3.18, p< .01 (path a) and that a growth mindset explained 3% of the variance in situational interest according to the R^2 value. According to model 2 a growth mindset dids not significantly predict cognitive Self-Regulated Learning with situational interest in the model (Paths c'), β= 0.21, t= 1.73, p = 0.08 but situational interest significantly predicted cognitive Self-

Regulated Learning (b path), β= 0.47, t = 8.03, $p < 0.01$. The R^2 value showed that a growth mindset and situational interest both explained 19% of the variation in cognitive Self-Regulated Learning. Model 3 showed the total effect of growth mindset on cognitive Self-Regulated Learning when situational interest was not included in the model, β =0.38, t =2.90, p =0.04. The R^2 value indicated that mindset explained 3% of the variance in cognitive Self-Regulated Learning. Therefore, when individual interest was included in the model, the predictive effect of a growth mindset on cognitive Self-Regulated Learning rose from 3% to 19%. Since the bootstrap confidence interval did not contain a zero BootLLCI and BootULCI, 0.05-0.31, the indirect effect (a*b) was significant. Therefore, situational interest mediated growth mindset and cognitive Self-Regulated Learning. Therefore, the hypothesis that situational interest mediates the relationship between a growth mindset and cognitive SRL was upheld. Results are further explained if figure 16.



Source: Survey data (2023)

Figure 16. ***Mediation effect of situational interest on the relationship between growth mindset and cognitive SRL***

Figure 16 results showed that path coefficients a and b were both statistically significant while path c' was not significant. Basing on the significant confidence interval in model 4 and the non-significant coefficient of c', situational interest fully mediated the relationship between growth mindset and cognitive Self-Regulated Learning. This implied that for growth mindset to effectively predict cognitive SRL, students should be interested in Mathematics lessons.

4.3.7.8 The mediation effect of situational interest on the relationship between growth mindset and meta-cognitive SRL. Table 35 and figure 17 present the results

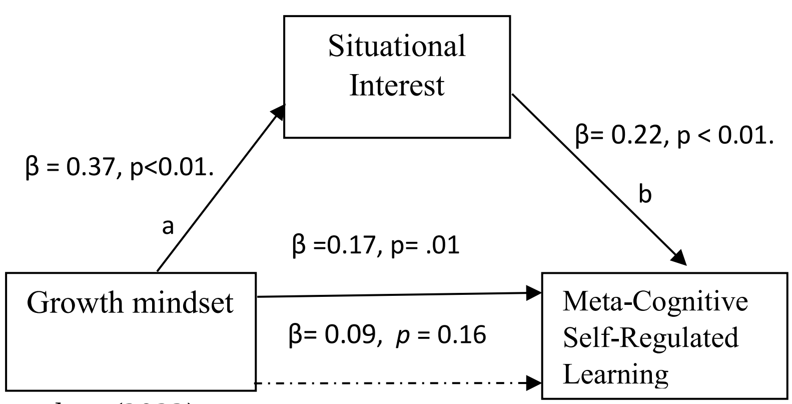
Table 35

Mediation effect of situational interest on the relationship between growth mindset and meta-cognitive SRL

Model	Outcome variable	Independent variable	β	T	p	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Situational Interest	Growth mindset	0.37	3.18	< .01	0.17	0.03	10.14	0.12	0.14	0.59
2	Meta-Cognitive SRL	Growth mindset	0.09	1.41	0.16	0.42	0.17	34.26	0.06	-0.03	0.21
		Situational interest	0.22	7.79	< .01				0.03	0.17	0.28
3	Meta-Cognitive SRL	Growth mindset	0.17	2.57	0.01	0.14	0.02	6.60	0.07	0.04	0.29
4	a*b		0.08							0.03	0.14

Source: survey data (2023)

According to Table 35, a growth mindset significantly predicted situational interest (a path), β = 0.37, t=3.18, p < .01 and accounted for 3% variation in situational interest. Results in model 2 showed that a growth mindset did not significantly predict meta-cognitive Self-Regulated Learning with situational interest in the model (Paths c'), β= 0.09, t= 1.41, *p* = 0.16 but situational interest significantly predicted meta-cognitive Self-Regulated Learning (b path), β= 0.22 , *t* = 7.79, p < 0.01. Both a growth mindset and situational interest accounted for 17% of the variance in meta-cognitive Self-Regulated Learning. Model 3 showed that when situational interest was not included in the model, growth mindset significantly predicted meta-cognitive Self-Regulated Learning, β =0.17, t =2.57, p =0.01and accounted for 2% variation in cognitive Self-Regulated Learning. So, when individual interest was added in the model, the effect of the growth mindset on cognitive Self-Regulated Learning changed from 2% to 17%. The indirect effect (a*b) was significant because the bootstrap confidence interval of 0.03-0.14 did not contain a zero according to Model 4. Therefore, situational interest mediated the relationship between a growth mindset and meta-cognitive Self-Regulated Learning. Therefore, the hypothesis that situational interest mediates the relationship between a growth mindset and meta-cognitive SRL was retained. Figure 17 explains the paths effects



Source: Survey data (2023)

Figure 17. ***Mediation effect of situational interest on the relationship between growth mindset and Meta-cognitive SRL***

The results in Figure 17 showed statistically significant coefficients for paths a and b and a non-significant coefficient for path c'. Since the indirect effect was not statistically significant, it implied a full mediation. Therefore, situational interest fully mediated the relationship between growth mindset and meta-cognitive Self-Regulated Learning. This implied that for a growth mindset to effectively predict meta-cognitive SRL, students had to be interested in Mathematics lessons.

4.3.7.9 The mediation effect of situational interest on the relationship between growth mindset and resource management SRL. Table 36 and figure 18 present the results

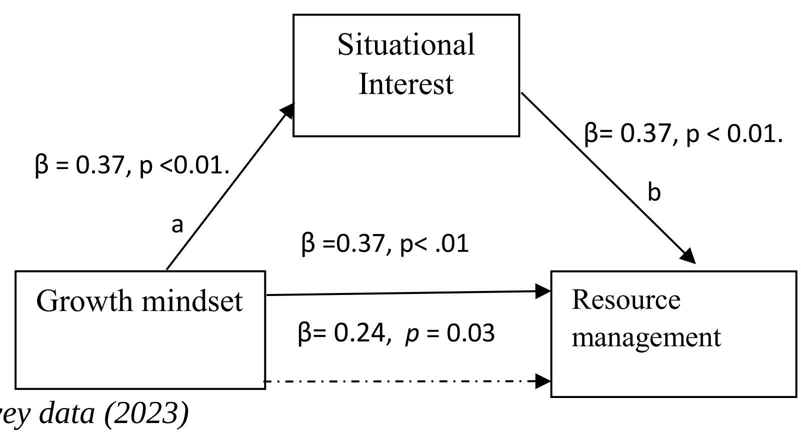
Table 36

Mediation effect of situational interest on the relationship between growth mindset and Resource management

Model	Outcome variable	Independent variable	β	t	P	R	R^2	F	SE	Bootstrap LLCI	ULCI
1	Situational Interest	Growth mindset	0.37	3.18	< .01	0.17	0.03	10.14	0.12	0.14	0.59
2	Resource management	Growth mindset	0.24	2.14	0.03	0.39	0.15	29.92	0.05	0.02	0.46
		Situational interest	0.37	6.95	< .01				0.05	0.26	0.47
3	Resource management	Growth mindset	0.37	3.17	< .01	0.17	0.03	10.06	0.12	0.40	0.60
4	a*b		0.13							0.03	0.25

Source. Survey data

From Table 36, showed that a growth mindset significantly predicted situational interest, β = 0.37, t=3.18, p< .01 (a path) and accounted for 3% variance in situational interest as shown by model 1. Model 2 showed that a growth mindset significantly predicted resource management with reduced effect when situational interest was included in the model, β= 0.24, t=2.14, *p* = 0.03 (Paths c'), and situational interest significantly predicted resource management (b path), β= 0.37, *t* = 6.95, p < 0.01. The R^2 value showed that with both a growth mindset and situational interest in the model, there was a 15% variation in resource management. Model 3 showed that when situational interest was not in the model, growth mindset significantly predicted resource management, β =0.37, t =3.17, p< .01and explained 3% of the variance in resource management. So when interest was included in the model, the effect of the growth mindset on resource management rose from 3% to 15%. Model 4 showed that indirect effect (a*b) was significant because the bootstrap confidence interval contains did not contain a zero (0.03 and 0.25). Therefore, situational interest partially mediated growth mindset and resource management. The hypothesis that situational interest mediates the relationship between a growth mindset and resource management SRL was therefore upheld. Figure 18 explains the paths effects.



Source: Survey data (2023)

Figure 18. ***Mediation effect of situational interest on the relationship between growth mindset and Resource management***

The results in Figure 18 showed that a, b and c' path coefficients were all statistically significant. Basing on the significant boot strap confidence interval in model 4 and a significant indirect effect in it implied partial mediation. Therefore, situational interest partially mediated the relationship between growth mindset and resource management. This implied that growth mindset and situational interest played a major role in predicting the students' resource management SRL in Mathematics.

4.3.8 Moderation additional analysis

4.3.8.1 The moderation effect of learner-centred strategies on the relationship between growth mindset and cognitive SRL. Table 37 and figure 19 present the results.

Table 37

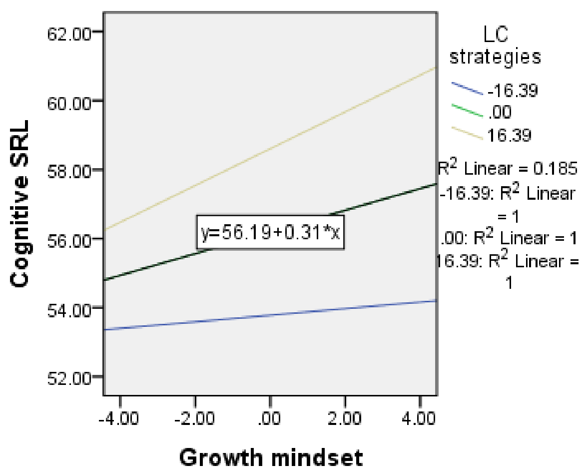
Moderation effect of learner-centred strategies on the relationship between growth mindset and cognitive SRL

Model	Outcome variable	Independent variable	β	SE	t	p	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 11.35, R^2 = 0.09, p= <.01								
2	Cognitive SRL	Growth Mindset	0.31	0.13	2.42	0.02	0.09	0.06	0.57
		LC-Teaching strategies	0.14	0.03	4.83	p < .01		0.09	0.21
		Interaction	0.01	0.01	2.10	0.04	0.04	0.0008	0.03
3	LC-Teaching strategies	Mindset							
	-16.39		0.10	0.16	0.59	0.55		-0.22	0.41
	0.00		0.31	0.13	2.42	0.02		0.06	0.57
	16.39		0.53	0.17	3.10	< 0.01		0.20	0.87

Source: Survey data (2023)

According to Table 37, model 1 showed that the overall model was statistically significant F= 11.35, R^2 = 0.09, p < .01 and Model 2 showed a statistically significant regression of growth mindset and cognitive SRL, β= 0.31, t=2.42, p= 0.02. Further, model 2 showed that learner-centred teaching strategies significantly predicted cognitive SRL β= 0.14, t= 4.83, p< .01 and the interaction effect was also significant, β= 0.01, t= 2.10, p< .04 because the bootstrap confidence interval did not contain a zero (BootLLCI and BootULCI) 0.0008 and 0.03. By adding learner-centred strategies to the model, a growth mindset explained 4% variation in cognitive SRL. Since the bootstrap confidence interval did not contain a zero, learner-centred teaching strategies significantly moderated the relationship between growth mindset and cognitive SRL. In this case the hypothesis was retained. Positive t(2.10) of the interaction effect showed that learner-centred teaching strategies positively increased the effect of growth mindset on cognitive Self-Regulated Learning. This implied that the more teachers used learner-centred teaching strategies, the more the change in learners' growth mindset and more cognitive Self-Regulated Learning. The conditional effects also showed the moderation effects as shown in model 3.

In order to identify ranges of values of the moderator for which the interaction effect was significant, the Johnson-Neyman region was used. The region of significant moderation ranged from -4.26, β= 0.26, t=1.96, p=0.05, BootLLCI and BootULCI=>0.00 to 0.51, to 37.2 β= 0.81, t=2.93, p <.01 BootLLCI and BootULCI= 0.26- 1.36 values of learner-centred strategies (in z scores). The Johnson-Neyman region showed that at very low levels use of learner-centred methods, the effect of growth mindset on cognitive SRL was not significant and vice versa. The general increase in the conditional effect indicated that the lower the use of learner-centred strategies, the less effect of growth mindset on cognitive SRL in Mathematics and vice versa (Appendix A). The moderation effect is graphically presented in Figure 19.



Source: Survey data (2023)

Figure 19. ***Moderation effect of learner-centred strategies on the relationship between growth mindset and cognitive SRL***

Figure 19 illustrated the simple slopes for the relationships and interaction. The results showed that when learner-centred strategies were applied at low levels, (SD= -16.39), there was a non-significant effect of a growth mindset on cognitive SRL, β= 0.10, t=0.59, p= 0.55 BootLLCI and BootULCI is -0.22 and 0.41 whereas at a moderate value of learner-centred teaching strategies ,SD=00, β= 0.31, t=2.42, p= 0.02, BootLLCI and BootULCI is 0.06 and 0.57 and at high levels SD=16.39, β= 0.53, t=3.10, p< .01 BootLLCI and BootULCI is 0.20 and 0.87 the effect of mindset on cognitive SRL increased. Because the interaction effect was significant, it showed moderation.

4.3.8.2 The moderation effect of learner-centred strategies on the relationship between growth mindset and Meta-cognitive SRL. Table 38 and figure 20 present the results.

Table 38

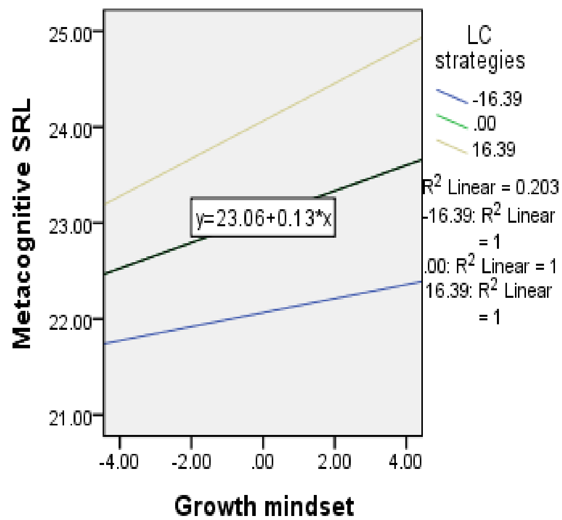
Moderation effect of learner-centred strategies on the relationship between growth mindset and Meta-cognitive SRL

Model	Outcome variable	Independent variable	β	SE	T	p	R^2	Bootstap LLCI	ULCI
1	Model summary, F= 7.80 R^2 = 0.07, p < .01								
2	Meta-Cognitive SRL	Growth Mindset	0.14	0.06	2.09	0.04		0.01	0.26
		LC-Teaching strategies	0.06	0.02	4.03	< .01		0.03	0.09
		Interaction	0.001	0.00	1.19	0.23	0.004	-0.02	0.01

Source: Survey data (2023)

Table 38 results showed that a growth mindset significantly predicted meta-cognitive SRL, β= 0.14, t=2.09, p= 0.04. Learner-centred teaching strategies too, β= 0.06, t= 4.03, p< .01. The R^2 value indicated that that there was a 0.04% variance explained by adding the interaction term to the model. Model 1 also showed that the overall model was statistically significant F= 7.80, R^2 = 0.07, p < .001. However, the overall interaction effect was not statistically significant because the bootstrap confidence interval contained a zero (BootLLCI and BootULCI) -0.0004 and 0.05, β= 0.001, t= 1.19, p=0.23. Therefore, Learner-centred teaching strategies did not significantly moderate the relationship between growth mindset and meta-cognitive

SRL. Therefore, the hypothesis that learner-centred strategies moderate the relationship between a growth mindset and meta-cognitive SRL was rejected. The Johnson Neymar did show any ranges of values where the interaction effect was significant and Figure 20 shows some moderation effect.



Source: Survey data (2023)

Figure 20. ***Moderation effect of learner-centred strategies on the relationship between growth mindset and Meta-cognitive SRL***

Figure 20 showed small changes in meta-cognitive SRL brought about by the interaction of a growth mindset and learner-centred strategies. Although the meta-cognitive SRL scores diverged from growth mindset scores at different levels of use of learner-centred strategies, the Johnson Neymar did not show any areas where the interaction effect was significant. Since the interaction effect was not significant too, it could not asserted that the predictive change was brought about by the moderator, so there was no moderation. Therefore, use of learner-centred strategies in this case did not in any way affect the relationship between growth mindset and learners' meta-cognitive Self-Regulated Learning.

4.3.8.3 The moderation effect of learner-centred strategies on the relationship between growth mindset and Resource management. Table 39 and figure 21 present the results

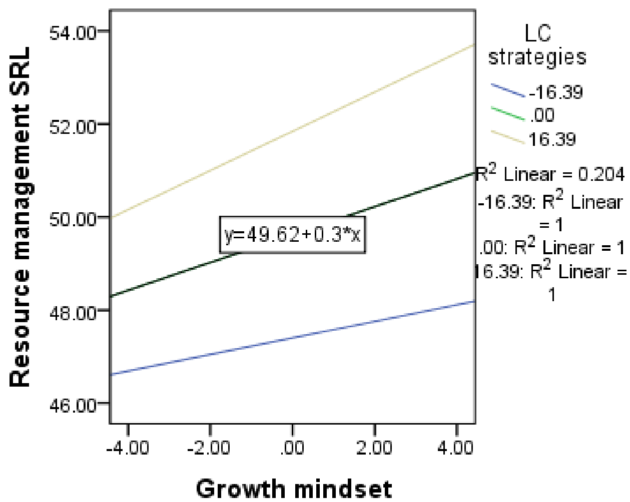
Table 39

Moderation effect of learner-centred strategies on the relationship between growth mindset and resource management SRL

Model	Outcome variable	Independent variable	β	SE	t	P	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 12.03 $R^2 = 0.07$, $p < .01$								
2	Resource management	Growth Mindset	0.30	0.11	2.60	0.01	0.01	0.07	0.53
		LC-Teaching strategies	0.14	0.03	5.01	< .01		0.08	0.19
		Interaction	0.01	0.01	1.32	0.19	0.01	-0.004	0.02

Source: Survey data (2023)

According to Table 39, the overall moderation model was statistically significant F= 12.03, $R^2 = 0.07$, p < .001. Model 2 showed that a growth mindset significantly predicted resource management, β= 0.30, t=2.60, p= 0.01 learner-centred teaching strategies too, β= 0.14, t= 5.01, p< .01. When the interaction term was added to the model, both the growth mindset and learner-centred strategies accounted for 1% variance in resource management. However, the bootstrap confidence interval showed that the overall interaction effect was not statistically significant because it contained a zero (BootLLCI and BootULCI) -0.0004 and 0.02, β= 0.01, t= 1.32, p=0.19. Therefore, Learner-centred teaching strategies did not significantly moderate the relationship between growth mindset and resource management. The hypothesis that learner-centred strategies moderate the relationship between a growth mindset and resource management was therefore rejected. The Johnson Neymar region too did not show any ranges of values where the interaction effect was significant but Figure 21 showed some small values of the moderation effect.



Source: Survey data (2023)

Figure 21. ***Moderation effect of learner-centred strategies on the relationship between growth mindset and Resource management SRL***

The simple slopes in Figure 21 showed some small relationship and interaction effects. Although there existed small Resource management SRL scores at different levels of use of learner-centred strategies, the Johnson Neymar did not show any areas where the interaction effect was significant. The interaction effect too being non-significant, it could not be concluded that the predictive change was brought about by the interaction of learner-centred strategies and growth mindset therefore, there was no moderation. In this case therefore, use of learner-centred strategies did not in any way affect the relationship between growth mindset and learners' resource management self-regulation.

4.3.8.4 The moderation effect of teacher-centred strategies on the relationship between growth mindset and cognitive SRL. Table 40 and figure 22 present the results.

Table 40

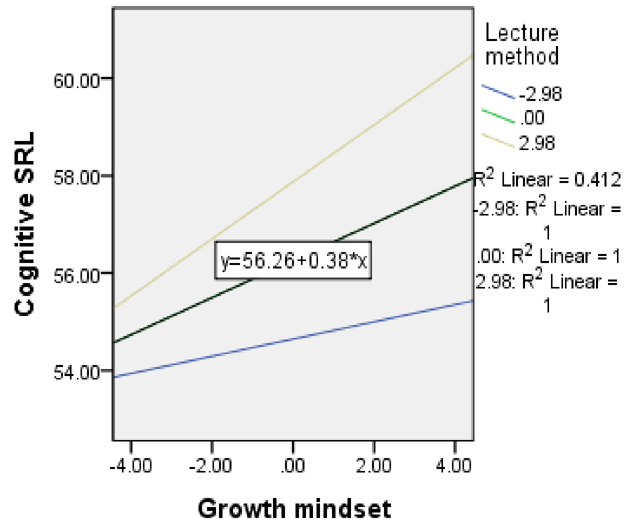
Moderation effect of teacher-centred strategies on the relationship between growth mindset and cognitive SRL

Model	Outcome variable	Independent variable	β	SE	t	P	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 6.95 R^2 = 0.06, p < .01								
2	Cognitive SRL	Growth Mindset	0.38	0.13	2.90	p< .01		0.12	0.64
		Teacher-centred strategies	0.54	0.17	3.20	p< .01		0.21	0.88
		Interaction	0.07	0.04	1.86	0.06	0.01	-0.004	0.14
3	Teacher-centred strategies	Growth Mindset							
	-2.98		0.18	0.16	1.09	0.28		-0.14	0.50
	0.00		0.38	0.13	2.90	p< .01		0.12	0.64
	2.98		0.59	0.18	3.24	p< .01		0.23	0.94

Source: Survey data (2023)

Table 40 showed that according to model 1, the overall moderation model was statistically significant F= 6.95, R^2 = 0.06, p < .001. Model 2 showed statistically significant regressions of growth mindset and cognitive SRL β= 0.38, t=2.90, p< .01 and teacher-centred teaching strategies and cognitive SRL β= 0.54, t= 3.20, p< .01. There was a 1% variance in cognitive SRL as explained by the R^2 value by adding the interaction term to the model. However, because the bootstrap confidence interval contained a zero (BootLLCI and BootULCI) -0.004 and 0.14, β= 0.07, t= 1.86, p=0.06, the overall interaction effect was not statistically significant. Therefore, teacher-centred teaching strategies did not significantly moderate the relationship between growth mindset and cognitive SRL. In this case the hypothesis that teacher-centred strategies do not moderate the relationship between a growth mindset and cognitive SRL was accepted. While the overall model was predictive, it could not be said that teacher-centred strategies moderated the predictive relationship between growth mindset and cognitive SRL for the entire population of subjects in this study. However, the conditional effects showed some moderation effects as shown in model 3 and figure 22.

Using the Johnson-Neyman's region ranges of values of the moderator for which the interaction effect was significant were found. Appendix A shows that the regions of significant moderation ranged from -1.60, β= 0.27, t=1.97, p=0.05, BootLLCI and BootULCI (> .00- 0.54) to 5.43 β= 0.75, t= 3.00, p <.01 BootLLCI and BootULCI (0.26 – 1.25) values of teacher-centred teaching strategies, (in z scores). Values implied that at very low levels use of teacher-centred teaching strategies, the effect of growth mindset on cognitive SRL was not significant and vice versa. The general increase in the conditional effect indicated that the lower the use of teacher-centred teaching strategies, the less the effect of growth mindset on SRL in Mathematics and vice versa. The moderation effect is graphically presented in Figure 22.



Source: Survey data (2023)

Figure 22. ***Moderation effect of teacher-centred strategies on the relationship between growth mindset and cognitive SRL***

The simple slopes in Figure 22 illustrated the relationships and interaction, at low levels of use of teacher-centred teaching strategies, SD= -2.98, the effect of the growth mindset on cognitive SRL was not significant, β= 0.18, t=1.09 p= 0.28 BootLLCI and BootULCI was -0.14-0.5 but at a moderate value of teacher-centred teaching strategy, SD=00, β= 0.38, t=2.90, p< .01, BootLLCI and BootULCI was (0.12-1.64) and at high levels of use of teacher-centred teaching strategies, SD=2.98, the effect of mindset on cognitive SRL was significant and showed an increase, β= 0.59, t=3.24, p< .01 BootLLCI and BootULCI was (0.23-0.94). Although at different levels of use of teacher-centred strategies there were changes in cognitive SRL brought by a growth mindset, the interaction effect was not significant, and therefore it could not be said that the predictive change was brought about by the moderator, so there was no moderation.

4.3.8.5 The moderation effect of teacher-centred strategies on the relationship between growth mindset and meta-cognitive SRL. Table 41 and figure 23 present the results

Table 41

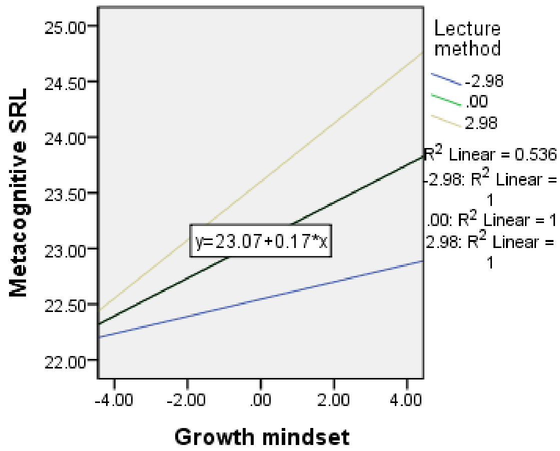
Moderation effect of teacher-centred strategies on the relationship between growth mindset and meta-cognitive SRL

Model	Outcome variable	Independent variable	β	SE	T	p	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 4.37, R^2 = 0.04, p = .01								
2	Meta-Cognitive SRL	Growth Mindset	0.17	0.07	2.61	0.01	0.03	0.04	0.30
		Teacher-centred strategies	0.18	0.08	2.12	0.04		0.01	0.34
		Interaction	0.03	0.02	1.69	0.09	0.008	-0.005	0.07
3	Teacher-centred strategies	Growth Mindset							
	-2.98		0.08	0.08	0.97	0.34		-0.08	0.23
	0.00		0.17	0.07	2.61	0.01		0.04	0.30
	2.98		0.26	0.09	2.93	p< .01		0.09	0.44

Source: Survey data (2023)

Table 41 results, showed that the overall model was statistically significant F= 4.37, R^2 = 0.04, p=0.01 according to model 1. Model 2 showed that the regression of growth mindset and meta-cognitive SRL was statistically significant, β= 0.17, t=2.61, p= 0.01 and teacher-centred teaching strategies and meta-cognitive SRL too, β= 0.18, t= 2.12, p= 0.04. There was 0.8% variation in meta-cognitive SRL after adding the interaction term to the model. There was no moderation because the overall interaction effect was not statistically significant since the bootstrap confidence interval contained a zero (BootLLCI and BootULCI) (-0.005 and 0.07), β= 0.03, t= 1.69, p= 0.09. Therefore, it was concluded that teacher-centred teaching strategies could not significantly moderate the relationship between growth mindset and meta-cognitive SRL. The hypothesis that teacher-centred teaching strategies do not moderate the relationship between a growth mindset and meta-cognitive SRL was therefore accepted. While the overall model was predictive, it could not be concluded that teacher-centred strategies moderated the predictive relationship between growth mindset and meta-cognitive SRL for the entire population of subjects in this study. However, the conditional effects showed some moderation effects as shown in model 3 and figure 23.

Using the Johnson-Neyman's region ranges of values of the moderator for which the interaction effect was significant were established. Appendix A shows that the region of significant moderation ranged from -1.25, β= 0.13, t=1.97, p=0.05, BootLLCI and BootULCI=> .00- 0.26 to 5.43 β= 0.34, t= 2.71, p <.01 BootLLCI and BootULCI= 0.09 – 0.58 values of teacher-centred teaching strategies, (in z scores). The general increase in the conditional effect indicated that the lower the use of teacher-centred teaching strategy, the less the effect of growth mindset on meta-cognitive SRL in Mathematics and vice versa. The moderation effect is further graphically presented in Figure 23.



Source: Survey data (2023)

Figure 23. ***Moderation effect of teacher-centred strategies on the relationship between growth mindset and cognitive SRL***

In addition to the Johnson-Neyman's region, Figure 23 showed the simple slopes for the relationships and interaction. At low levels of application of teacher-centred teaching strategies in Mathematics classrooms, SD= -2.98, the effect of the growth mindset on meta-cognitive SRL was not significant, β= 0.08, t= 0.97 p= 0.34 BootLLCI and BootULCI was (-0.08- 0.23) at a moderate value of teacher-centred teaching strategies, SD=00, the effect of growth mindset on meta-cognitive SRL was significant and increases β= 0.17, t=2.61, p= 0.01, BootLLCI and BootULCI was (0.04 and 0.30) and at high levels of the effect of teacher-centred teaching strategies, SD=2.98, the effect of mindset on meta-cognitive SRL increases β= 0.26, t=2.93, p< .01 BootLLCI and BootULCI was (0.09 and 0.44). Although at different levels of use of teacher-centred strategies meta-cognitive SRL scores diverged from growth mindset scores, the interaction effect was not significant, and therefore it could not be said that the predictive change was brought about by the moderator, so there was no moderation.

4.3.8.6 The moderation effect of teacher-centred strategies on the relationship between growth mindset and resource management SRL. Table 42 and figure 24 present the results.

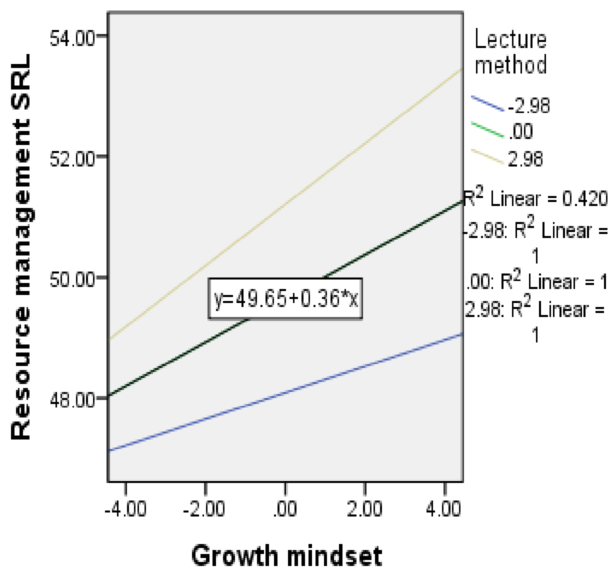
Table 42

Moderation effect of teacher-centred strategies on the relationship between growth mindset and resource management SRL

Model	Outcome variable	Independent variable	β	SE	T	p	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 7.84, $R^2 = 0.07$, p< .01								
2	Resource management	Growth Mindset	0.36	0.12	3.11	p< .01	0.07	0.13	0.59
		Teacher-centred strategies	0.52	0.15	3.49	p< .01		0.23	0.82
		Interaction	0.05	0.03	1.48	0.14	0.006	-0.02	0.11

Source: Survey data (2023)

From Table 42, the overall model was statistically significant F= 7.84, $R^2 = 0.07$, p < .01 as shown by model 1. Model 2 showed that the regression of growth mindset and resource management was statistically significant, β= 0.36, t=2 3.11, p= 0.01 and the regression of teacher-centred teaching strategies and resource management SRL too was statistically significant β= 0.52, t= 3.49, p< .01. The R^2 value of 0.6% shows a small variance in resource management after adding the interaction term to the model. However, the overall interaction effect was not statistically significant because the bootstrap confidence interval contained a zero (BootLLCI and BootULCI) (-0.02 and 0.11), β= 0.05, t= 1.48, p=0.14. Therefore, teacher-centred teaching strategies could not significantly moderate the relationship between growth mindset and resource management. In this case the hypothesis that teacher-centred strategies do not moderate the relationship between a growth mindset and resource management SRL was accepted. Though the Johnson Neymar did not show any ranges of values where the interaction effect was significant, Figure 23 shows some minimal moderation effect.



Source: Survey data (2023)

Figure 24. ***Moderation effect of teacher-centred strategies on the relationship between growth mindset and resource management SRL***

From Figure 24, resource management SRL scores changed at different levels of use of teacher-centred strategies. However, the Johnson Neymar did not show any areas where the interaction effect was significant. Since the interaction effect was not significant too, it could not be said that the predictive change was brought about by the moderator, so there was no moderation. Therefore, use of teacher-centred strategies in this case did not in any way affect the relationship between growth mindset and learners' resource management Self-Regulated Learning.

4.3.8.7 The moderation effect of student-teacher interactive strategies on the relationship between growth mindset and cognitive SRL.

Table 43 and figure 25 present the results

Table 43

Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and cognitive-SRL

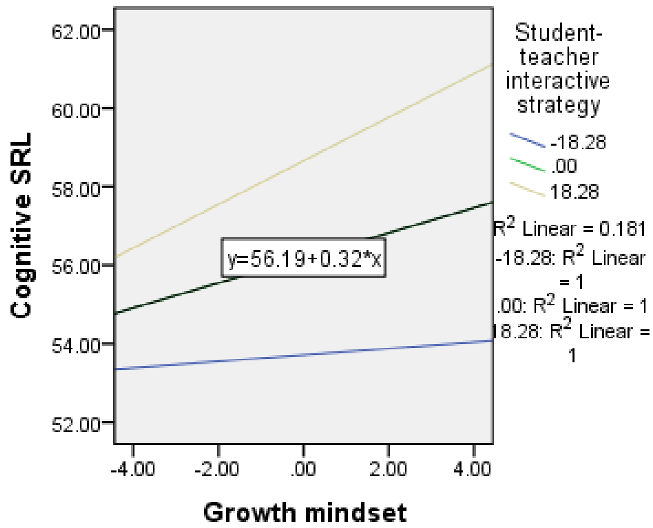
Model	Outcome variable	Independent variable	β	SE	t	p	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 78.32 R^2 = 0.31, p < .01								
2	SRL	Growth Mindset	0.32	0.13	3.46	P=0.01		0.06	0.57
		Student-teacher interactive strategy	1.13	0.03	4.93	p< .01		0.08	0.19
		Interaction	0.01	0.005	2.31	0.02	0.02	0.002	0.02
3	Student-teacher interactive strategy	Growth Mindset							
	-18.28		0.08	0.16	0.51	0.61		-0.23	0.39
	0.00		0.32	0.13	2.46	P= 0.01		0.06	0.57
	18.28		1.56	0.17	3.26	p< .01		0.22	0.89

Source: Survey data (2023)

From Table 43, the overall model was statistically significant F= 9.32, R^2 = 0.08, p < .01 as shown by model 1. The growth mindset statistically predicted cognitive SRL, β= 0.91, t=3.46, p < .01 and student-teacher interactive strategy too β= 1.24, t= 3.66, p< .01 according to model 2. The R^2 value indicates that there was a 1%

variation explained by adding the interaction term to the model. The overall interaction effect was also statistically significant β= 0.05, t= 1.99, p< .05 because the bootstrap confidence interval did not contain a zero (BootLLCI and BootULCI) 0.002 and 0.29. Therefore, student-teacher interactive strategy significantly moderated the relationship between growth mindset and cognitive SRL. In this case the hypothesis was retained. Positive t (2.31) of the interaction effect showed that student-teacher interactive strategy positively increased the effect of growth mindset on Self-Regulated Learning. The more the teachers used student-teacher interactive strategies, the more the change in learners' growth mindset and more cognitive Self-Regulated Learning. The conditional effects showed the moderation effects as shown in model 3 and figure 25.

According to the Johnson-Neyman region there were ranges of values of the moderator for which the interaction effect was significant beyond and below which were not. The region of significant moderation ranged from -4.79, β= 0.26, t=1.97, p=0.05, BootLLCI and BootULCI (>0.00 to 0.51), to 42.65 β= 0.87, t=3.11, p <.01 BootLLCI and BootULCI (0.32- 1.42) values of student-teacher interactive strategies (in z scores). The values indicated that at very low levels use of student-teacher interactive strategy, the effect of growth mindset on cognitive SRL was not significant and vice versa. The general increase in the conditional effect indicated that the lower the use of student-teacher interactive strategies, the less the effect of growth mindset on cognitive SRL in Mathematics and vice versa (Appendix A). This moderation effect is graphically presented in Figure 25.



Source: Survey data (2023)

Figure 25. ***Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and cognitive SRL***

Figure 25 showed the simple slopes for the relationship and interaction and that at low levels of use of student-teacher interactive strategy, SD= -18.28, the effect of the growth mindset on cognitive SRL was not significant, β= 0.08, t=0.51, p= 0.61 BootLLCI and BootULCI was (-0.23-0.40), at a moderate value of student-teacher interactive strategy, SD=00, the effect of growth mindset on cognitive SRL was significant and increased β= 0.31, t=2.46, p=0.01, BootLLCI and BootULCI was (0.06-0.57) and at high levels of the effect of student-teacher interactive strategy, SD= 18.28, the effect of mindset on cognitive SRL increased β= 0.56, t=3.26, p< .01 BootLLCI and BootULCI is (0.22- 0.89). Because cognitive SRL scores diverged from growth mindset scores at various levels of use of student-teacher interactive strategies and the interaction effect was significant, it showed moderation.

4.3.8.8 The moderation effect of student-teacher interactive strategies on the relationship between growth mindset and meta-cognitive SRL. Table 44 and figure 26 present the results

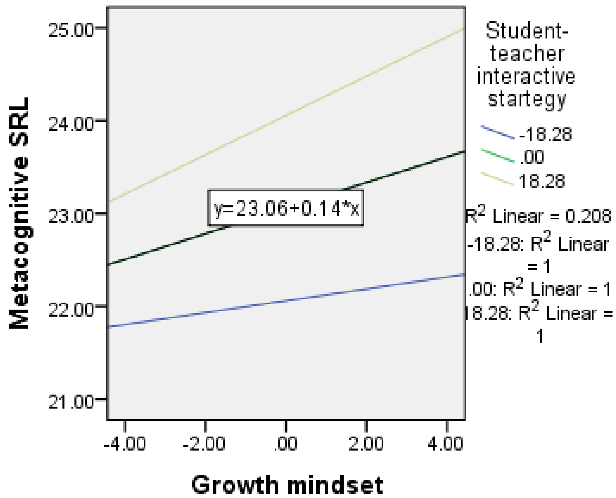
Table 44

Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and meta-cognitive SRL

Model	Outcome variable	Independent variable	β	SE	t	P	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 7.80, R^2 = 0.07, p< .01								
2	Meta-cognitive SRL	Growth Mindset	0.14	0.07	2.14	P= 0.03		0.01	0.26
		Student-teacher interactive strategy	0.06	0.01	4.00	p< .01		0.03	0.08
		Interaction	0.004	0.03	1.45	0.15	0.006	-0.02	0.01

Source: Survey data (2023)

According to Table 44, model 1 showed that the overall model was statistically significant F= 7.80, R^2 = 0.07, p < .01. Results in Model 2 further showed that a growth mindset significantly predicted meta-cognitive SRL, β= 0.14, t=2.14, p= 0.03 and student-teacher interactive strategies too, β= 0.06, t= 4.00, p< .01. However, because the bootstrap confidence interval contained a zero, the overall interaction effect was not statistically significant (BootLLCI and BootULCI) (-0.02-0.01), β= 0.004, t= 1.45, p=0.15. Therefore, student-teacher interactive strategy did not significantly moderate the relationship between growth mindset and meta-cognitive SRL. In this case the hypothesis that student-teacher interactive strategies moderate the relationship between a growth mindset and meta-cognitive SRL was rejected. The Johnson Neymar did not show any ranges of values where the interaction effect is significant; however, Figure 26 shows some moderation effect.



Source: Survey data (2023)

Figure 26. ***Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and meta-cognitive SRL***

Figure 26 showed some small increase in the meta-cognitive SRL scores at different levels of use of student-teacher interactive strategies. However, the Johnson Neymar did not show any areas where the interaction effect was significant and since the interaction effect was not significant too, it could not be said that the predictive change was brought about by the moderator, so there was no moderation. Therefore, use of student-teacher interactive strategies in this study did not affect the relationship between growth mindset and learners' meta-cognitive Self-Regulated Learning.

4.3.8.9 The moderation effect of student-teacher interactive strategies on the relationship between growth mindset and resource management SRL. Table 45 and figure 27 present the results

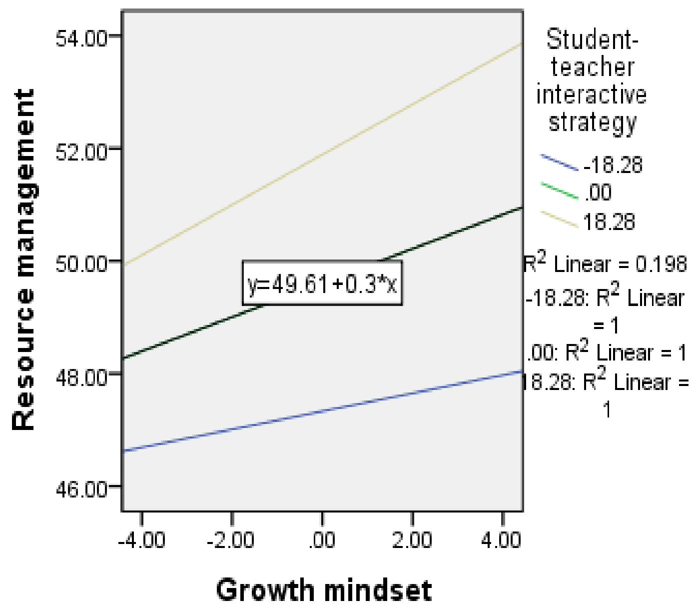
Table 45

Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and resource management SRL

Model	Outcome variable	Independent variable	β	SE	t	P	R^2	Bootstrap LLCI	ULCI
1	Model summary, F= 12.47, $R^2 = 0.10$, p< .01								
2	Resource management	Growth Mindset	0.30	0.12	2.64	P= 0.01	0.07	0.08	0.53
		Lecture	0.13	0.02	5.12	p< .01		0.08	0.17
		Interaction	0.008	0.005	1.57	0.12	0.007	-0.002	0.02

Source: Survey data (2023)

Results in Table 45 showed that the overall model was statistically significant F= 12.47, $R^2 = 0.10$, p < .01. Results in Model 2 also showed that a growth mindset significantly predicted resource management, β= 0.30, t=2.631, p= 0.01. The predictive relationship of student-teacher interactive strategy and resource management SRL was also statistically significant β= 0.13, t= 5.12, p< .01. However, the overall interaction effect was not statistically significant because the bootstrap confidence interval contained a zero (BootLLCI and BootULCI) (-0.002-0.02), β= 0.01, t= 1.57, p=0.12. Therefore, student-teacher interactive strategy did not significantly moderate the relationship between growth mindset and resource management. So in this case the hypothesis that student-teacher interactive strategies moderated the relationship between a growth mindset and resource management was rejected. The Johnson Neymar did not also show any ranges of values where the interaction effect was significant but Figure 26 showed some moderation effect.



Source: Survey data (2023)

Figure 27. ***Moderation effect of student-teacher interactive strategies on the relationship between growth mindset and resource management SRL***

Figure 27 illustrated the simple slopes for the relationships and interaction. Although the simple slopes showed that there were changes in resource management SRL scores at different levels of application of student-teacher interactive strategies, the Johnson Neymar did not show any areas where the interaction effect was significant. Since the interaction effect was not significant too, it could not be concluded that the predictive changes were brought about by the student-teacher interactive strategies, so there was no moderation. Therefore, the teachers' use of student-teacher interactive strategies in Mathematics lessons for the current study case did not affect the relationship between growth mindset and learners' resource management Self-Regulated Learning.

4.3.9 Chapter summary

This chapter presented the results from the quantitative and qualitative data in accordance with the objectives and research questions. Tables were used to show the quantitative results, and narratives were used to support the qualitative data. Quantitative and qualitative methods were used to test objectives one through four. There were moments when the qualitative and quantitative results converged, and there were also moments when the two sets of results disagreed. The divergence may be because, qualitative data can reveal more profound and nuanced understandings of the complexities of life and the context of human behaviour while quantitative methods can measure and describe patterns across large samples and can capture aspects that can be measured statistically. In light of this, the mindset, interest, and Self-Regulated Learning of students as well as the teaching strategies of teachers that were discussed in different sections of this chapter provided a thorough explanation and comprehension of the study variables. As a result, the study's discussions are covered in the next chapter (5).

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

5.1 Discussion of findings

This section discusses findings on mindsets, interest, teaching strategies, and Self-Regulated Learning in Mathematics among students in lower secondary schools in Wakiso district. Quantitative and qualitative interpretations are combined for the purpose of expanding and enhancing each other. Literature backup has been utilized to enhance the discussion with increased authenticity when appropriate. The discussion has been structured based on the objectives of the research. This chapter includes the study's discussion, conclusion, suggestions and recommendations for further research.

5.1.1 Differences in mindsets exhibited by students in Mathematics

Based on the descriptive findings in Table 7, a larger number of students demonstrated a growth mindset. The findings indicate that a greater number of students thought that their potential in Mathematics could be developed rather than being seen as an inherent ability that is either present or absent. Most students had a growth mindset, which implies that they believed that they could always learn, develop and improve their Mathematics abilities and grades. This aligned with some students' qualitative stories where they conveyed a desire to enhance their Mathematics skills despite receiving criticism or performing poorly in the subject. Additionally, students' opinions indicated that they approached Mathematics with a growth mindset. There was a discrepancy between the qualitative and quantitative findings because students' and teachers' narratives revealed that many students held fixed mindsets in Mathematics. The narratives from teachers and students showed that some students had characteristics of a fixed mindset in Mathematics. The findings suggested that a good number of students in schools believed that their Mathematics ability was static, that they had a predetermined level of Mathematics ability, and that there was nothing that could be done to change or increase it. The relatively high percentage of students exhibiting characteristics of a fixed mindset could not be disregarded and necessitated interventions to shift their mindsets on Mathematics. The mean results, however, demonstrated that more students were inclined towards a growth mindset than a fixed mindset.

The findings are consistent with the Social Cognitive Theory (SCT), which holds that people have self-beliefs that allow them to exert some control over their thoughts, feelings, and behaviours. As a result, students may put forth greater effort, endure through difficulties, and continue in the face of failure, or they may perceive effort as futile and give up easily when faced with difficulties depending on whether they believe their Mathematics ability is static or can be improved.

The findings are in line with those of Snipes and Loan (2017), who discovered that the majority of the study participants had views that were consistent with a growth mindset in Mathematics. The results, however, are in contrast to those of Bedford (2017), who discovered that there were a variety of mindsets among science students in England aged 15 to 17, pointing out that the majority were inclined towards a growth mindset but that the results were not statistically significant. The results also contradict Glerum et al. (2020), who studied mindset variations among VET students in the Netherlands and discovered that more students had a growth mindset, followed by a mixer of mindsets and a fixed mindset, which was the least prevalent. Their results were also not significant.

When students or members of a population are classified as having a strong growth mindset, a growth mindset with fixed ideas, a fixed mindset with growth ideas, or a strong fixed mindset, this is referred to as the "mixer of mindsets." However, these can be classified as having a fixed or growth mindset. Additionally, these disparities emerge from using a mindset tool that combines items for both fixed and growth mindsets rather than using separate tools for growth and fixed mindsets, all of which lead to mindsets. This study used a separate set of tools for each mindset. The discrepancies may also result from studying general disciplines like science subjects where students hold different mindsets for different subjects as opposed to when studying Mathematics specifically, where students can be classified as having either a fixed or growth mindset in a particular discipline. It is better therefore for studies to be conducted in specific subjects rather than in generic subject categorizations because people have diverse beliefs and views in different situations.

Further, results in Table 8 showed that there were no statistically significant differences in the students' fixed versus growth mindsets in Mathematics across gender. But conflicting findings are presented in the literature that is currently available. It has been noted that gender and mindsets are associated, with more males holding a growth mindset and females a fixed mindset when it comes to Mathematics. Literature also demonstrates that students who are vulnerable to fixed mindsets, such as gender stereotypes, are more likely to believe that Mathematics is difficult and complicated and that men are better at it than women (Dweck, 2017;

Mofield & Peters, (2018); Marriott et al., 2019; Donohoe et al., 2021). The findings, however, are in line with those of Rothrock (2019), Mcpartlan et al. (2020), Burnette et al. (2020), and Donohoe et al. (2021), who discovered that there were no appreciable differences in mindsets between men and women. These findings demonstrated that both males and females were capable of having a fixed or growth mindset when it cames to Mathematics. The findings are consistent with the SCT, which demonstrates that anyone can have beliefs and that those beliefs can influence or shape people's behaviours. However, some qualitative narratives from students and teachers conflict with the quantitative results. According to the narratives, some female students believed that they could not succeed in Mathematics because they believed that it was a male subject.

The qualitative findings contrast from those of Zarrinabadi et al. (2021), who reported that L2 and L3 language learners in Iran had significant gender disparities in mindsets, with men having higher fixed mindsets. In a study of Mathematics students in grades 4-7 in California, Claro and Loeb (2019) found that females had a more growth mindset than males. The contradictions in results may be caused by Iran's and California's geographical separation from Uganda. Additionally, findings indicating that males had a fixed mindset compared to girls might be the result of an overemphasis on gender abilities and more emphasis on females over males enrolling in STEM courses which changed females' views about Mathematics. There needed to be an action taken to correct the false impression held by certain female students who still viewed Mathematics as a male field. However, the quantitative findings showed that anyone could have a fixed or growth mindset in Mathematics, regardless of their gender.

Other demographic factors as personal and environmental influences were taken into consideration with reference to mindsets, in addition to gender differences in mindsets. Results in Table 9 indicated that there were no statistically significant differences in the fixed and growth mindsets among the students by tribe, school foundation and location, school type, or parents'/guardians' occupations with the exception of religious affiliation. The findings of several studies regarding demographic characteristics vared, for example, results on parents' or guardians' occupation differed from those of Claro and Loeb (2019), who discovered significant differences in mindsets between students from high- and low-income families, with students from low-income families having a fixed mindset and those from high-income families having a growth mindset. The parents' occupation may be correlated with high or low income.

In contrast, Mcpartlan et al. (2020) discovered that there were no significant differences between students from low economic status and those from higher income status. Most studies focused more on high- and low-income schools when examining school types. Results on religion revealed significant variations in a growth mindset across various religions. This was in disagreement with the quantitative findings of Luebke (2019), which revealed that there were no significant differences in Mathematics mindsets among religions. Luebke (2019) in a qualitative study found out that students perceived a relationship between mindsets and religion. They reported turning to their religious beliefs for support, encouragement, and guidance to develop a more positive mindset when facing challenges.

The quantitative findings partially supported the qualitative findings, which found that children and teachers did not link mindset to factors including, school type, tribe and location. The qualitative results, however, contradicted the quantitative findings because the teachers' and students' narratives did not link mindsets to religion but linked mindsets to parents'/guardians' occupation. Student narratives, revealed that some of them believed that they possessed or did not possess Mathematics abilities because of their parents/guardians. Due to the fact that their parents worked in fields involving Mathematics, such as engineering and medicine, students believed that they could also be mathematicians. Others held the opinion that they lacked mathematical abilities because no one in their families worked in a similar field. This finding was consistent with King (2020), who discovered that mindsets were socially contagious and that students could acquire them by merely observing others and gauging their own abilities from them. The findings were also consistent with the SCT, which emphasizes how the environment interacts with a person's characteristics to influence how they act. Parents, being external environmental factors might have a direct or indirect impact on their children's' mindsets.

Although there seemed to be discrepancies between the study's results and global demographic data, it was evident that anyone could have improved mathematical ability perceptions. The lack of notable variations in mathematical mindsets among different demographic groups showed that every student had the potential to overcome a fixed mindset. Regarding religion, the contrasts between fixed and growth mindsets meant that students could always turn to their respective faiths for support in order to maintain a growth mindset if they felt as though they were slipping into the fixed mindset range.

5.1.2 Differences and levels of interest in Mathematics

The descriptive results in Table 10 showed that students had high levels of interest in Mathematics. However, the qualitative results disagreed with the quantitative ones because teachers and students in the majority of schools rated Mathematics interest as low. Students further expressed their lack of interest in Mathematics by themselves or with their peers, giving a variety of reasons, such as those related to the nature of Mathematics like being difficult, abstract, complex, boring, requiring a lot of calculations or not applicable to real life. They were also reasons related to social others for example receiving negative feedback from peers, teachers, parents, and others around them, being taught poorly and previous poor performance in Mathematics. This aligned well with the SCT which holds that what people think, believe and feel influences how they behave. Results also agreed with the Four Phase model of interest development on environmental factors fostering interest. Students acted in an interesting way towards Mathematics due to their false perceptions about it. The qualitative results were consistent with UNEB findings indicating that, despite the fact that Mathematics was compulsory at the O level, few students continued with it at the A level, citing interest as one of the reasons for the low numbers (UNEB, 2019, UNEB, 2021).

The quantitative findings were in line with Salifu and Bakari (2022), who showed that although students had misconceptions about Mathematics, they demonstrated a high interest in the subject. According to (Schweder & Raufelder, 2021), as adolescents mature, students' interest in Mathematics tends to decline. The findings were also in line with Ampaire (2022), who observed that family stereotypical beliefs about careers were a predictor of career aspirations. This trend undermined the students' capacity to concentrate on genuine career aspirations. Similarly, some students in the study attributed their low interest in Mathematics to their parents or guardians.

The quantitative findings were in contradiction with Arhin & Yanney (2020), who asserted that college students in Ghana had a low interest in Mathematics, which had an impact on their Mathematics performance. On the other hand, qualitative findings were consistent with Salifu and Bakari's (2022) observation that students' low interest in Mathematics was due to their perception of it as abstract, boring, difficult for them to understand and having no practical application. Ukobizaba et al. (2021) also discovered that harsh and careless teachers could cause students to lose motivation and interest in Mathematics. Peers could influence students' interest in Mathematics, according to Eriksson (2020), and Jameel and Ali (2016) found that most Mathematics teachers did not make teaching Mathematics engaging and practical, which resulted in the students having negative attitudes and showing little interest in the subject, which ultimately resulted in poor Mathematics performance. Savelsbergh et al. (2016), Mun & Hertzog (2018), and Kihwele & Mkomwa (2022), studies also revealed that teachers' use of creative teaching methods and strategies had a good impact on students' interest in Mathematics. This research and body of literature partly indicate that there are low levels of interest owing to a variety of reasons, some of which are personal to the students and others related to their socializers, such as peers and parents and teachers. The misconceptions about Mathematics that need to be dispelled are largely to blame for the low levels.

Results from Table 11 compared situational and individual interests and revealed that there were significant differences between the two. Students showed more situational interest in Mathematics than individual interest. The findings implied that environmental and external factors such as teachers, the learning environment at school, parents or peers caused students to have high or low interest. The findings also suggested that students' enduring, well-developed interest in and overall liking for Mathematics was low and that most students were not willing to pursue the subject further or pursue a profession in it.

The findings may also help to explain why some students reported liking Mathematics but not wanting to pursue it further because their situational interest did not develop into individual interest. The results were in line with the majority of students' narratives, which indicated that environmental factors like teachers and peers were the main reason why most students were more interested in Mathematics. Those who were not as interested in Mathematics attributed their lack of interest to more personal factors, such as their negative perceptions of the subject, which led to a general dislike of it. They also noted that these perceptions were influenced in part by what others had to say about the subject and most students were further not willing to pursue the subject after O level. The findings were in line with the Social Cognitive Theory that explains how environmental effects, personal factors such erroneous ideas and thinking, affection, behaviour and the environment can all have an impact on one another to cause behaviour. They also agreed with the Four Phase model of interest development on the social factors, organization of the environmental fostering interest. The findings were in accordance with Wong and Wong (2019), who conducted research among form two students in Malaysia and found that while students had a propensity for liking Mathematics, they did not see its benefits, which indicates situational interest. However, the findings were in contrast with Ryan et al. (2022), who examined students' motivation beliefs, emotions, and self-related beliefs at the end of their first year of secondary education. These found out that despite receiving poor grades, more students were eager to learn and enrol in more Mathematics courses, which suggests individual interest. This discrepancy might be caused by the geographic difference between Ireland and Uganda as well as the various classes included in the study.

According to Table 12, there were statistically significant differences in Mathematics interest according to gender. Results show that males were more interested than females. Mathematics was believed to be complex, abstract and difficult and males were thought to be more capable and stronger than females, who were thought to be feeble and weak, and as a result males were seen as capable of the hard and ‘abstract’ Mathematics. This conception of Mathematics had an impact on women's interest in the field. This finding was consistent with qualitative narratives in which teachers revealed that most students showed less interest in Mathematics. Various teachers also pointed out various misconceptions that had an impact on female students' interest in Mathematics, such as the notion that sciences and Mathematics were more appropriate for boys than for girls. These findings were consistent with the SCT, which discusses how people's beliefs that they build about themselves affect their interest in activities. The findings were consistent with Marriott et al (2019), who reported that males had significantly higher interest in

Mathematics than females in the USA. They also agreed with Tembe et al. (2020), who found out that both men and women showed interest in Mathematics, but that men's interest was greater than that of women. The results were also in line with Oluyemo et al. (2020) in Nigeria, who found out that males and females both showed higher levels of interest in Mathematics, with males scoring higher on the high and moderate interest scale than females, and that males and females both showed lower levels of interest, but females expressed lower levels of interest in Mathematics.

Contrarily, a study by Musbahu et al. (2020) on gender inequalities in Mathematics interest and achievement in Junior Secondary Schools in Nigeria found out that female students showed more interest in Mathematics than their male counterparts. The results furthermore were in disagreement with Yadav and Aggarwal (2016) findings that there were no significant gender differences in Mathematics. In addition, Song et al. (2019) in Korea discovered that there were no significant differences between boys’ and girls' mean levels of interest. On the other hand, qualitative findings showed that there is still a perception that Mathematics is a masculine discipline which seems to affect women.

Results in Table 12 further showed that there were statistically significant differences in individual and situational interest in respect to gender with males exhibiting more situational and individual interest than females. The findings suggested that males exhibited more enduring and well-developed interest than girls in Mathematics, and at the same time they were more interested in Mathematics lessons than girls. The findings were consistent with qualitative findings that showed more males expressing a willingness to pursue Mathematics beyond the O level. The findings were, however, partially in agreement with Hogheim and Reber (2017) who observed that there were gender differences in individual interest, with males reporting higher levels of individual interest than girls, but no gender differences in situational interest. The study findings showing that males were more situationally interested than females in Mathematics suggested that extrinsic environmental influences, such as teachers, peers and other environmental agents like parents, had a greater impact on boys' interest. Similarly, literature presents different findings which show that females' interest in Mathematics is more influenced by environmental factors like peers, teachers, peers, stereotypes than males' (Lazarides & Ittel 2013; Eriksson 2020).

Different demographics, including tribe, religious affiliation, parents' or guardians' occupation, school type—including day-only, boarding-only, and day and boarding, urban-rural location, and private or government-aided school—were compared against interest and its constructs, i.e., individual and situational interest. The findings showed that there were no significant differences in interest across demographics. The findings suggested that all students, regardless of their tribe, religion, or parents' or guardians' occupation, whether they attend boarding, day, or boarding and day schools, live in urban or rural areas, or attend private or public schools, could engage with or venture in Mathematics. The findings were somewhat supported by Yadav and Aggarwal (2016), findings who discovered that there were no variations in interest based on the school's location as either urban or rural. The results also contradicted Musbahu et al.'s (2021) findings, which revealed that although students in private schools performed better in Mathematics, students in public schools showed greater interest in the subject than their private school counterparts. The quantitative results and the qualitative findings were partly in agreement where students and teachers did not attribute interest in Mathematics to factors like school type or foundation. The findings went against the SCT, which holds that people can react differently to different situations depending on their personal and environmental factors. The findings also disagree with the Four Phase model of interest development on social factors fostering interest.

However, several students' and teachers' narratives indicated that some students might be drawn to Mathematics by their parents' line of work. This was consistent with SCT theory, which emphasizes the impact of environmental factors on people's behaviour. The lack of variances in the majority of demographics demonstrated that anyone could learn Mathematics. The results did, however, also show that parents played a significant effect in how interested their children are because, depending on their parents, children can either be interested or not in Mathematics.

5.1.3 Extent of Self-Regulated Learning

According to Table 15, students had high Self-Regulated Learning in Mathematics. Results also showed that learners' levels of metacognitive, cognitive, and resource management Self-Regulated Learning in Mathematics were high. Students had more metacognition followed by resource management and lastly cognitive Self-Regulated Learning. Results suggested that students were better at monitoring and regulating their learning, managing their resources than they were at encoding, memorizing and recalling knowledge. These findings were partly in line with Llagoso (2017), who discovered that Self-Regulated Learning was high for half of the student respondents and low for the other half. However, the findings contradict with Susilowati et al. (2020), who observed that students' levels of Self-Regulated Learning fell into the moderate category on average. The results were also in contrary with Harding et al. (2019) in Australia who found out that lower secondary school students were low on Self-Regulated Learning.

In addition, results in Table 15 showed that students employed all or some strategies highly while others moderately. Results also showed that time and study environment, effort-regulation, elaboration, organization and peer learning were highly used in the aforementioned order. The least used approaches were rehearsal, critical thinking and help seeking. The high and moderate Self-Regulated Learning and use of learning strategies highly and moderately implied that learners applied all the strategies in their learning at appropriate times other than relying on only one strategy which wasa sign of good self-regulated learners. The findings were consistent with the SCT on agency, which holds that people are agents over their own development and learning and have the power to things that happen through their actions.

The results are in line with Llagoso's (2017) findings, which indicated that high self-regulated learners who performed well in Mathematics used all the strategies (self-evaluation, environmental and structural structuring, goal setting and planning, rehearsing and memorizing, organizing and transforming). However, the results contradict Harding et al. (2019), who discovered that students in lower secondary schools reported less usage of SRL behaviours than those in upper primary schools. The findings also partially corroborated with Kwarikunda et al. (2022), in Uganda who discovered that secondary school students employed elaboration and metacognitive self-regulation more frequently than critical thinking in Physics. The results, however, contradicted the study's findings that rehearsing was the most used strategy. Contradictions might arise from the subjects considered in the studies, which focused on Mathematics other than physics. The results were also against Alotaibi et al. (2017) who discovered, that students employed less metacognitive self-regulation and more rehearsal and memorisation.

The findings are also in disagreement with Kizilcec et al. (2016), who conducted research in Chile across different learning levels and discovered that students employed more self-evaluation and elaboration, followed by strategic planning, task strategies, and goal setting and help seeking was the least used strategy. On the other hand, the quantitative and qualitative findings concur, demonstrating that learners used various strategies while studying and learning Mathematics. The most mentioned strategies from both students and teacher narratives were peer learning, help seeking, daily practice, time and study environment, elaboration and meta-cognitive self-regulation. The results are in line with the SCT about people's ability to use a number of strategies to self-regulate behaviour.

Tables 16 and 17 findings revealed the differences in Self-Regulated Learning in Mathematics by demographics. Results showed that, according to gender, there were no differences in Self-Regulated Learning in Mathematics. These results contradict those of Mutua and Oyoo (2020), who discovered that males outperformed girls in the use of higher order methods while girls outperformed boys in the use of various learning strategies. The findings also contradicted those of

Filho and Nova (2020) and Sáez-Delgado, (2022), who discovered that females had greater SRL levels than males.

Regarding school type, there were no significant differences in SRL depending on being in day, boarding or day and boarding school, school location or being in a private or government school. According to Farooq and Asim (2020), home environment greatly influenced SRL through parental support in instilling self-regulatory behaviour in their children. The findings contradicted Susilowati et al. (2020) in Indonesia, who found that day students were more self-regulated than boarding students. The findings were partly consistent with Masud and Islam (2022), who discovered that there were no significant differences in SRL depending on whether a school was in an urban or rural setting. However, the results disagreed with Masud and Islam (2022) findings that private schools performed better than public schools in goal-setting, environment structuring, help-seeking, self-evaluation, and self-regulation and that there was no significant difference in the mean public school scores on task strategies, time management, and cognitive strategy use. Qualitative findings were in line with quantitative results because the narratives did not reveal differences in SRL depending on the demographics.

The findings were consistent with the SCT's assertion that people possess capabilities that enable them to symbolize, devise alternate strategies, self-regulate and self-reflect. The SCT also holds that humans are active agents who self-regulate rather than being passive recipients waiting to be worked on by external agents. There is also a disagreement with the SCT on environmental factors influencing SRL. However, the findings imply that all children could be self-regulated learners or not, regardless of their qualities and the kind of schools they attended.

5.1.4 Perceived use of teaching strategies

Students believed that teachers used all of the strategies, according to the descriptive findings in Table 18. Results from Table 18 demonstrate that students perceived their teachers to use all the teaching strategies highly i.e. teacher-centred, learner-centred and student-teacher interactive strategies. The findings showed that teachers did not just rely on one method when teaching Mathematics but they employed all of them. The findings also showed that teachers employed learner-centred and student-teacher interactive strategies equally, but that teacher-centred strategies were more frequently used by teachers. The findings suggested that teachers continued to dominate Mathematics teaching.

The findings also showed that teachers used learner-centred strategies, in which the student was placed at the centre of the teaching, as well as a combination of learner- and teacher-centred strategies (student-teacher interactive strategies). It was possible that while using the student-teacher interactive strategies, the teacher dominated the class for the majority of the time before allowing students to actively participate afterwards. In the same vain, qualitative narratives from both the students and teachers yielded similar results (see narratives on objective two and four). Students also narrated that Mathematics required calculations, thus they preferred teachers to teach them the calculations first while also allowing them to practice as they often became lost and losing interest in Mathematics when left on their own. Teachers also mentioned that the students preferred to depend more on teachers during Mathematics lessons because the students lost motivation easily when they get stuck during calculations but at the same time they wanted to actively take part in the lesson. The findings concurred with Sibomana et al. (2022) who noted that teachers in Burundi employed teacher-centred strategies more often when teaching Mathematics. The findings were also in accordance with Mavumba and Mtitu (2022), in Tanzania who discovered that teachers used the lecture method/ teacher-centred strategies more often in Mathematics classes, but they also employed learner-centred strategies and a combination of both learner-centred and teacher-centred strategies. These findings and literature demonstrated that teachers were aware of the need to apply a variety of teaching strategies in order to improve their student learning.

Study results also showed that, with the exception of audio-visual aid use, which was rated average, teachers used all methods under all strategies highly. Similarly, the qualitative findings were consistent with the quantitative findings because, according to students and teachers, students preferred teachers who would demonstrate how to approach calculations, offer them time to practice, and allowing them to collaborate with others when working out numbers. Students expressed a preference for Mathematics lessons that highlighted the application of Mathematics in real life. Only a few students noted that their teachers used project-based learning and audio-visual aids in class. These findings were consistent with Sibomana et al. (2022), who conducted a qualitative study and discovered that teachers employed the lecture method, question-and-answer, and cooperative learning while teaching Mathematics. The findings were further in line with Mavumba and Mtitu (2022), who discovered that lecture method, question-and-answer, cooperative learning, group discussions, demonstrations, problem-solving, inquiry-based learning, and discovery learning were all employed by teachers while teaching Mathematics. Different methods of teaching Mathematics were offered through literature reviews for better results. These results, earlier research, and literature demonstrate that teachers could influence students' learning by choosing and implementing the best teaching strategies and methods when necessary, rather than relying solely on one strategy/method. The qualitative results did not differ so much from the quantitative results because students' and teachers' narratives revealed that teachers used different methods and strategies while teaching Mathematics. The results were in line with the SCT on human functioning which viewed it as a dynamic environmental influences such as teachers influencing people's actions.

Different strategies were compared against different school categorizations. There were no significant differences in the use of different strategies depending on a school being day, boarding or day and boarding. However, Mostafa (2018) findings from OECD results noted that some teaching practices were better in different contexts than others.

Regarding school location, there were significant differences in the use of learner-centred and student-teacher interactive strategies on either being an urban school or rural school. Rural schools had a higher mean on the two strategies than urban schools. The findings contradicted literature, such as that of Du Plessis and Mestry (2019), which showed that rural schools faced greater challenges than urban schools in the area of Mathematics teaching. However, the results were consistent with Echazarra and Radinger (2019) findings from the OECD, which indicated that rural schools were more likely to adjust lessons to learners' requirements and use a variety of teaching strategies to help students learn.

Furthermore, there were no significant differences in the use of the different teaching strategies depending on whether a school was government aided or private.

The results disagreed with those from Mostafa (2018) OECD study findings, that private schools employed more adaptable teaching strategies than did public schools. Results were further in contrast with Shah et al. (2022) in Pakistan that found out that public schools (government-aided) teachers of English used more independent study, small-group discussions and brainstorming while private school teachers used demonstration. The findings also went against Suprayogi et al. (2022), who discovered that teachers' use of differentiated teaching in primary schools was below average in both private and public schools but that public schools had a higher mean than private schools. The conflicting results may result from the various levels of study, such as primary vs secondary and different subjects studied. Nevertheless, the significant results were in line with the SCT on environmental contexts impacting on behaviours

The trend between urban and rural schools, as opposed to private or public schools, demonstrated that teachers received the same training, for instance SESEMAT, and applied what they learnt whether they worked in a day school or a boarding school. However, the location of the school, such as urban or rural, might influence how the strategies or methods were applied. Mostafa (2018) noted that some strategies were better adapted to different contexts and students. That rural schools sometimes had small classes or performed poorly and called for teachers to be creative and use a variety of techniques to help students to learn. On the same note, all schools reported employing all teaching strategies highly, despite what appeared to be small variations in the rates of use of various strategies and methods. The qualitative findings from the students and teachers did not demonstrate that mathematics teaching could be influenced by the location or type of school one teaches in.

5.1.5 The mediation effect of interest in the relationship between mindset and Self-Regulated Learning

This was investigated using 12 sub-hypotheses. In general, no research on the mediated link of interest, individual interest and situational interest in the relationship between a growth mindset and SRL was found in the literature, and in particular, none that produced equivalent results. The discussion, for this matter incorporated the outcomes of numerous descriptive, correlational and literature research. The additional sub hypotheses are presented in the additional discussion section.

5.1.5.1 The Mediation effect of interest on growth mindset and Self-Regulated Learning

The findings in Table 22 indicated that there was a partial mediation effect of interest on the relationship between SRL and growth mindset. Results indicated that students who believed that their mathematical ability could be improved over time were likely to be more self-regulated than those who thought that their mathematical ability was fixed. According to figure 4, students who adopted a growth mindset were more likely to engage in Self-Regulated Learning. Particularly, interest acted as a mechanism to account for why students that adopted a growth mindset were self-regulated learners. Additionally, the results showed that adding interest to the model had a positive effect on SRL.

According to this study, students who had a growth mindset were more likely to use a variety of Self-Regulated Learning strategies that aided in their successful Mathematics learning. Students were more likely to engage in a variety of self-regulated activities and enhance their Mathematics learning when they believed that their mathematical ability was malleable and were interested in the subject. Therefore, compared to learners who believed that their intelligence was fixed and unchangeable, students with a growth mindset were more interested in Mathematics and were more likely to be highly self-regulated. Because interest is a partial rather than a full mediator, it suggests that a growth mindset can influence students' Self-Regulated Learning even in the absence of interest. The findings supported the SCT's assertion that self-perceived beliefs play a crucial role in the exercise of control and personal agency.

Dweck (2017) asserts that adopting a growth mindset can lead to a person changing their opinions about themselves and, consequently, all aspect of their life, including their interests in all areas of life. Children need to believe that they can learn Mathematics in order to engage in Self-Regulated Learning according to Ahmed (2017). Correlational research, for example by Widyastuti & Djono (2022), demonstrated that students' mindsets influenced how they regulated their learning, thus demonstrating the necessity to improve self-regulation by first instilling a growth mindset. Students that had a growth mindset believed that Mathematics ability was malleable and could be improved with effort, therefore they were more likely to employ efficient study strategies and exert effort necessary to advance their skills.

Additionally, students who had a growth mindset were more likely to be enthusiastic about their academic work and to value academic subject matter more highly in contrast to those who had a fixed mindset. Therefore they could readily interact more deeply with the course material and grow more interested in a subject (Schmidt et al., 2017). According to Ahmed (2017), there is a link between interest and Self-Regulated Learning, which suggests that if a student is not interested in the subject, they may not engage in Self-Regulated Learning. According to a study conducted in primary schools in Hong Kong by Zhu & Mok (2018), students who showed a greater interest in Mathematics were more likely to participate in Self-Regulated Learning. This shows that high levels of SRL in Mathematics are attained when a growth mindset is supported by high interest.

5.1.5.2 The Mediation effect of interest on growth mindset and Cognitive Self-Regulated Learning

Table 23 results revealed a full mediation effect of interest on the relationship between a growth mindset and cognitive SRL. Results indicated that students were more likely to engage well with the material by memory learning and problem solving, which helped to generate new knowledge through mental processes and apply it in daily life, than students who believed that their level of Mathematics ability was unchangeable. Figure 5 findings demonstrated that students who had strong growth mindsets were more likely to learn cognitively and autonomously through fostering interest.

Furthermore, students that had a growth mindset were more likely to have high levels of cognitive Self-Regulated Learning, and this was especially true of their capacity to repeatedly interact with certain objects, events or ideas over time.

The current study further shows that students who have a growth mindset are more likely to use cognitive strategies like rehearsal, elaboration, organization, and critical thinking to learn Mathematics effectively. In addition, students are more interested and can apply a variety of cognitive Self-Regulated Learning strategies and enhance their Mathematics learning when they believe that their mathematical ability is malleable.

For this particular study, it was revealed that interest served a significant role in learners' cognitive SRL because it served as a full mediator between growth mindset and cognitive SRL. This suggested that having a growth mindset and believing that one's mathematical ability was malleable could better assist students to be cognitively Self-Regulated in their learning if they were interested in the subject. This was in line with the SCT on personal factors like beliefs and affection affecting people's behaviour

According to Montalbano (2021), because of the disparity in students' core beliefs about Mathematics intelligence, students are likely to use various SRL strategies differently. The growth mindset and habitual use of the cognitive strategies of elaboration and structuring are positively correlated, according to Hertel & Karlen (2021). A growth mindset can also increase interest since it facilitates the development of value-related features of the subject (Dagmar, 2022). Interest stimulates students to take initiative and develop into self-regulated learners through the use of a number of strategies that assist learners in knowing how to learn something (Merett et al., 2020).

According to Abdullahi and Umeano (2020), interest increases enjoyment and reduces the strain on limited cognitive resources during the performance of an activity or task. According to Ahmed (2017) study on motivation and Self-Regulated Learning in the USA, intrinsic value (interest) was a better predictor of Self-Regulated Learning strategies of memorization, elaboration, and control. When students have a growth mindset and are interested in Mathematics, they can easily apply a variety of strategies to aid their learning.

5.1.5.3 The Mediation effect of interest on growth mindset and meta-cognitive Self-Regulated Learning

Results from Table 24 indicated that there was a full mediation effect of interest in the relationship between a growth mindset and meta-cognitive SRL. The findings indicated that students who believed they could improve their Mathematics abilities over time were able to think about their thinking and learned how to learn. A growth mindset enabled them to complete tasks through planning, monitoring, assessing and comprehending. According to the findings in figure 6, students that had high growth mindsets were more likely to learn in a metacognitive, self-regulated way through enhanced their interest. Particularly, interest acted as a mechanism to account for why students who adopted a growth mindset were more conscious of their meta-cognitive processes. Therefore, students were more likely to plan, monitor, set own goals and monitor them if they believed in the malleability of their Mathematics ability and interested in the subject. Interest in the current study played a full mediator role an indication that students' growth mindset worked better on improving students' meta-cognition if students were interested in Mathematics. This aligned well with the SCT on personal factors influencing people's ability to self-reflect.

According to literature, Mathematics contains whole new skills, concepts or conceptual systems that may cause difficulties while learning, in contrast to other verbal courses. This causes students to doubt their Mathematics ability which undermines their motivation, interest and consequently their ability to learn the subject (Dweck 2007). According to Kachnowski (2019), students who have a growth mindset are more likely than those who have a fixed mindset to use metacognitive learning strategies. This is because students that are meta-cognitively self-regulated are more likely to self-test and go over the material again to make sure they understand it. A study by Hertel and Karlen (2021), found out that using metacognitive processes of evaluation and adaptation and having a growth mindset were positively correlated. On the other side, Kachnowski (2019) did not discover a significant association between a growth mindset and university students' usage of the metacognitive learning strategies of planning, monitoring, and regulating feedback among university students. Contradictions may have stemmed from using different participants, that is university students vs secondary school students. Additionally, if students are interested in what they are studying, they will work hard to learn new information and be willing to keep track of it on their own (Schweder & Raufelder, 2021). It is clear that students with a growth mindset may readily monitor and regulate their learning when they are interested in Mathematics.

5.1.5.4 The Mediation effect of interest on growth mindset and resource management

Table 25 results showed that there was a partial mediation effect of interest on the relationship between growth mindset and resource management, Results indicated that students who adopted a growth mindset in Mathematics had a tendency to effectively manage and regulate their resources, including time, study environment and effort. According to the findings in figure 7, a growth mindset predicted students' resource management through the enhancement of interest. Particularly, interest provided a mechanism to explain how growth mindset students could efficiently use their study time, set realistic goals, manage their effort even when faced with uninteresting tasks, collaborate with others and even identify someone to assist them when they felt that they needed help with a subject.

According to the current research, students who had a growth mindset were more likely to use a variety of resource management strategies, such as effort regulation, peer learning, help seeking, managing their time and study environment, all of which promoted effective mathematical learning. In contrast to students who believed that their intelligence was fixed and unchanging, those who had a growth mindset were more likely to be interested in Mathematics and to manage their study resources well. Because interest only partially mediated the relationship between growth mindset and resource management, rather than acting as a partial mediator, it was implied that growth mindset influenced students' resource management even when interest was absent. However, it is also possible that other intervening variables needed to be looked into. This related well with the SCT on personal variables in form of self-beliefs and affect influencing people's efforts.

In addition, students that have a growth mindset are more likely to persevere through difficulties, especially when something does not seem fascinating, and to employ a variety of tools and strategies to reach their objectives (Dweck & Yeager, 2019). Mrazek et al. (2018) add that developing the right mindset is the first step in encouraging Self-Regulated Learning. Kiger (2017) further elaborates about the advantages of promoting a growth mindset in the classroom, where it is believed to be a fantastic catalyst for enhancing student problem-solving and peer cooperation abilities. Growth mindset and resource management strategies (such as time management and organization) were found to be positively correlated by Hertel and Karlen (2021). A growth mindset may also broaden a person's range of interests, which may be useful for forming connections between other subjects and producing original ideas (O'keefe et al., 2018a). Due to their interest, students may place a high value on certain tasks or subject areas, such as Mathematics, hence increasing their level of Self-Regulated Learning (Ahmed, 2017). This suggests that if learners are interested in what they are studying, they will work to acquire more resources to support it. This shows that students who are have a growth mindset and are interested in Mathematics are able to manage their resources effectively, as it is typical of self-regulated learners.

5.1.6 The Moderation effect of teaching strategies in the relationship between mindset and Self-Regulated Learning

The moderation effect was investigated using 12 hypotheses. Generally, no studies on this moderated relationship and particularly none with similar findings was discovered in the literature. Instead, the findings tended to agree or disagree with the results of literature, several correlational and descriptive studies. The additional sub hypotheses are discussed in the additional discussion section.

5.1.6.1 The moderating effect of learner-centred strategies in the relationship between a growth mindset and SRL

The study findings, indicated that learner-centred teaching strategies did not significantly moderate the relationship between growth mindset and SRL. Therefore, the sub hypothesis was rejected. However, the model in Table 26, simple slope in Figure 8 and Appendix A showed some levels of moderation of learner-centred strategies. While some models could explain a portion of the variance in SRL, it could not be concluded that learner-centred teaching strategies moderated the predictive relationship of the growth mindset on SRL in those instances. The whole model was also significantly predictive, but the predictive relationship between growth mindset and SRL in Mathematics for the entire population of subjects in this study could not be stated to be moderated by learner-centred strategies. The results disagreed with the SCT on environmental factors in form of teacher strategies interacting with self-beliefs to cause SRL.

However, correlation results showed that a growth mindset was related to students' SRL. For example, a study by Widyastuti & Djono (2022) showed that students' mindsets affected their strategy in regulating their learning. Literature shows that learner-centred strategies make sure that learners are motivated by active learning experiences that are driven by curiosity and exploration. With the belief that students should learn to actively construct knowledge, the educator acts as a guide. This implies that learner-centred strategies in classes stimulate learners to actively participate in lessons by utilizing their critical thinking, problem-solving and learning skills (Apple et al., 2018). However, the study results contradicted Gouedard (2021) OECD findings which reported that when teachers helped students with their learning, it helped them to develop a growth mindset that could impact on their learning. According to Apple et al. (2018), it's critical to comprehend how students learn in addition to the design, delivery methods, and nature of the subject content. According to Gouedard's (2021) findings, instructors who not only impart knowledge but also show unwavering support for their students create a secure learning environment that promotes the growth of growth mindsets and subsequently strengthens students' SRL. The lack of statistical significance in the current study suggests that the teachers may have simply utilized the strategies to impart knowledge and not to change students' mindsets, which would have led to their usage of SRL strategies.

5.1.6.2 The moderating effect of teacher-centred strategies in the relationship between a growth mindset and SRL

According to Table 27 results, teacher-centred strategies partially moderated the relationship between a growth mindset and SRL. As a result, the sub hypothesis was rejected. The partial moderation implied that within a particular range of values for teacher-centred teaching strategies, the interaction effect was significant beyond which it was not. Figure 9, Table 27, and Appendix A demonstrated that at low levels of teacher-centred strategy use, a growth mindset did not significantly predict or affect SRL but it did so at moderate and high levels. Although teacher-centred strategies had been criticized by most literature, the results showed that these strategies, specifically the lecture method for this study where teachers did most of the talking, showed improvement of the growth mindset-SRL link. Furthermore, results showed that at low levels of use of the lecture method, the students' perceptions of the malleability of mathematical ability did not improve SRL but at high use of lecture method, a growth mindsets led students to be self-regulated learners. Therefore, high use of teacher-centred methods encouraged the growth mindset-SRL relationship and low use of teacher-centred strategies hindered it for all significant moderation ranges and for all SRL score ranges. Overall, it could be said that the association between a growth mindset and SRL was moderated by teacher-centred strategies.

According to Sibomana et al. (2022), the lecture method or teacher-centred approaches, where the teacher does most of the talking, are detrimental to a learner's academic development since they make them passive recipients of knowledge. Results from the Gouedard (2021) revealed that students reported having a fixed mindset more frequently when professors did not modify the lesson to the class's needs and knowledge. This study's findings suggested that, contrary to the literature and other findings, using teacher-centred strategies by teachers fostered the link between a growth mindset and SRL. This fit some narratives, (reference is made to objective 4) which revealed that students preferred their teachers to demonstrate how something is done rather than wait for them to first fail and criticize, which would have a negative effect on their confidence.

These results further implied that students' mindset was weak and their degree of SRL was low at low levels of teacher-centred strategy utilization. The mindset-SRL connection was improved at moderate and high levels of teacher-centred strategy use, though. Perhaps this was the case because students did better when given tasks to complete and were helped first on how to go about them rather than when they were expected to take charge of their learning and repeatedly failed. According to (Farrington, 2012), good performance supports a growth mindset, which empowers students to be self-regulated learners, while poor performance confirms a fixed mindset. The results of Kaymakamoglu (2018) study showed that teachers' use of teacher-centred strategies were because of different students' characteristics in class. Perhaps teachers in the study employed teacher-centred techniques that were based on the various learner characteristics, which helped the students to develop a better mathematical mindset and enhanced their SRL.

5.1.6.3 The moderating effect of student-teacher interactive strategies in the relationship between a growth mindset and SRL

According to the findings in Table 28, the relationship between growth mindset and SRL was partially moderated by the student-teacher interactive strategies. As a result, the sub hypothesis was accepted. The partial moderation, meant that within a particular range of values for the student-teacher interactive strategy the interaction effect was significant beyond which it was not. Table 28, Figure 10, and the Appendix A all demonstrate that at low levels of use of student-teacher interactive strategy a growth mindset does not significantly predict or influence SRL, but at moderate and high use of student- teacher interactive strategy, mindset-predicts SRL. More importantly, the findings indicated that teachers who used both learner- and teacher-centred strategies in the classroom when teaching Mathematics could enhance the impact of growth mindset on SRL. The students' perspectives on the malleability of mathematics ability did not improve their use of SRL when teachers employed low levels of student-teacher interactive strategies. However, a growth mindset encouraged students to become more self-regulated learners as long as teachers effectively blended both approaches. In other words, high use of student-teacher interactive methods supported the growth mindset-SRL relationship while low use of student-teacher interactive strategy hindered it for all significant moderation ranges and for all SRL scores. In general, it can be said that the association between development of growth mindset and SRL was moderated by the student-teacher interactive strategies.

The student-interactive strategy allowed teacher-centred and learner-centred strategies to be both integrated into the classroom. These findings were consistent with Gouedard (2021) findings, which demonstrated that when teachers used a variety of effective strategies that engaged students in active learning, a growth mindset was fostered. The findings were also in accordance with Brandisauskiene (2022), who discovered that having a growth mindset was related to students' perceptions that their teachers supported them in class.

The researcher came to the conclusion that students who had a more pronounced growth mindset used learning strategies more actively and that students' beliefs in the growth of their abilities, which was inherent in a higher growth mindset, encouraged the student to put in more personal effort (more active use of learning strategies) to assimilate the material needed to learn. Results from Gouedard (2021) showed that teachers who not only imparted knowledge but also showed unwavering support for their students created a safe learning environment that fostered the development of a growth mindset and eventually strengthened students' SRL.

5.1.7 Additional discussion on mediation and moderation

5.1.7.0 Mediation additional discussion

5.1.7.1 The Mediation effect of individual interest on growth mindset and SRL

The findings in Table 29 demonstrated that there was a partial mediation effect of individual interest on the association between a growth mindset and SRL. According to the findings, children who had a growth mindset in Mathematics were likely to be more self-regulative than students who had a fixed mindset. Further, Figure 11 demonstrated that fostering strong growth mindsets in students predicted Self-Regulated Learning by fostering individual interest. Growth mindset students were especially adept at controlling their cognitive, affective and behavioural characteristics, which could be explained by the fact that they had a well-developed and enduring interest in Mathematics. According to the current study, learners who had a growth mindset in Mathematics were more likely to use various cognitive, metacognitive and resource management strategies to learn.

When students believed that their mathematical ability was malleable, they might develop a general liking for the subject, which acted as a motivator for them to use a variety of self-regulatory strategies effectively and improve their mathematical learning. The fact that individual interest only partially mediated the relationship between growth mindset and SRL suggested that a growth mindset could influence students' Self-Regulated Learning even in the absence of individual interest, but it also suggested that there might be additional intervening factors that needed to be investigated. This related well with the SCT that personal factors and affection can influence people's ability to regulate their behaviours.

Students that have a mathematical mindset actively seek out learning opportunities, are not easily shaken by mistakes (Rothrock, 2019), and are aware of their responsibility as Mathematics learners to consider mathematical relationships and concepts and to make sense of them (Boaler, 2019). These students use a self-directed process to organize their mental abilities into academic skills Rothrock (2019) but it is not that they possess a specific mental aptitude or academic skill (Zimmerman, 2002). Additionally, having a growth mindset may help one develop a stronger interest in Mathematics. Students with individual interest in Mathematics are expected to be motivated and committed to SRL activities, which are sometimes time- and effort-intensive (Zhu & Mok, 2018). A student's interest in the study of a particular academic subject, such as Mathematics, tends to be more of individual interest, leading the student to examine the material more closely, expand his/her knowledge of the subject, work to learn new mathematical skills, achieve high results and self-regulate behaviour (Fomina & Morosanova, 2017). Students that have a growth mindset in Mathematics and who have a well-developed interest in Mathematics can use a variety of SRL strategies to help them learn.

5.1.7.2 The Mediation effect of individual interest on growth mindset and cognitive Self-Regulated Learning

The findings in Table 30 demonstrated that the relationship between a growth mindset and cognitive SRL was fully mediated by individual interest. Figure 12 demonstrated that the enhancement of individual interest could help the students with a growth mindset in Mathematics to use cognitive strategies that could enable them to gain skills of encoding, memorizing and recall of information. Individual interest in particular acted as a mechanism to explain why students who adopted a growth mindset were able to cognitively modify and manipulate mathematical materials.

The current study showed that students who had a growth mindset were more likely to use cognitive strategies including elaboration, organization, rehearsal and critical thinking, which helped them to retain and effectively recall mathematical content. When students believed that their mathematical aptitude was malleable, they could grow an enduring interest in the subject, which acted as a mechanism for enabling students to appropriately participate in a variety of cognitive self-regulated procedures and enhance their mathematical learning. As a result, children who had a growth mindset were more likely to use a variety of cognitive processes to study Mathematics and to show greater individual interest in the subject. Individual interest being a full mediator in the relationship between a growth mindset and cognitive SRL implied that it played a crucial role in students SRL. It further implied that a growth mindset works best at predicting cognitive SRL when students have individual interest in the Mathematics. This was related to the Four Phase model of interest development on individual interest enabling the generation of more types and deeper strategies for working with tasks.

According to literature, individual interest can have a profoundly positive effect on their attention levels, memory, persistence in enabling the integration of prior knowledge and effort in the pursuit of knowledge, as well as a positive impact on a range of abilities like recognition and recall of information, which points to cognitive SRL (Darlington, 2017). O'keefe et al. (2018a) in a study among Mechanical Turk workers found that those with a growth mindset were more inclined to explore topics outside their areas of expertise. This demonstrated that students might devote their mental energy and time to SRL activities, which are often time- and effort-consuming, with ease when they believed that their abilities could be developed and have a persistent degree of interest (Zhu & Mok, 2018). A growth mindset and individual interest, therefore, are essential factors in students cognitive SRL.

5.1.7.3 The Mediation effect of individual interest on growth mindset and meta-cognitive Self-Regulated Learning

Table 31 results, showed that the relationship between growth mindset and Meta-cognitive SRL was fully mediated by individual interest. Results indicated that students with a growth mindset were more likely to plan their learning effectively and regulate their cognition than were students with a fixed mindset. Figure 13 demonstrated how fostering a growth mindset in students enhanced individual interest and predicted meta-cognitive Self-Regulated Learning. Individual interest in particular acted as a mechanism to explain why students who had a growth mindset were high on planning, monitoring and managing their learning. Students had individual interest when they approached Mathematics with a growth mindset. This acted as a catalyst that enabled them to effectively plan, monitor and regulate their own behaviour and improve their mathematical learning.

According to Schmidt et al. (2017), students who have a growth mindset are more likely to be enthusiastic about their academic work and to value academic subject matter more highly. In contrast to people who have a fixed mindset, they can readily interact more deeply with the course material and get more interested in the regular classroom activities. The results were in line with Denker et al. (2022) who found out that having a communication growth mindset helped to predict students’ individual interest. Linnenbrink-Garcia et al. (2010), argues that interest grows as people learn about and appreciate a subject, which in turn stimulates curiosity and further exploration into the subject. Results were also in agreement with literature by Merett et al. (2020) who note that a well-developed interest encourages students to take initiative and develop into self-regulated learners through the use of a number of strategies that aid students in understanding how to do, how to study, and, in short, how to learn. Furthermore, results were also in agreement with Wang et al. (2021) who demonstrated that interest worked in conjunction with metacognitive abilities to increase student engagement in learning. Monem (2010) also stated that metacognition was triggered by interest and that addressing students' interests stimulated metacognitive functions like strategic knowledge, knowledge about cognitive tasks and self-knowledge.

5.1.7.4 The Mediation effect of individual interest on growth mindset and resource management

The findings in Table 32 indicated that there was a partial mediation effect of individual interest on the relationship between a growth mindset and resource management. According to the findings, students who had a growth mindset were more likely to control their mathematical effort, collaborate with peers and ask for assistance when they felt that they did not understand what was being taught. This was in contrast with students who believed that their mathematical ability was fixed. Figure 14 demonstrated how fostering students' growth mindsets predicted effective resource management by fostering individual interest.

Individual interest, in particular, acted as a mechanism to explain why growth mindset students were able to govern their resources successfully, such as manage time, put in effort even in the face of difficulties and seek help without worrying that they would be perceived as having less ability in Mathematics. When students approached Mathematics with a growth mindset, their interest in the subject could easily grow which served as a mechanism that enabled them to, for example, apply more effort and enhance their Mathematics learning.

Additionally, students who believed that they could solve mathematical problems successfully were more motivated to learn and engage in mathematical tasks than students who did not believe in themselves, and their interest, knowledge and skills grew over time when they participated in engaging Mathematics lesson activities (Gjoka, 2022). Findings were in line with literature by Darlington (2017), who notes that individual interest can significantly affect students' SRL through persistence and effort management. Furtrhermore, literature by Amoozegar et al. (2022) also relates to the findings noting that interested students who are self-regulatory and aware of their academic strengths and shortcomings are better at dealing with the difficulties that arise on a regular basis in their academic work. When they feel they are not understanding the content, these students can readily ask for assistance. Because of this, students who approached Mathematics with a growth mindset could readily develop an interest in the subject, which motivated them to put forth effort even when a task did not appear interesting.

5.1.7.5 The Mediation effect of situational interest on growth mindset and SRL

Results in Table 33 showed that situational interest had a partly mediating effect on the relationship between a growth mindset and SRL. According to figure 15, having a growth mindset predicted Self-Regulated Learning through enhancing situational interest. In other words, when students were fascinated by Mathematics lessons and had focused attention, it helped to explain why students with a growth mindset exhibited high levels of Self-Regulated Learning. Students could more effectively engage in a variety of self-regulated activities and advance their understanding of Mathematics when they believed that their mathematics ability was malleable and had situational interest.

Because situational interest only partially mediated the relationship between growth mindset and SRL, rather than acting as a full mediator, this suggested that there existed other mediators and also that mindset was a crucial factor in students' SRL even in absence of situational interest. The results aligned well with the SCT on environmental factors and personal factors interacting to cause SRL.

Findings were in line with most literature for example, Schmidt et al. (2017), notes that students who have a growth mindset are more likely to be enthusiastic about their academic work and to value academic subject matter more highly. Xu et al. (2021) suggested that a mindset change was crucial, for enhancing situational interest becaause individual interest developed from situational interest. Furthermore, results were in line with Xu et al. (2021), who found out that a growth mindset induction had a favourable impact on maintained situational interest. Situational interest motivates people to become more engaged with content or a task (Toli & Kallery, 2021) , persist longer and engage in self-regulated behaviours (Harackiewicz et al., 2016). Findings also agreed with Roure et al. (2019) about the effect of situational interest on Self-Regulated Learning in PE, situational interest is important in promoting use of Self-Regulated Learning strategies. Even though the study was in PE, it demonstrated the importance of interest in SRL. Because of this, learners' interests as shaped by environmental factors like a positive learning environment and a growth mindset were key determinants of SRL in Mathematics. Finally, results agree with the Four Phase model of interest development on interest enabling students to attend to content, set goals and learn,

5.1.7.6 The Mediation effect of situational interest on growth mindset and cognitive Self-Regulated Learning

There was a full mediational effect of situational interest in the relationship between a growth mindset and cognitive SRL as shown by Table 34. The results implied that students who believed that their Mathematics ability was something that could be developed through effort were more cognitively SR. Further, figure 16 showed that having a growth mindset could help that teachers to predict how frequently students would use strategies to manage their thinking, perception and reasoning through enhanced interest in classroom activities. Particularly, situational interest offered a framework for explaining why students who adopted a growth mindset employed a number of cognitive strategies. Students could readily use extrinsic motivators to develop interest in Mathematics, leading to Self-Regulated Learning, when they believed that they could enhance their mathematical competence through studying. As a result, students who had a growth mindset were more likely to be highly cognitively self-regulated than students who believed that intelligence was fixed and unchangeable. They also enjoyed Mathematics lessons and had a greater situational interest in Mathematics.

Findings were in line with literature for example according to Dweck and Yeager (2019), a student's belief in their abilities will have an impact on whether or not they adopt productive self-regulating views and behaviours. Jia et al. (2022) also assert that people with a fixed mindsets often adopt shallower techniques, like copying and memorization, whereas people with a growth mindset frequently embrace deeper strategies, like paraphrasing and note making. These findings are also in line with correlational results for example by Jia et al. (2022) who found out that growth mindset was positively related to divergent thinking. Mindset was also related to students' interest in classroom activities because according to Dweck (2017), adopting a growth mindset can help people to improve their views about themselves and all aspects of their life, including their interest.

Similarly, according to a study by Dagmar (2022) in the Netherlands, students who received mindset intervention scored higher on the situational interest than those in the control group. Zhu & Mok (2018) noted that students with stronger interest were anticipated to be more willing to devote their time and mental energy to SRL activities, which were often time- and effort-consuming. According to Roure et al.'s (2019) study, when students are engaged in exploring the possibilities offered by their environment, they tend to pay attention to pertinent details within the task, think about and seek an understanding of the content when looking for the best way to accomplish it, and mentally simulate their performance when attempting new skills—all of which are self-regulatory processes.

5.1.7.7 The Mediation effect of situational interest on growth mindset and meta-cognitive Self-Regulated Learning

Table 35 demonstrated that there was a full mediational effect of situational interest on the link between growth mindset and Meta cognitive SRL. According to the findings in figure 17, changing students' mindsets to growth mindsets increased situational interest, which in turn predicted meta-cognitive Self-Regulated Learning. Situational interest in particular provided a mechanism to explain why students who adopted a growth mindset placed a high value on controlling their cognition. These students also showed greater situational interest, which stimulated them to engage in a variety of strategies that enabled them to fine-tune and continuously adjust their meta-cognitive activities, thereby enhancing their mathematical learning. In contrast to students who had a fixed mindset, these students with a growth mindset were also more likely to be high on meta-cognitive Self-Regulated Learning and to have a greater situational interest in Mathematics. Results further implied that a growth mindset worked best at predicting meta-cognitive self-regulation with enhanced situational interest.

These findings were in line with literature, for example, Dweck and Yeager (2019) note that students that have a growth mindset are more likely to persevere through difficulties, especially when something doesn't seem interesting, and to employ a variety of tools and strategies to reach their goals. Students may value tasks or domains, such as Mathematics, out of enjoyment and become more engaged in self-regulation. However, if they have less value, interest and enjoyment for a domain or subject, they are more likely to use shallow strategies such as memorization than meta-cognitive self-regulatory strategies (Ahmed, 2017). Findings also agreed with Deci and Ryan (2015) who point out that situational interest may encourage a person to engage in a task they are not interested in, and that person may eventually integrate extrinsic motivators and regulate the task on their own. O'keefe et al. (2021) further note that students who have a growth mindset and interest are willing to explore new endeavours and gain interest in them while Schweder and Raufelder (2021) remark that interest is beneficial to learning because it encourages the willingness to independently monitor learning.

5.1.7.8 The Mediation effect of situational interest on growth mindset and resource management

According to Table 36, situational interest partially mediated the relationship between growth mindset and resource management SRL. Figure 18, demonstrated that a growth mindset improved situational interest, which in turn predicted resource management. In particular, situational interest explained how students with a growth mindset may control their effort, find a suitable study environment, manage their time, collaborate well with others while learning and seek help where need be. Students were better able to apply various resource management strategies effectively and increase their understanding of Mathematics when they believed that they could continuously improve their mathematical ability through perseverance, and have a situational interest. Therefore, compared to students with a fixed mindset, students with a growth mindset were more likely to have a situational interest in Mathematics and manage their resources well. Because situational interest only partially mediated the relationship between growth mindset and resource management, rather than acting as a full mediator, this suggested that growth mindset was important in influencing the students' resource management.

These findings were in line with most literature for example, according to Kachnowski (2019), students can learn more efficiently if they have better mindsets that will allow them to use metacognitive, motivational and behavioural strategies while they participate in the stages of learning that involve forethought, performance and self-reflection. This is because literature demonstrates that students who have a growth mindset believe that ability is malleable and that it can be enhanced with effort (Dweck, 2017). A growth mindset, according to Claro and Loeb (2019), promotes classroom motivation and self-regulation abilities. Findings are also in line with different correlational results, for example, a study by Bai et al. (2021) in Hong Kong showed that a growth mindset and collaborative learning were related and a growth mindset was also linked to situational interest. Findings were also in line with Xu et al. (2021) in a study about high school students in Physics who found that a growth mindset induction had a positive influence on maintained situational interest. According to Schmidt et al. (2017), promoting a growth mindset in the classroom encourages students to become more interested. In addition, situational interest is one of the strategies for successful learning, according to Roure et al. (2019). Schweder & Raufelder (2021), further notes that if students are interested in what they are learning, they will work hard to learn new things and will have more resources to help them to understand and find solutions. Students with a growth mindset are more likely to continue and persist in case of problems even when something looks uninteresting and use a variety of resources and strategies to attain his or her objective, according to Dweck & Yeager (2019).

All the 12 sub hypotheses were upheld because interest, individual interest and situational interest mediated the relationship between a growth mindset and SRL, cognitive SRL, meta-cognitive SRL, and resource management. The findings further indicated that interest was an important factor in students' Self-Regulated Learning and well mediated the relationship between mindset and SRL. This was because all the mediation models showed that mindset predictive ability on SRL was low whenever interest was absent and whenever interest was introduced in all the models, the predictive ability of mindset on SRL greatly improved. This implied that a growth mindset worked best in predicting students' SRL when students were interested in Mathematics. All the results all agreed with the SCT on personal factors in form of self-beliefs and affect explaining SRL behaviours.

5.1.8.0 Moderation additional discussion

5.1.8.1 The moderating effect of learner-centred strategies in the relationship between a growth mindset and cognitive SRL

According to Table 37, learner-centred strategies partially moderated the relationship between growth mindset and cognitive SRL. As a result, the sub hypothesis was accepted. The partial moderation effect implied that within a particular range of values for learner-centred teaching strategies, the interaction effect was significant beyond which it was not. Table 37, Figure 19, and Appendix A all demonstrate that a growth mindset does not significantly predict or influence cognitive SRL at low levels of learner-centred strategy use, but does so at moderate and high levels of use of learner-centred strategies. More importantly, findings indicated that strategies and methods like demonstration, cooperative learning and problem solving that make learners active agents in their learning had a role in enhancing the effect of growth mindset on cognitive SRL.

Students' beliefs about the malleability of mathematics ability do not improve students' use of cognitive SRL when teachers employ low levels of learner-centred strategies. However, as teachers use more learner-centred strategies, learners with a growth mindset become better engaged with the material, for instance through the use of rehearsal, organisation and critical thinking, which aids in the generation of new information. Accordingly, for all significant moderation ranges, and for the entire range of cognitive SRL scores, high use of learner-centred strategies facilitated the growth mindset-cognitive SRL link whereas low use of learner-centred strategies hindered it. Overall, it could be concluded that learner-centred strategies moderated the association between cognitive SRL and growth mindset. These results were in agreement with the SCT on environmental factors like teacher strategies interacting with personal factors like self-beliefs to cause SRL

According to Olugbenga (2021), employing learner-centred strategies makes the students to demonstrate their own prior knowledge, experiences, education and views, which affects how they assimilate new material and learn. In learner-centred learning, teachers take a more passive role while students actively participate in their learning (Olugbenga, 2021). While learning Mathematics, students come across a variety of mathematical problems that they may or may not be able to solve. Similarly, Gouedard's (2021) results assert that students' psychological processes are favourably impacted and thus enable them to interact with the content cognitively when teachers communicate that mistakes are opportunities to learn rather than diminish their efforts.

Academic achievement is correlated with cognitive SRL. The study's findings were consistent with those of Gouedard (2021), which found out that teaching practices influenced the association between a growth mindset and academic achievement in the United States. When teacher practices in form of teacher support, adaptive instruction and feedback areas were poor, students with a growth mindset performed worse than at increased levels of the mentioned teacher practices. In addition, these findings agreed with Matsuyama's et al. (2019) study that found out that learner-centred strategies used in the classroom could assist students in moving from a memorization-based learning strategy to one that allows for the control of learning beliefs and the application of a variety of learning strategies, including elaboration and organization. Therefore, teachers' use of learner-centred strategies and high levels of teacher support increases the growth mindset-cognitive SRL link.

5.1.8.2 The moderating effect of learner-centred strategies in the relationship between a growth mindset and Meta-cognitive SRL

According to the study findings, the association between a growth mindset and metacognitive SRL was not significantly moderated by learner-centred teaching strategies. Thus, the sub hypothesis was rejected. Table 38 showed that the interaction effect was so small and the simple slopes in Figure 20 showed small predictive effects of the growth mindset on metacognitive SRL at various levels of learner-centred strategy. Therefore, it could not be argued that learner-centred strategies attenuated the predictive link between growth mindset and meta-cognitive SRL in Mathematics for the full population of individuals in this study, despite the fact that the overall model was significantly predictive. These results disagree with the SCT which shows that environmental influences and personal factors can explain SRL.

A growth mindset intervention or training programme developed by researchers through experimental research is one of the many strategies for encouraging a growth mindset among students. Zeeb et al. (2020) and Seaton (2018) point out that mindset training could not be successful if it was separated from regular lessons. Zeeb et al. (2020) added that the influence of mindset training interacted with classroom behavioural norms and instructional practices. In a review of mindset research, Dweck and Yeager (2019) state that long-lasting change requires a culture shift among educators that promotes growth mindset. Dignath and Veenman (2021) point out that encouraging students to self-regulate their learning and establishing a positive learning environment in the classroom help the students to develop higher-order thinking skills and metacognition. Perhaps the teachers' classroom practices focused on the students and increased meta-cognitive SRL, but they were unable to strengthen the mindset-meta-cognitive SRL.

5.1.8.3 The moderating effect of learner-centred strategies in the relationship between a growth mindset and resource management SRL

The study results showed that learner-centred strategies did not significantly moderate the relationship between a growth mindset and resource management SRL. Thus, the sub-hypothesis was rejected. Although mindset and learner-centred strategies both predicted students' ability to manage their study resources, the interaction effect being non-significant showed that it could not be concluded that learner centred strategies moderated the predictive relationship of growth mindset and SRL in Mathematics for the entire population of subjects in this study.

On the other hand, effort regulation, and students' capacity to recognize when they don't know and seek appropriate assistance from teachers, peers, or others are examples of resource management tactics and are associated with a growth mindset. According to Gouedard (2021) findings, teachers who employ effective teaching techniques like learner-centred strategies, help students to acquire a growth mindset. The relationship was described in a way that showed how teachers who consistently assisted their students to create a safe learning environment that promoted the growth of growth mindsets. According to Gouedard (2021, high-quality teachers that employ more effective teaching techniques, such as learner-centred methods, not only help to increase student accomplishment but also create welcoming environments that encourage students' social and emotional growth.

Students who believe that their arithmetic skill can be developed through learning put in effort, endure in the face of difficulties, learn from others, and ask for help without trying to hide their weaknesses and this is typical of resource management (Dweck 2017). The lack of statistical significance may indicate that the teachers' use of learner-centred techniques was insufficient to tap into growth mindset characteristics of resource management. Or it could mean that when learner-centred techniques were utilized, students did not get enough support from teachers to strengthen the link between growth mindset and resource management. Students could not just take their newly developed development mindset to any situation and apply it there, according to Yeager et al. (2022). Instead, the setting in the classroom should encourage the mindset by providing the proper affordances, which would gradually lead to students using meta-cognitive SRL.

5.1.8.4 The moderating effect of teacher-centred strategies in the relationship between a growth mindset and cognitive SRL

This study results showed that there was no significant moderation effect of teacher-centred strategies in the relationship between a growth mindset and cognitive SRL. Thus, the sub hypothesis was accepted. However, a considerable amount of moderation of teacher-centred strategies was nevertheless seen in the models and simple slopes as shown by Table 40, Figure 22, and Appendix A. Apart from the interaction effect that was not significant, all models explained a portion of variation in cognitive SRL brought about by mindset and use of teacher-centred strategies.

However, it could not be argued that teacher-centred strategies moderated the predictive link of the growth mindset on cognitive SRL in Mathematics for the entire population of subjects in this study.

According to Kaymakamoglu (2018), teachers that employ a teacher-centred method of instruction have low expectations for their pupils, which causes academic failure. And according to a Scottish study by Seaton (2018), teachers are crucial in facilitating classroom interventions, and people's mindsets are flexible and changeable therefore, the students' well-being was correlated with a growth mindset. According to Gouedard’s (2021) findings, students' behaviour in class is more likely to improve when they approach Mathematics with a growth mindset.

Additionally, according to the OECD, students who have a growth mindset are more likely to be resilient and creative in their approach to learning. They are more likely to recognise the proper cognitive techniques, such as planning and critical thinking, that can facilitate their learning. This study’s findings were consistent with earlier research, which showed that using teacher-centred techniques did not bring about positive effects in students’ learning. However, the results were in disagreement with the qualitative findings, which revealed that students believed that they were capable of learning Mathematics when teachers demonstrated how to deal with numbers and calculations and gave them the opportunity to practice as opposed to when the teachers instructed them to figure out things on their own, which to them was a sign of low mathematical ability. Qualitative findings also showed that some students had a fixed or growth mindset depending on their prior Mathematics performance. When students did well and passed, this confirmed their growth mindset, and they could use a variety of tactics to pass. This was in line with Farrington's (2012) contention that a growth mindset is influenced by prior success.

5.1.8.5 The moderating effect of teacher-centred strategies in the relationship between a growth mindset and meta-cognitive SRL

According to the study findings, the association between a growth mindset and metacognitive SRL was not significantly moderated by teacher-centred instructional strategies. Thus, the sub hypothesis was accepted. However, a considerable amount of moderation of teacher-centred strategies was nevertheless seen in the models and simple slopes in Table 41, Figure 23, and Appendix A It cannot be argued that teacher-centred techniques tempered the predictive link of a growth mindset on meta-cognitive SRL in those situations, even if all the models could explain a fraction of the variance in meta-cognitive SRL. Although the overall model was significantly predictive and both a growth mindset and teacher-centred strategies predicted meta-cognitive SRL as shown by Table 40, it could not be argued that teacher-centred strategies moderated the predictive link of growth mindset and meta-cognitive SRL in Mathematics for the entire population of subjects in the study.

According to Aragon et al. (2018), a teacher who sincerely believes that only the bright students will comprehend difficult concepts may find it pointless to devote a significant amount of time and resources to producing essentially equivalent results because only the brightest students will comprehend in any case, and this teacher is more likely to employ teacher-centred strategies. According to a systematic critical review by Khalaf and Zin (2018), students in traditional classes that use teacher-centred strategies grow their knowledge, skills and competence to a limited extent, and do not believe in their own abilities. Dignath and Buttner’s(2018) study discovered that although teachers' instructional tactics potentially supported SRL, they rarely spent time explicitly teaching SRL techniques. They taught majorly cognitive strategies rarely taught metacognitive strategies. On the other hand, the interviews revealed that the teachers had little understanding of metacognition as a crucial element of SRL and were reluctant to advocate for it. Perhaps the teachers in the study did not aid their students much in the development of their mindsets and metacognitive SRL.

5.1.8.6 The moderating effect of teacher-centred strategies in the relationship between a growth mindset and resource management SRL

The study findings showed that there was no moderation effect of teacher-centred strategies in the relationship between a growth mindset and resource management SRL. Thus, the sub hypothesis was accepted. According to Table 42, the interaction impact was incredibly little, and the simple slope revealed small growth mindset predictive effects on resource management SRL at various degrees of teacher-centred teaching strategies.

According to Kaymakamoglu (2018), when teachers employ teacher-centred strategies, the learning experiences students receive are based on knowledge facts, concepts and abilities, with an emphasis on content. Students are primarily expected to work alone and are viewed as passive recipients of information. Zeeb et al. (2020) emphasise that fixed mindsets are likely to be supported by behavioural norms and instructional strategies that place a strong emphasis on the students' characteristics and performance. Cooperative learning and group discussions are examples of resource management strategies. Fixed mindsets hinder cooperative learning and asking for help because doing so could indicate to others that the student is having low ability (Dweck, 2017). According to a study by Zeeb et al. (2020), using methods including cooperative learning, brainstorming, writing about physics-related goals, group discussions, and the use of positive classroom norms led to the growth mindset belief. In contrast, the teachers in this study used teacher-centred strategies. The non-moderated relationship might be that perhaps because learners were more engaged in individualized learning during teacher-centred classes. The findings might also suggest that teachers did not provide adequate support for students when learner-centred strategies were employed to help them with growth mindset-resource management link.

5.1.8.7 The moderating effect of student-teacher interactive strategies in the relationship between a growth mindset and cognitive SRL

The study findings in Table 43 showed that the relationship between a growth mindset and cognitive SRL was partially moderated by the student-teacher interactive strategy. As a result, the sub hypothesis was accepted. Partial mediation results implied that within a certain range of values of student-teacher interactive strategies, the interaction effect was significant beyond the given range it was not. Table 43, Fig. 25, and the Appendix A all demonstrated that while a growth mindset did not significantly predict or influence cognitive SRL at low levels of student-teacher interaction, it did so at moderate and high levels of interaction.

These findings indicated that combining teacher-centred and student-centred practices in Mathematics instruction contributed to enhancing the impact of growth mindset on cognitive SRL. A growth mindset in Mathematics did not enhance the students' use of cognitive SRL when teachers employed low degrees of student-teacher interactive method. However, a growth mindset made the students more cognitively SRL when teachers employed more student-teacher interactive strategies. Accordingly, high usage of student-teacher interactive methods supported the growth mindset-cognitive SRL relationship and low use of student-teacher interactive strategy hindered it for all significant moderation ranges and for all SRL scores. In general, it could be said that the relationship between growth mindset and cognitive SRL was moderated by the student-teacher interactive strategy.

According to Mavumba and Mtitu (2022), teachers who use a mixer of teaching strategies have been demonstrated to increase student learning. These results were consistent with Gouedard's (2021) findings that demonstrated superior outcomes, such as fostering a growth mindset in learners, were achieved when teachers selected and employed teaching strategies based on the students' learning needs. The findings also indicated a significant relationship between cognitive SRL and a growth mindset. This suggested that the growth mindset-cognitive link was weaker when teachers used low student-teacher interactive strategies, whereas the link was stronger when teachers used moderate and high student-teacher interactive strategies.

5.1.8.8 The moderating effect of student-teacher interactive strategies in the relationship between a growth mindset and meta-cognitive SRL

This study results showed that there was no significant moderation effect of student-teacher interactive strategies in the relationship between a growth mindset and meta-cognitive SRL. Thus, the sub hypothesis was disproved and as seen in Table 44, the interaction impact was very minimal. Similarly, at various levels of utilization of the student-teacher interaction method, the simple slope demonstrated small predictive impacts of growth mindset on meta-cognitive SRL. It could not be argued that the student-teacher interactive technique moderated the association between growth mindset and metacognitive SRL in Mathematics for the full population of subjects in this study, despite the fact that the overall model was significantly predictive.

The findings of the study were in disagreement with the body of literature which demonstrates that when teachers choose and implement effective tactics, it leads to greater gains, such as boosting students' performance (Dignath & Veenman, 2021), which supports a growth mindset (Farrington et al., 2012). A systematic review by Wang and Sperling (2020), on the characteristics of Self-Regulated Learning interventions in Mathematics reported that for secondary school students that only use cognitive strategies were less effective than those that combined metacognitive and motivational strategies. Perhaps the employment of the various strategies failed to tap into the learners' mindsets and metacognitive processes. Or, the degree to which the student-teacher interactive strategies were used might have been either low or too high to strengthen the connection between the growth mindset and metacognition.

5.1.8.9 The moderating effect of student-teacher interactive strategies in the relationship between a growth mindset and resource management SRL

The study findings showed that the association between a growth mindset and resource management SRL was not significantly moderated by the student-teacher interactive strategy. Thus, the sub-hypothesis was disapproved. Table 45 illustration of the interaction effect and the simple slope's analysis of resource management SRL at various levels of student-teacher interaction demonstrated that there was a small effect. Although the overall model was predictive, the predictive association between growth mindset and resource management SRL in Mathematics for the full population of subjects in this study could not be stated to be moderated by student-teacher interactive method.

These results were in disagreement with those of Kachnowski (2019) who demonstrated a relationship between students' growth mindset and usage of resource management strategies. He observed that a growth mindset was related to resource management strategies including effort regulation and students' capacity to ask for assistance without covering up their deficiencies (Dweck 2017). Findings by Govorova et al. (2020), which were based on PISA 2018 results revealed that school factors in terms of teaching styles like adaptive instruction, teacher-directed instruction, teacher feedback, and teacher instruction were found to have no discernible direct effects on the students' cognitive wellbeing as measured by a growth mindset. In other words, no matter what approach a teacher used, it had no bearing on how students developed a growth mindset. The employment of the various tactics might not have sufficiently tapped into the learners' mindsets and resource management to have a major impact. Or, perhaps the level of interaction between students and teachers was either too low or too high to enhance the connection between growth mindset and resource management.

The study findings overall indicated that teacher-centred strategies and student-teacher interactive strategies moderated the relationship between a growth mindset and SRL. Further findings revealed that learner-centred strategies and student-teacher interactive strategies moderated the relationship between a growth mindset and cognitive SRL. Despite teacher-centred strategies being criticized in literature for only helping leaners to have surface knowledge in Mathematics, for this particular study it showed that it could strengthen the growth mindset-SRL link. Further an integration of both teacher-centred and leaner centred strategies strengthened the growth mindset-SRL link. Therefore, the teaching of Mathematics at lower secondary level should not centre on conventional methods and strategies but teachers should be innovative in class and come up with strategies and methods that could bring each learner on board. This is because the qualitative findings (narratives on objective two) revealed that students had different negative beliefs about Mathematics which needed to be worked on and still had low interest. Perhaps the teachers' innovative strategies could help the learners to benefit more from Mathematics.

5.2 Conclusion

According to the study's objectives and based on the findings and discussions, the following conclusions were drawn.

The study concluded that there existed differences in mindsets held by students in Mathematics. A growth mindset was more prevalent among students than fixed mindset. The report went on to conclude that some students did have a fixed mindset when it came to Mathematics and still thought that their ability for the subject was something basic about them that could be changed. The study also concluded that while most demographic factors, such as tribe, and the type of school attended, did not influence students' mindsets, gender, religion and the parents'/guardians' occupation could influence whether or not students had a growth or fixed mindset when it came to Mathematics. The SCT discussed people's self-beliefs and mindsets as view of people’s abilities were mentioned among the self-beliefs. According to the theory, personal factors like gender and environmental influences like parents have an impact on students’ beliefs. Apart from the mentioned characteristics, a fixed or growth mindset in Mathematics could be held by all students, regardless of their demographics.

The study also came to the conclusion that students had high interest in Mathematics. There were also misconceptions that students had about the subject's nature, as well as their gender and their parents' or guardians' occupation influencing interest. Additionally, gender inequalities in Mathematics interest still existed, with males showing more interest than females and males having more situational and individual interest than females. Males having more situational interest meant that they were also influenced by their environment, including their classmates, parents and teachers not as most literature stated that females were more influenced by environmental contexts when it came to Mathematics. This is clearly stated in the SCT section on how people's feelings, behaviours, and actions are influenced by their personal and environmental factors. Additionally, there were differences in the students' levels of interest in Mathematics, with students showing greater situational interest than individual interest. Students were interested in Mathematics depending on external factors and environmental influences such as teachers or peers. This had consequences since students might not be interested in Mathematics or occupations related to it if their interest in the subject was not sufficiently developed for them to see its value and benefits.

The study further concluded that students had high SRL and applied all strategies highly and moderately. This showed that students did not rely on one strategy when studying Mathematics. Demographics had no bearing on how well students managed their own learning. Therefore, a person could develop into a self-regulated learner regardless of who they were. This was connected to the SCT, which holds that humans are active agents who self-regulate rather than being passive recipients who are waiting to be worked on by external recipients.

In addition, the study concluded that, with the exception of the use of audio-visual aids that was rated low, teachers employed all instructional strategies when teaching Mathematics highly. Therefore, teachers did not rely on only one strategy while teaching Mathematics. The study also came to the conclusion that the teachers' use of teaching strategies was not affected by the type of school. The type of school that a teacher works in had no bearing on how they instructed students in Mathematics because all instructors received the same pre-service and in-service training in the subject. This disagreed with the SCT's notion that the environment can influence people’s behaviours

The study also concluded that the association between a growth mindset and Self-Regulated Learning was mediated by interest. Although a growth mindset was crucial for learning Mathematics, it worked best to influence SRL when students were genuinely interested in the subject. Therefore, it was pertinent for all stake holders to develop students’ interest in Mathematics and this was connected to the SCT, which holds that people's feelings, evaluative self-components, and ability beliefs can all interact to affect their behaviours.

The study continued to conclude that, teacher-centred strategies, and student-teacher interactive strategies moderated the relationship between a growth mindset and SRL. The study also concluded that student-teacher interactive strategies and learner-centred strategies moderated the relationship between growth mindset and cognitive SRL. This was consistent with the SCT's assertion that personal factors, such as ability beliefs can interact with environmental influences, such as teachers to cause SRL behaviour. Despite the fact that all of the strategies were employed, teaching Mathematics appeared to strengthen the application of cognitive strategies more than metacognitive and resource management strategies. This was detrimental to the production of self-regulated and 21^{st} century learners that should have all the SRL skills.

In general, the study concluded that mindset, specifically a growth mindset, predicted well SRL when it interacted with interest and teaching strategies that were tailored to the needs of the students.

5.2.1 Limitations of the study

The study findings had a limited knowledge of SRL in other Ugandan districts because the study's focus was restricted to Wakiso district only.

The study findings had also limited knowledge in the entire Wakiso District because some sub counties were not included in the study. Therefore, by conducting the study throughout Wakiso and Uganda some gaps might be filled.

Further the study did not account for the dynamic interplay of some contextual factors like social-economic, political and cultural factors that might have influenced the study variables.

5.2.2 Delimitations of the study

The study might have limited knowledge on the study variables in other lower secondary classes and "A" level because it focused on lower secondary school students and S.3 class.

There were only 16 schools included in the study. So the study would have been better if it had included more schools in Wakiso district.

5.2.3 Last sight limitations

If the study had covered all of Uganda or all of the sub counties in the Wakiso district, it might have been more comprehensive and richer. However, Wakiso was selected according to its geographic position and performance, and some sub-counties were selected through random sampling. Therefore, the data would have been richer if it had included opinions from all other districts in Uganda or from all of the sub counties in Wakiso district. A moderated-mediation model of teaching strategies would have also made the work richer by analysing the influence teachers had on the students' mindsets, interest and SRL in Mathematics.

5.3 Contribution of the study

Numerous contributions were made by the study.

5.3.1 A body of new knowledge

The study added knowledge in the areas of mindset, interest, SRL, and strategies specifically in Mathematics. The study showed how having a growth mindset affected students' interest and SRL in Mathematics. It also highlighted the important role that interest in Mathematics and teaching strategies played in students' SRL. These were found to significantly mediate and moderate the study variables respectively. The study further illustrated the importance of both individual and situational interest for students' learning and understanding of Mathematics and teachers should tailor their teaching strategies while teaching Mathematics to the characteristics and needs of their learners. From the pretest results, it was revealed that students had different experiences depending on the different subjects. Therefore, it was important to study specific subjects like Mathematics instead of general courses like science subjects.

5.3.2 A questionnaire.

A self-administered questionnaire with five sections—demographic characteristics, mindset, interest, teaching strategies, and strategies—was employed in the study. After a thorough assessment of the literature, the tools were selected. Although the instruments had been used elsewhere, they were modified to suit the Ugandan context and several items that were not pertinent to the Ugandan context were deleted after factor analysis. The questionnaire might be used by other researchers for similar studies.

5.3.3 Contribution to Policy and practice

In terms of SRL, mindsets and students' interest in Mathematics, the study has findings that inform policy makers on designing mindset and SRL training courses for students that can be integrated in normal lessons. The stakeholders in charge of implementing the new curriculum will benefit from the study by coming up with strategies aimed at changing students' mindsets towards Mathematics. Teacher training institutions and MOES responsible for retraining teachers will benefit from the study through encouraging the teaching of students by adapting the teaching to the needs and types of learners

5.3.4 A reconstructed model for influences of SRL

In terms of the effects of SRL, the study was useful. A conceptual framework of the factors influencing Self-Regulated Learning in Mathematics was created by the study. To build a new model, the significant variables and demographic characteristics were taken into consideration. The rebuilt model revealed statistically significant factors that potentially accounted for SRL.

An outcome model

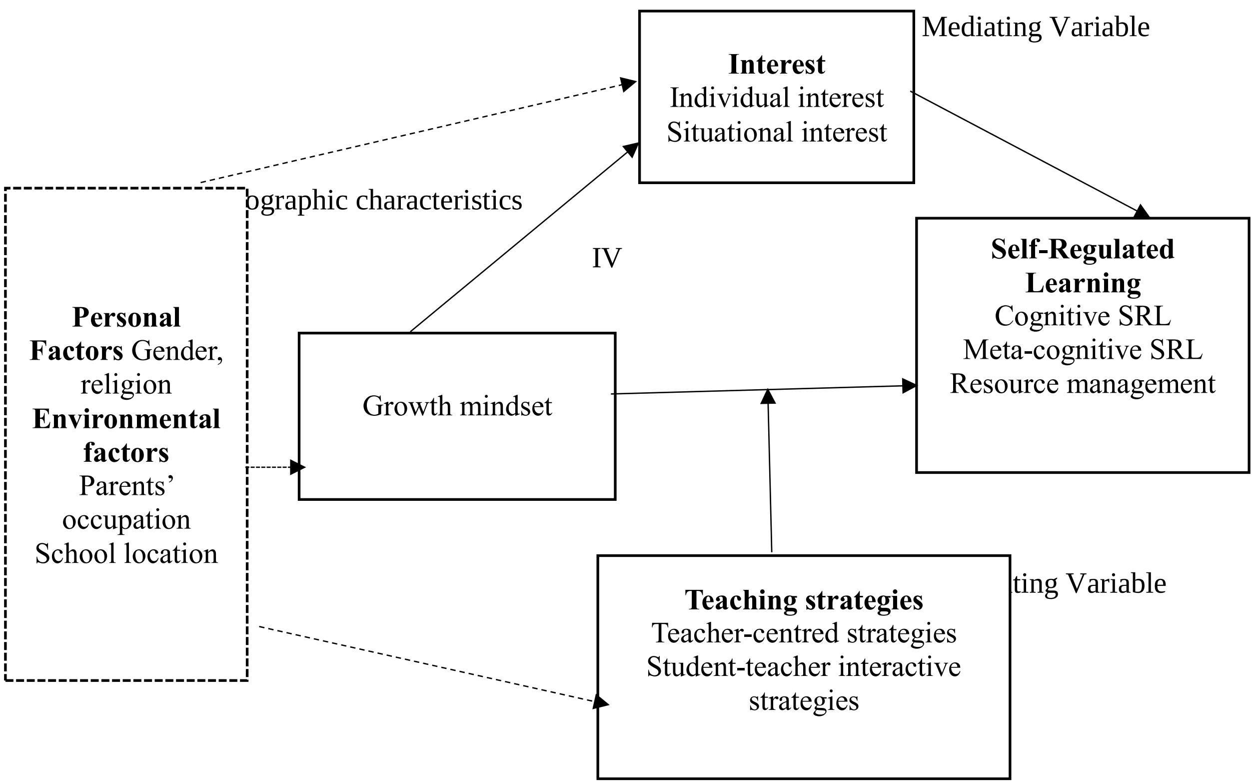


Figure 28. A reconstructed model showing the factors explaining SRL in Mathematics at lower secondary school level.

Figure 28 shows the factors that explain or influence SRL. According to the model, a growth mindset influences SRL through overall interest, individual interest and situational interest. That means that students' growth mindset is related to the students' interest and interest too is related to SRL. For students to be fully self-regulated learners in Mathematics, they should believe in their Mathematics abilities as malleable, should have both a well-built interest in Mathematics (individual interest) as well as interest in daily Mathematics lessons (situational interest). This is important for all stake holders to work on instilling a growth mindset and improve students' interest in Mathematics if we are to produce self-regulated learners. Similarly the model shows that teacher-centred strategies and student-teacher interactive strategies moderate the relationship between a growth mindset and SRL. This shows that teachers' way of teaching should be able to strength the link between students' growth mindset and SRL. Because student-teacher interactive strategies strengthen the growth mindset-SRL link, it implies that teachers should not be tied by one strategy or method in class but should teach learners basing on their needs and characteristics for them to learn well Mathematics and become self-regulated learners. The model also shows that gender, religion as personal factors explain SRL through their influence on mindset and interest and parents'/ occupation and school location as environmental factors too influence SRL.

5.3.5 Theoretical contribution.

The study was underpinned by the SCT. Self-efficacy is highlighted in the theory as a key self-belief underlying people's Self-Regulated Learning. According to the current study, mindsets are also useful self-beliefs in explaining students' SRL. Although interest is only briefly stated in the theory, the study demonstrates its importance as a personal factor in explaining SRL, particularly if it is combined with a growth mindset. Other personal factors in form of gender, age and religion can explain SRL through their effect on mindset and interest. Teachers through teaching strategies, parents through their occupations, peers and school location as environmental factors are also crucial elements in explaining SRL.

5.3.6 Philosophical contribution.

The study was conducted in Uganda's Wakiso District and took certain demographic factors like gender, school type into account. Thus, the study provided an explanation of mindset, interest, teaching strategies, and self-regulated learning in the context of Uganda. Additionally, the study can spear discussions of how education can be a tool for empowerment and social development.

The study further, examined a variety of demographic and non-cognitive variables, which can give an understanding of students as complex beings whose learning is influenced by a variety of factors rather than just cognitive ones.

5.3.7 Article publications.

Three articles were produced from this research as a contribution to the body of knowledge on Self-Regulated Learning and its antecedents. (See Appendix F).

Nakasiita, K. N., Baguwemu, A., Kibedi, H. & Olema, D. (2023). Why and How is the Difference? Fixed and Growth Mindsets in Mathematics among O-level Secondary School Students in Wakiso District, Uganda East African Journal of Health and Science, 6(2), 92-104. https://doi.org/10.37284/eajhs.6.2.1650.

Nakasiita, K. N., Kibedi, H., Olema, D. & Baguwemu, A. (2023). Mathematics Interest among O-Level Secondary School Students in Wakiso District, Uganda East

African Journal of Health and Science, 6(2), 66-79. https://doi.org/10.37284/eajhs.6.2.1648.

Nakasiita, K. N., Olema, D. Baguwemu, A. & Kibedi, H. (2023). Teaching Strategies as Predictors of Students' Mathematics Interest among O-Level Students in Wakiso District, Uganda East African Journal of Health and Science, 6(2), 80-91. https://doi.org/10.37284/eajhs.6.2.1649.

5.3.8 Strengths of the study

The study examined various factors to explain SRL. This provides a more comprehensive explanation of SRL. The study made use of both quantitative and qualitative approaches, which reduced the drawbacks of each approach and increased understanding of the research problem. The study considered Lower secondary level (O level), where Mathematics was compulsory, and this could be used to explain why few students continued to pursue Mathematics and Mathematics related careers after O level. The sample was taken from various schools, including private and government-aided schools, day, boarding schools and day and boarding schools, rural and urban schools, from Wakiso, which has a diverse population of people from various ethnic backgrounds. The sample included an equal number of males and females, and research variables were analysed in relation to demographic characteristics. As a result, the findings are dependable and broadly generalizable.

5.4 Recommendations

The following recommendations are made in accordance with the study objectives, research hypotheses and research questions on the basis of the study findings. Educational governing bodies like Ministry of Education and Sports, National

Curriculum Development Centre (NCDC), policy makers, teacher training institutions, school heads, teachers, parents, the community and students may find these recommendations helpful.

The study recommends that NCDC, the Ministry of Education and Sports, and other stakeholders responsible for implementing the new curriculum to incorporate strategies to encourage the growth mindset and increase students' interest in Mathematics in the new curriculum. The duo has been found to be essential for students' Self-Regulated Learning as emphasized by the new curriculum.

The study recommends placing a strong emphasis on teacher training to equip teacher trainees with skills on how to adapt their Mathematics instruction to the needs and characteristics of their students. The training also needs to emphasize innovation in the classroom to develop strategies that can foster the development of a growth mindset, the development of students' interest in Mathematics, and the teaching of students how to self-regulate cognitively, meta-cognitively, and behaviourally with the end goal of producing a fully self-regulated learner. Strategies that are tailored to the characteristics of students were found to be beneficial to students.

The study recommends educating parents, caretakers, and the general public about the benefits of providing children with a supportive environment and constructive feedback. Children's views of their Mathematics ability and their interest in the subject are influenced by parents as environmental factors, and this can have an impact on students' SRL behaviour.

More regular refresher courses for in-service teachers and increased teacher retraining are recommended by the study. Instead of focusing on the conventional, well-known strategies, teachers should be innovative and creative while focusing on the needs and characteristics of their learners. In order to produce learners who not only have the skills to control their cognition but also metacognitive and resource management skills, teachers' teaching should move away from only using a specific strategy or method to teach and instead incorporate practices in their lessons that tap into students' interest in Mathematics, improve students' beliefs about their abilities, and produce whole self-regulated learners.

The study suggests mindset-training courses for both students and teachers. The views students hold about their ability are key influences in how well they learn. The mindsets can be cultivated by teachers through their lessons. Therefore, when students adopt better mindsets, it might increase their interest and eventually lead to self-regulatory behaviour, especially in Mathematics. A growth mindset was found to be related to interest and SRL in Mathematics

5.4.1 Areas for Further Research

In contrast to other educational levels, such as primary, other levels and other subjects, the study concentrated on Mathematics and students in lower secondary schools. The study recommends further investigation of the factors that affect SRL at various levels and other school subjects. Only teaching strategies were examined in the study; other teacher factors, such as their beliefs about ability, support, and feedback on students' mindsets, interests, and SRL, were not taken into account. The study suggests more research to be done on those instructor variables and how they affect students' SRL through influencing their interests and mindsets. The study further recommends studying other mediators and moderators other than interest and teaching strategies as these were found to partially mediate and moderate the relationship between mindset and SRL respectively.

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APPENDICES

Appendix A. Conditional effects of the moderators

The moderating effect of learner-centred teaching strategies on the relationship between a growth mindset and SRL

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
-8.5374	27.4096	72.5904

Conditional effect of focal predictor at values of the moderator:

LCTstrt	Effect	se	t	p	LLCI	ULCI
-53.7892	-.5712	.7134	-.8007	.4239	-1.9746	.8322
-49.2392	-.4596	.6600	-.6964	.4867	-1.7579	.8387
-44.6892	-.3480	.6073	-.5730	.5670	-1.5428	.8468
-40.1392	-.2364	.5557	-.4254	.6708	-1.3295	.8568
-35.5892	-.1248	.5053	-.2469	.8051	-1.1189	.8694
-31.0392	-.0131	.4567	-.0288	.9771	-.9116	.8853
-26.4892	.0985	.4105	.2399	.8106	-.7090	.9059
-21.9392	.2101	.3674	.5718	.5679	-.5127	.9329
-17.3892	.3217	.3289	.9781	.3287	-.3253	.9687
-12.8392	.4333	.2966	1.4608	.1450	-.1502	1.0169
-8.5374	.5388	.2739	1.9672	.0500	.0000	1.0777
-8.2892	.5449	.2729	1.9970	.0467	.0081	1.0817
-3.7392	.6566	.2600	2.5257	.0120	.1452	1.1679
.8108	.7682	.2595	2.9603	.0033	.2577	1.2787
5.3608	.8798	.2716	3.2397	.0013	.3456	1.4140
9.9108	.9914	.2946	3.3650	.0009	.4118	1.5710
14.4608	1.1030	.3264	3.3799	.0008	.4610	1.7450
19.0108	1.2146	.3645	3.3324	.0010	.4976	1.9317
23.5608	1.3263	.4072	3.2566	.0012	.5251	2.1274
28.1108	1.4379	.4533	3.1719	.0017	.5461	2.3297
32.6608	1.5495	.5018	3.0880	.0022	.5624	2.5366
37.2108	1.6611	.5520	3.0091	.0028	.5752	2.7471

Data for visualizing the conditional effect of the focal predictor:

```
DATA LIST FREE/
  Grthmdst   LCTstrt    SRL        .
BEGIN DATA.
   -3.8082   -16.3920   121.9284
     .0000   -16.3920   123.2467
    3.8082   -16.3920   124.5650
   -3.8082      .0000   126.0293
     .0000      .0000   128.8789
    3.8082      .0000   131.7285
   -3.8082    16.3920   130.1301
     .0000    16.3920   134.5111
    3.8082    16.3920   138.8921
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     SRL      BY       LCTstrt  .
```

The moderating effect of learner-centred teaching strategies on the relationship between a growth mindset and cognitive SRL

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
-4.2600	37.6506	62.3494

Conditional effect of focal predictor at values of the moderator:

LCTstrt	Effect	se	t	p	LLCI	ULCI
-53.7892	-.4037	.3576	-1.1288	.2598	-1.1071	.2998
-49.2392	-.3429	.3308	-1.0366	.3007	-.9937	.3079
-44.6892	-.2822	.3044	-.9271	.3546	-.8811	.3167
-40.1392	-.2215	.2785	-.7953	.4270	-.7695	.3264
-35.5892	-.1608	.2533	-.6349	.5260	-.6591	.3375
-31.0392	-.1001	.2289	-.4373	.6622	-.5505	.3503
-26.4892	-.0394	.2058	-.1915	.8483	-.4442	.3654
-21.9392	.0213	.1842	.1157	.9080	-.3410	.3836
-17.3892	.0820	.1649	.4975	.6192	-.2423	.4063
-12.8392	.1427	.1487	.9599	.3378	-.1498	.4352
-8.2892	.2034	.1368	1.4873	.1379	-.0656	.4725
-4.2600	.2572	.1307	1.9672	.0500	.0000	.5144
-3.7392	.2641	.1303	2.0271	.0435	.0078	.5205
.8108	.3249	.1301	2.4974	.0130	.0690	.5807
5.3608	.3856	.1361	2.8324	.0049	.1178	.6534
9.9108	.4463	.1477	3.0218	.0027	.1557	.7368
14.4608	.5070	.1636	3.0991	.0021	.1852	.8288
19.0108	.5677	.1827	3.1071	.0021	.2083	.9271
23.5608	.6284	.2041	3.0783	.0023	.2268	1.0300
28.1108	.6891	.2272	3.0326	.0026	.2421	1.1361
32.6608	.7498	.2515	2.9810	.0031	.2550	1.2446
37.2108	.8105	.2767	2.9292	.0036	.2662	1.3549

Data for visualizing the conditional effect of the focal predictor:

```
DATA LIST FREE/
  Grthmdst   LCTstrt    Cognitiv   .
BEGIN DATA.
   -3.8082   -16.3920    53.4177
     .0000   -16.3920    53.7807
    3.8082   -16.3920    54.1437
   -3.8082      .0000    54.9971
     .0000      .0000    56.1930
    3.8082      .0000    57.3889
   -3.8082    16.3920    56.5765
     .0000    16.3920    58.6053
    3.8082    16.3920    60.6342
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     Cognitiv BY       LCTstrt  .
```

The moderating effect of learner-centred teaching strategies on the relationship between a growth mindset and meta-cognitive SRL

Data for visualizing the conditional effect of the focal predictor:
DATA LIST FREE/
Grthmdst LCTstrt Metacog .
BEGIN DATA.

-3.8082	-16.3920	21.7874
.0000	-16.3920	22.0654
3.8082	-16.3920	22.3433
-3.8082	.0000	22.5519
.0000	.0000	23.0646
3.8082	.0000	23.5773
-3.8082	16.3920	23.3163
.0000	16.3920	24.0638
3.8082	16.3920	24.8113

END DATA.
GRAPH/SCATTERPLOT=
Grthmdst WITH Metacog BY LCTstrt .

The moderating effect of learner-centred teaching strategies on the relationship between a growth mindset and resource management

Data for visualizing the conditional effect of the focal predictor:
DATA LIST FREE/
Grthmdst LCTstrt Rscmgt .
BEGIN DATA.

-3.8082	-16.3920	46.7234
.0000	-16.3920	47.4007
3.8082	-16.3920	48.0780
-3.8082	.0000	48.4803
.0000	.0000	49.6213
3.8082	.0000	50.7623
-3.8082	16.3920	50.2373
.0000	16.3920	51.8420
3.8082	16.3920	53.4467

END DATA.
GRAPH/SCATTERPLOT=
Grthmdst WITH Rscmgt BY LCTstrt .

The moderating effect of teacher-centred teaching strategies on the relationship between a growth mindset and SRL

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
-2.2358	21.0843	78.9157

Conditional effect of focal predictor at values of the moderator:

TCstra	Effect	se	t	p	LLCI	ULCI
-10.5663	-.6507	.7998	-.8136	.4165	-2.2240	.9226
-9.7663	-.5323	.7439	-.7155	.4748	-1.9958	.9312
-8.9663	-.4138	.6887	-.6009	.5483	-1.7687	.9410
-8.1663	-.2954	.6342	-.4658	.6417	-1.5430	.9522
-7.3663	-.1770	.5807	-.3048	.7607	-1.3193	.9653
-6.5663	-.0586	.5284	-.1108	.9118	-1.0980	.9809
-5.7663	.0599	.4777	.1253	.9004	-.8800	.9997
-4.9663	.1783	.4294	.4152	.6782	-.6664	1.0229

-4.1663	.2967	.3841	.7725	.4404	-.4589	1.0523
-3.3663	.4151	.3431	1.2099	.2272	-.2599	1.0901
-2.5663	.5336	.3082	1.7311	.0844	-.0728	1.1399
-2.2358	.5825	.2961	1.9672	.0500	.0000	1.1650
-1.7663	.6520	.2816	2.3149	.0212	.0979	1.2060
-.9663	.7704	.2659	2.8975	.0040	.2473	1.2935
-.1663	.8888	.2629	3.3808	.0008	.3716	1.4060
.6337	1.0073	.2731	3.6879	.0003	.4700	1.5446
1.4337	1.1257	.2952	3.8137	.0002	.5450	1.7064
2.2337	1.2441	.3267	3.8086	.0002	.6015	1.8867
3.0337	1.3625	.3652	3.7314	.0002	.6442	2.0809
3.8337	1.4810	.4087	3.6237	.0003	.6770	2.2849
4.6337	1.5994	.4558	3.5089	.0005	.7027	2.4961
5.4337	1.7178	.5055	3.3981	.0008	.7234	2.7123

Data for visualizing the conditional effect of the focal predictor:

```
DATA LIST FREE/
  Grthmdst   Tcstra    SRL       .
BEGIN DATA.
   -3.8082    -2.9791   123.4775
     .0000    -2.9791   125.2768
    3.8082    -2.9791   127.0760
   -3.8082      .0000   125.5004
     .0000      .0000   128.9791
    3.8082      .0000   132.4577
   -3.8082     2.9791   127.5234
     .0000     2.9791   132.6814
    3.8082     2.9791   137.8394
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     SRL      BY       Tcstra  .
```

The moderating effect of teacher-centred teaching strategies on the relationship between a growth mindset and cognitive SRL

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
-1.5961	21.0843	78.9157

Conditional effect of focal predictor at values of the moderator:

Tcstra	Effect	se	t	p	LLCI	ULCI
-10.5663	-.3440	.3984	-.8633	.3886	-1.1278	.4398
-9.7663	-.2891	.3706	-.7800	.4360	-1.0181	.4400
-8.9663	-.2341	.3431	-.6825	.4954	-.9091	.4408
-8.1663	-.1792	.3159	-.5673	.5709	-.8008	.4423
-7.3663	-.1243	.2893	-.4298	.6676	-.6934	.4447
-6.5663	-.0694	.2632	-.2637	.7922	-.5872	.4484
-5.7663	-.0145	.2380	-.0609	.9515	-.4827	.4537
-4.9663	.0404	.2139	.1890	.8502	-.3804	.4612
-4.1663	.0953	.1913	.4983	.6186	-.2811	.4717
-3.3663	.1503	.1709	.8790	.3800	-.1860	.4865
-2.5663	.2052	.1535	1.3362	.1824	-.0969	.5072
-1.7663	.2601	.1403	1.8537	.0647	-.0159	.5361
-1.5961	.2718	.1381	1.9672	.0500	.0000	.5435
-.9663	.3150	.1325	2.3781	.0180	.0544	.5756
-.1663	.3699	.1310	2.8243	.0050	.1123	.6276

.6337	.4248	.1361	3.1223	.0020	.1572	.6925
1.4337	.4797	.1470	3.2625	.0012	.1905	.7690
2.2337	.5347	.1627	3.2855	.0011	.2145	.8548
3.0337	.5896	.1819	3.2410	.0013	.2317	.9474
3.8337	.6445	.2036	3.1655	.0017	.2440	1.0450
4.6337	.6994	.2271	3.0801	.0022	.2527	1.1461
5.4337	.7543	.2518	2.9953	.0030	.2589	1.2497

Data for visualizing the conditional effect of the focal predictor:

```
DATA LIST FREE/
  Grthmdst   TCstra   Cognitiv   .
BEGIN DATA.
   -3.8082   -2.9791   53.9698
     .0000   -2.9791   54.6432
    3.8082   -2.9791   55.3167
   -3.8082     .0000   54.8055
     .0000     .0000   56.2576
    3.8082     .0000   57.7098
   -3.8082    2.9791   55.6411
     .0000    2.9791   57.8720
    3.8082    2.9791   60.1029
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     Cognitiv BY       TCstra  .
```

The moderating effect of teacher-centred teaching strategies on the relationship between a growth mindset and meta-cognitive SRL

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
-1.2502	31.9277	68.0723

Conditional effect of focal predictor at values of the moderator:

TCstra	Effect	se	t	p	LLCI	ULCI
-10.5663	-.1572	.1970	-.7979	.4255	-.5448	.2304
-9.7663	-.1325	.1833	-.7228	.4703	-.4930	.2281
-8.9663	-.1077	.1697	-.6350	.5259	-.4415	.2260
-8.1663	-.0830	.1562	-.5312	.5956	-.3904	.2244
-7.3663	-.0583	.1431	-.4072	.6841	-.3397	.2232
-6.5663	-.0335	.1302	-.2575	.7970	-.2896	.2226
-5.7663	-.0088	.1177	-.0745	.9406	-.2403	.2228
-4.9663	.0160	.1058	.1510	.8801	-.1921	.2241
-4.1663	.0407	.0946	.4303	.6673	-.1454	.2269
-3.3663	.0655	.0845	.7743	.4393	-.1008	.2318
-2.5663	.0902	.0759	1.1878	.2358	-.0592	.2396
-1.7663	.1149	.0694	1.6565	.0986	-.0216	.2514
-1.2502	.1309	.0665	1.9672	.0500	.0000	.2618
-.9663	.1397	.0655	2.1324	.0337	.0108	.2685
-.1663	.1644	.0648	2.5385	.0116	.0370	.2918
.6337	.1892	.0673	2.8113	.0052	.0568	.3215
1.4337	.2139	.0727	2.9416	.0035	.0709	.3570
2.2337	.2387	.0805	2.9655	.0032	.0803	.3970
3.0337	.2634	.0900	2.9279	.0037	.0864	.4404

3.8337	.2881	.1007	2.8618	.0045	.0901	.4862
4.6337	.3129	.1123	2.7862	.0056	.0920	.5338
5.4337	.3376	.1245	2.7109	.0071	.0926	.5826

Data for visualizing the conditional effect of the focal predictor:

```
DATA LIST FREE/
  Grthmdst   Tcstar    Metacog    .
BEGIN DATA.
   -3.8082    -2.9791    22.2503
     .0000    -2.9791    22.5452
    3.8082    -2.9791    22.8401
   -3.8082      .0000    22.4271
     .0000      .0000    23.0729
    3.8082      .0000    23.7187
   -3.8082     2.9791    22.6040
     .0000     2.9791    23.6006
    3.8082     2.9791    24.5972
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     Metacog  BY       TCstra  .
```

The moderating effect of teacher-centred teaching strategies on the relationship between a growth mindset and resource management

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

```
DATA LIST FREE/
  Grthmdst   TCstra    Rscmgt     .
BEGIN DATA.
   -3.8082    -2.9791    47.2574
     .0000    -2.9791    48.0883
    3.8082    -2.9791    48.9192
   -3.8082      .0000    48.2678
     .0000      .0000    49.6486
    3.8082      .0000    51.0293
   -3.8082     2.9791    49.2783
     .0000     2.9791    51.2088
    3.8082     2.9791    53.1393
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     Rscmgt   BY       TCstra  .
```

The moderating effect of student-teacher interactive strategies on the relationship between a growth mindset and SRL

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
-9.1273	28.6145	71.3855

Conditional effect of focal predictor at values of the moderator:

STteach	Effect	se	t	p	LLCI	ULCI
-64.3554	-.8363	.7481	-1.1178	.2645	-2.3080	.6355
-59.0054	-.7036	.6922	-1.0164	.3102	-2.0654	.6582
-53.6554	-.5710	.6371	-.8962	.3708	-1.8242	.6823

-48.3054	-.4383	.5828	-.7521	.4526	-1.5848	.7082
-42.9554	-.3057	.5298	-.5770	.5644	-1.3478	.7365
-37.6054	-.1730	.4783	-.3617	.7178	-1.1140	.7680
-32.2554	-.0403	.4291	-.0940	.9251	-.8845	.8038
-26.9054	.0923	.3829	.2411	.8097	-.6610	.8456
-21.5554	.2250	.3410	.6597	.5099	-.4458	.8958
-16.2054	.3576	.3051	1.1721	.2420	-.2426	.9578
-10.8554	.4903	.2776	1.7659	.0783	-.0559	1.0364
-9.1273	.5331	.2710	1.9672	.0500	.0000	1.0662
-5.5054	.6229	.2612	2.3847	.0177	.1090	1.1368
-.1554	.7556	.2580	2.9287	.0036	.2481	1.2631
5.1946	.8882	.2684	3.3092	.0010	.3602	1.4163
10.5446	1.0209	.2910	3.5078	.0005	.4484	1.5934
15.8946	1.1535	.3233	3.5681	.0004	.5175	1.7895
21.2446	1.2862	.3626	3.5467	.0004	.5728	1.9996
26.5946	1.4189	.4070	3.4860	.0006	.6182	2.2196
31.9446	1.5515	.4550	3.4102	.0007	.6565	2.4465
37.2946	1.6842	.5054	3.3320	.0010	.6898	2.6785
42.6446	1.8168	.5578	3.2572	.0012	.7195	2.9141

Data for visualizing the conditional effect of the focal predictor:

```
DATA LIST FREE/
  Grthmdst   STteach    SRL       .
BEGIN DATA.
   -3.8082   -18.2838   121.9403
     .0000   -18.2838   123.1059
    3.8082   -18.2838   124.2715
   -3.8082      .0000   125.9632
     .0000      .0000   128.8553
    3.8082      .0000   131.7474
   -3.8082    18.2838   129.9861
     .0000    18.2838   134.6047
    3.8082    18.2838   139.2232
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     SRL      BY       STteach  .
```

The moderating effect of teacher-centred teaching strategies on the relationship between a growth mindset and cognitive SRL

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
-4.7914	36.1446	63.8554

Conditional effect of focal predictor at values of the moderator:

STteach	Effect	se	t	p	LLCI	ULCI
-64.3554	-.5152	.3751	-1.3736	.1705	-1.2531	.2227
-59.0054	-.4459	.3471	-1.2848	.1998	-1.1287	.2369
-53.6554	-.3766	.3194	-1.1791	.2392	-1.0050	.2518
-48.3054	-.3073	.2922	-1.0516	.2938	-.8821	.2676
-42.9554	-.2380	.2656	-.8960	.3709	-.7605	.2845
-37.6054	-.1687	.2398	-.7033	.4824	-.6405	.3031
-32.2554	-.0994	.2151	-.4618	.6445	-.5226	.3239
-26.9054	-.0300	.1920	-.1565	.8757	-.4077	.3476

-21.5554	.0393	.1710	.2296	.8185	-.2971	.3756
-16.2054	.1086	.1530	.7097	.4784	-.1924	.4095
-10.8554	.1779	.1392	1.2779	.2022	-.0960	.4517
-5.5054	.2472	.1310	1.8874	.0600	-.0105	.5048
-4.7914	.2564	.1304	1.9672	.0500	.0000	.5129
-.1554	.3165	.1294	2.4469	.0149	.0620	.5710
5.1946	.3858	.1346	2.8669	.0044	.1211	.6506
10.5446	.4551	.1459	3.1190	.0020	.1681	.7422
15.8946	.5244	.1621	3.2353	.0013	.2056	.8433
21.2446	.5937	.1818	3.2655	.0012	.2361	.9514
26.5946	.6631	.2041	3.2491	.0013	.2616	1.0645
31.9446	.7324	.2281	3.2106	.0015	.2836	1.1811
37.2946	.8017	.2534	3.1634	.0017	.3031	1.3002
42.6446	.8710	.2797	3.1144	.0020	.3208	1.4212

Data for visualizing the conditional effect of the focal predictor:

```
DATA LIST FREE/
  Grthmdst   STteach    Cognitiv   .
BEGIN DATA.
    -3.8082   -18.2838    53.4018
      .0000   -18.2838    53.7128
     3.8082   -18.2838    54.0237
    -3.8082      .0000    54.9725
      .0000      .0000    56.1855
     3.8082      .0000    57.3985
    -3.8082    18.2838    56.5432
      .0000    18.2838    58.6583
     3.8082    18.2838    60.7733
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     Cognitiv BY       STteach  .
```

The moderating effect of teacher-centred teaching strategies on the relationship between a growth mindset and meta-cognitive SRL

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

```
DATA LIST FREE/
  Grthmdst   STteach    Metacog    .
BEGIN DATA.
    -3.8082   -18.2838    21.8175
      .0000   -18.2838    22.0609
     3.8082   -18.2838    22.3043
    -3.8082      .0000    22.5341
      .0000      .0000    23.0586
     3.8082      .0000    23.5831
    -3.8082    18.2838    23.2507
      .0000    18.2838    24.0562
     3.8082    18.2838    24.8618
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     Metacog  BY       STteach  .
```

The moderating effect of teacher-centred teaching strategies on the relationship between a growth mindset and resource management

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

```
DATA LIST FREE/
   Grthmdst   STteach    Rscmgt     .
BEGIN DATA.
    -3.8082   -18.2838    46.7209
      .0000   -18.2838    47.3322
     3.8082   -18.2838    47.9435
    -3.8082      .0000    48.4566
      .0000      .0000    49.6112
     3.8082      .0000    50.7658
    -3.8082    18.2838    50.1922
      .0000    18.2838    51.8902
     3.8082    18.2838    53.5881
END DATA.
GRAPH/SCATTERPLOT=
 Grthmdst WITH     Rscmgt   BY       STteach  .
```

Appendix B. Factor loadings

Loadings for mindset

Communalities		
	Initial	Extraction
I have a certain amount of ability to do Mathematics and i can't really do much to change it	1.000	.589
My ability to do Mathematics is something about me that i can't change very much	1.000	.609
To be honest, i can't really change my ability to do Mathematics	1.000	.530
I can learn new things, but i can't really change my basic Mathematics ability.	1.000	.406
No matter who I am , i can significantly change your ability to do Mathematics	1.000	.562
I can always substantially change my ability to do Mathematics	1.000	.472
No matter how much ability I have, i can always change my ability to do Mathematics quite a bit	1.000	.513
I can change even my basic Mathematics ability level considerably.	1.000	.540
Extraction Method: Principal Component Analysis.		

Mindset factors

Rotated Component Matrix[a]		
	Component	
	1	2
I have a certain amount of ability to do Mathematics and i can't really do much to change it	.055	**.765**
My ability to do Mathematics is something about me that i can't change very much	-.198	**.755**
To be honest, i can't really change my ability to do Mathematics	-.385	**.618**
I can learn new things, but i can't really change my basic Mathematics ability.	-.469	**.431**
No matter who you are, you can significantly change your ability to do Mathematics	**.720**	-.208
You can always substantially change your ability to do Mathematics	**.630**	-.274

No matter how much ability you have you can always change your ability to do Mathematics quite a bit	**.716**	.012
You can change even your basic Mathematics ability level considerably.	**.727**	-.109
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Interest loadings

Communalities

	Initial	Extraction
Compared to other subjects, I feel relaxed studying Mathematics	1.000	.345
Compared to other subjects, Mathematics is exciting to me	1.000	.462
Everyone should study Mathematics	**1.000**	**.146**
I am more interested in Mathematics if I put more effort into the lessons	**1.000**	**.110**
Mathematics is boring	**1.000**	**.298**
I can apply what we are learning in Mathematics classes to real life	**1.000**	**.101**
I can see how what I learn from Mathematics applies to life	**1.000**	**.192**
I cannot see why some people devote their lives to the study of Mathematics	**1.000**	**.061**
I dislike Mathematics lessons	1.000	.441
I don't find anything interesting about Mathematics lessons this year	**1.000**	**.285**
I enjoy finding out about Mathematics for myself	**1.000**	**.265**
I enjoy studying Mathematics	1.000	.603
I have always enjoyed studying Mathematics at school	1.000	.521
I look forward to Mathematics lessons	1.000	.532
Mathematics lessons are fun	1.000	.470
Mathematics as a subject is fun	1.000	.425
I would be glad to do something Mathematics based for my work experience	1.000	.374
I think the field of Mathematics is interesting	1.000	.413
I think what we are studying in Mathematics classes is useful to know	1.000	.505

Investigating Mathematics ideas which are already understood is a waste of time	**1.000**	**.104**
My lessons in other subjects are more interesting than those in Mathematics	1.000	.435
I am not really interested in using Mathematics in my future career	1.000	.470
Mathematics is enjoyable	1.000	.456
I plan on taking more Mathematics courses even when I don't have to	1.000	.350
Mathematics lessons bore me	1.000	.398
Someday I want to have a job that involves Mathematics	**1.000**	**.272**
Teachers should make Mathematics lessons interesting	1.000	.523
To be honest, I just don't find Mathematics interesting	1.000	.352
Extraction Method: Principal Component Analysis.		

Interest loadings after removing items that were loading below 0.3

Communalities

	Initial	Extraction
Compared to other subjects, I feel relaxed studying Mathematics	1.000	.371
Compared to other subjects, Mathematics is exciting to me	1.000	.470
I dislike Mathematics lessons	1.000	.464
I enjoy studying Mathematics	1.000	.598
I have always enjoyed studying Mathematics at school	1.000	.528
I look forward to Mathematics lessons	1.000	.544
Mathematics lessons are fun	1.000	.502
Mathematics as a subject is fun	1.000	.456
I would be glad to do something Mathematics based for my work experience	1.000	.349
I think the field of Mathematics is interesting	1.000	.401
I think what we are studying in Mathematics classes is useful to know	1.000	.576
My lessons in other subjects are more interesting than those in Mathematics	1.000	.451
I am not really interested in using Mathematics in my future career	1.000	.517
Mathematics is enjoyable	1.000	.484
I plan on taking more Mathematics courses even when I don't have to	1.000	.403

Mathematics lessons bore me	1.000	.436
Teachers should make Mathematics lessons interesting	1.000	.541
To be honest, I just don't find Mathematics interesting	1.000	.308
Extraction Method: Principal Component Analysis.		

Interest factors

Rotated Component Matrix[a]		
	Component	
	1	2
I enjoy studying Mathematics	.748	
I have always enjoyed studying Mathematics at school	.719	
I look forward to Mathematics lessons	.713	
Mathematics lessons are fun	.696	
Compared to other subjects, Mathematics is exciting to me	.685	
Mathematics as a subject is fun		.675
I dislike Mathematics lessons	.671	
My lessons in other subjects are more interesting than those in Mathematics	.665	
Compared to other subjects, I feel relaxed studying Mathematics	.608	
I think the field of Mathematics is interesting		.588
Mathematics is enjoyable	.403	.567
I would be glad to do something Mathematics based for my work experience		.540
To be honest, I just don't find Mathematics interesting		.476
I think what we are studying in Mathematics classes is useful to know		.759
Teachers should make Mathematics lessons interesting		.726
I am not really interested in using Mathematics in my future career		.710
Mathematics lessons bore me	.619	
I plan on taking more Mathematics courses even when I don't have to	.393	.499
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Teaching strategies loadings

Communalities		
	Initial	Extraction
Do most of the talking.	1.000	.578

Act out the skill to illustrate and put into context what I am talking about.	1.000	.435
Let students solve real life problems in class.	1.000	.406
Evaluate students through their products instead of written tests.	1.000	.547
Encourage students to explain the reasoning behind their ideas.	1.000	.478
Assign students to work in groups.	1.000	.470
Reinforce learning through the use of audio-visual media.	1.000	.540
Lead the whole class discussion (students listen and answer question).	1.000	.156
Demonstrate to the class how to do the task	1.000	.546
Let the students decide their own procedures or techniques in solving problems and discuss among themselves their techniques and result.	1.000	.460
Require students to produce a product (project) based on the lessons discussed in class.	1.000	.507
Emphasize students' thought process by asking them how they figured out something.	1.000	.360
Provide opportunities to work in groups.	1.000	.481
Use computer/projector when applicable in teaching.	1.000	.615
Tell the students what skill they need to learn.	1.000	.547
Model how to use the skills on certain tasks.	1.000	.484
Encourage the students to show how a particular concept can be applied to an actual problem or situation.	1.000	.455
Require students to present in concrete form the results of the information gathered about the concept or topic.	1.000	.483
Ask probing questions that clarify concepts.	1.000	.404
Encourage students to learn from ideas of others.	1.000	.483
Prepare video presentation to stimulate students' interest and enhance learning.	1.000	.507
Encourage students to raise questions during the discussion.	1.000	.468
Let the students conduct return demonstration after showing the skills needed to learn.	1.000	.371
Acts as facilitator, allowing students to come up with their own generalization of the concept.	1.000	.413
Apply the knowledge learned through project method.	1.000	.396
Get the students to justify their reasoning.	1.000	.210
Pair students to work as peer tutors.	1.000	.436
Use technology to effectively advance learning.	1.000	.597

Provide generalization on the topic discussed after the lecture.	1.000	.492
Give students the opportunities to practice or put into action the skills learned.	1.000	.545
Let the students formulate problems from given situations.	1.000	.540
Give recognition for well-constructed project to add to students' feeling of confidence and accomplishment.	1.000	.554
Expose students in constructing arguments.	1.000	.463
Encourage students to work cooperatively with other students on course assignment.	1.000	.426
Use computer to get information or pictures from the Internet for use in lesson.	1.000	.393
Extraction Method: Principal Component Analysis.		

Teaching strategies loadings after removing items loading below 0.3

Communalities		
	Initial	Extraction
Do most of the talking.	1.000	.590
Act out the skill to illustrate and put into context what I am talking about.	1.000	.449
Let students solve real life problems in class.	1.000	.416
Evaluate students through their products instead of written tests.	1.000	.498
Encourage students to explain the reasoning behind their ideas.	1.000	.497
Assign students to work in groups.	1.000	.492
Reinforce learning through the use of audio-visual media.	1.000	.536
Demonstrate to the class how to do the task	1.000	.554
Let the students decide their own procedures or techniques in solving problems and discuss among themselves their techniques and result.	1.000	.502
Require students to produce a product (project) based on the lessons discussed in class.	1.000	.510
Emphasize students' thought process by asking them how they figured out something.	1.000	.364
Provide opportunities to work in groups.	1.000	.486
Use computer/projector when applicable in teaching.	1.000	.624
Tell the students what skill they need to learn.	1.000	.535
Model how to use the skills on certain tasks.	1.000	.491

Encourage the students to show how a particular concept can be applied to an actual problem or situation.	1.000	.460
Require students to present in concrete form the results of the information gathered about the concept or topic.	1.000	.499
Ask probing questions that clarify concepts.	1.000	.427
Encourage students to learn from ideas of others.	1.000	.459
Prepare video presentation to stimulate students' interest and enhance learning.	1.000	.491
Encourage students to raise questions during the discussion.	1.000	.459
Let the students conduct return demonstration after showing the skills needed to learn.	1.000	.367
Acts as facilitator, allowing students to come up with their own generalization of the concept.	1.000	.407
Apply the knowledge learned through project method.	1.000	.370
Pair students to work as peer tutors.	1.000	.433
Use technology to effectively advance learning.	1.000	.604
Provide generalization on the topic discussed after the lecture.	1.000	.485
Give students the opportunities to practice or put into action the skills learned.	1.000	.550
Let the students formulate problems from given situations.	1.000	.554
Give recognition for well-constructed project to add to students' feeling of confidence and accomplishment.	1.000	.564
Expose students in constructing arguments.	1.000	.484
Encourage students to work cooperatively with other students on course assignment.	1.000	.478
Use computer to get information or pictures from the Internet for use in lesson.	1.000	.360
Extraction Method: Principal Component Analysis.		

Self-Regulated Learning

Communalities

	Initial	Extraction
When studying/revising Mathematics notes, I practice saying the material to myself over and over.	1.000	.631
When revising Mathematics, I read my class notes and the materials from relevant books over and over again.	1.000	.573

I memorize key words to remind me of important concepts in Mathematics.	1.000	.501
I make lists of important items in Mathematics and memorize the lists.	1.000	.555
When reading for Mathematics, I pull together information from different sources, such as class lessons, notes, and discussions	1.000	.575
I try to relate ideas in Mathematics to those in other subjects whenever possible.	1.000	.508
When reading Mathematics, I try to relate the material to what I already know	1.000	.492
I try to understand the material in Mathematics by making connections between the notes from library books and the concepts from the notes	1.000	.490
I try to apply ideas from notes in Mathematics in other class activities such as lessons and discussions	1.000	.598
When revising Mathematics, I go through different books and my class notes and try to find the most important ideas	1.000	.491
When revising Mathematics I go over my class notes and make an outline of important concepts.	1.000	.516
When a theory, interpretation, or conclusion is presented in class or in the books, I try to decide if there is good supporting evidence.	1.000	.566
I treat the material in my Mathematics notes and books as a starting point and try to develop my own ideas about it.	1.000	.453
I try to play around with ideas of my own related to what I am learning in Mathematics.	1.000	.622
Whenever I read or hear an assertion or conclusion in Mathematics, I think about possible alternatives	1.000	.490
When I become confused about something I'm reading in Mathematics, I go back and try to figure it out	1.000	.519
If Mathematics notes are difficult to understand, I change the way I read the material.	1.000	.625
Before I study new material in Mathematics thoroughly, I often scan it to see how it is organized.	1.000	.503
I ask myself questions to make sure I understand the material I have been studying in Mathematics	1.000	.612
When studying/revising Mathematics I try to determine which concepts I don't understand well.	1.000	.608
When revising Mathematics, I set goals for myself in order to direct my activities in each revision period	1.000	.517

I usually revise in a place where I can concentrate on my course work.	1.000	.526
I make good use of my revision time for Mathematics.	1.000	.540
I have a regular place set aside for revising Mathematics	1.000	.587
I make sure that I keep up with the weekly readings and assignments for Mathematics.	1.000	.559
I work hard to do well in Mathematics even if I don't like what we are doing.	1.000	.675
Even when Mathematics' notes and lessons are dull and uninteresting, I manage to keep working until I finish	1.000	.556
When revising for Mathematics, I often try to explain the material to a classmate or friend.	1.000	.558
I try to work with other students to complete exercises and assignments.	1.000	.430
When revising Mathematics, I often set aside time to discuss with a group of students from the class.	1.000	.416
Even if I have trouble learning the material in Mathematics, I try to do the work on my own, without help from anyone	1.000	.813
I ask the Mathematics teachers to clarify concepts I don't understand well	1.000	.493
When I can't understand the material in Mathematics, I ask another student for help	1.000	.522
I try to identify students at school class whom I can ask for help in Mathematics if necessary.	1.000	.552
Extraction Method: Principal Component Analysis.		

Appendix C. Survey Questionnaire for students

KYAMBOGO UNIVERSITY DEPARTMENT OF PSYCHOLOGY

Mindset, Interest teaching strategies and Self-Regulated Learning in Mathematics among Secondary School Students in Uganda

Dear Participant,

I Nakasiita Kirabo Nkambwe, a PhD student at Kyambogo University, am carrying out a study on the above topic. You have been identified as a suitable person to provide the required information for the study. All the information you will give will be treated with utmost confidentiality and used purely for academic purposes. The findings and recommendations from this study are envisaged to benefit educational institutions and enhance teaching and learning at various levels. I therefore, kindly request you to spare some of your valuable time to respond to these questions. There are no right or wrong answers.

Section A: Demographic information

Please answer as required by ticking/circling in the appropriate alternative.

Gender: (a) Male (b) Female

Age: (a) 13-14 (b) 15-17 (c) 18-20 (d) above 20

Religious affiliation (a) Catholic (b) Protestant (c) Muslim (d) Pentecostal (e) Others (Please mention)…………………….

Parents'/ Gurdian's occupation (Please mention)………………………….

Tribe (Please mention)………………………………..

School type 1: (a) Day only (b) Boarding only (c) Mixed day and boarding

School type 2: (a) Government aided (b) Private school

School location (a) Urban (b) Rural

Section B. Mindset

People hold different Mindset towards various things/persons/events. I would like to know the mindset you hold towards Mathematics. Please respond to the following statements as candidly as possible by indicating the extent to which you agree or disagree with the statements. There are no right or wrong answers to the questions.

Strongly Disagree (SD)	**Disagree (D)**	**Not Sure (NS)**	**Agree (A)**	**Strongly Agree (SA)**
1	**2**	**3**	**4**	**5**

Tick the most appropriate in the table below

SN	**Please read each statement carefully and then indicate the extent to which you agree or disagree,**	**SD**	**D**	**NS**	**A**	**SA**
M1	I have a certain amount of ability to do Mathematics and i can't really do much to change it					
M2	No matter who I am, i can significantly change my ability to do Mathematics					
M3	My ability to do Mathematics is something about me that i can't change very much.					
M4	I can always substantially change my ability to do Mathematics					
M5	To be honest, i can't really change my ability to do Mathematics					
M6	No matter how much ability i have i can always change my ability to do Mathematics quite a bit					
M7	I can learn new things, but i can't really change my basic Mathematics ability.					
M8	I can change even my basic Mathematics ability level considerably.					

Section C: Interest

I would also like to find out how you rate your interest in Mathematics. Please candidly rate the statements as candidly as possible to represent your interest in Mathematics

Strongly Disagree (SD)	Disagree (D)	Not sure (NS)	Agree (A)	Strongly Agree
1	2	3	4	5

SN	Indicate your level of interest on the following	SD	D	NS	A	SA
I1	Compared to other subjects, I feel relaxed studying Mathematics					
I2	Compared to other subjects, Mathematics is exciting to me					
13	Everyone should study Mathematics					
14	I am more interested in Mathematics if I put more effort into the lessons					
15	Mathematics is boring					
16	I can apply what we are learning in Mathematics classes to real life					
17	I can see how what I learn from Mathematics applies to life					
18	I cannot see why some people devote their lives to the study of Mathematics					
19	I dislike Mathematics lessons					
I10	I don't find anything interesting about Mathematics lessons this year					
I11	I enjoy finding out about Mathematics for myself					
I12	I enjoy studying Mathematics					
I13	I have always enjoyed studying Mathematics at school					
I14	I look forward to Mathematics lessons					
II5	Mathematics lessons are fun					
116	Mathematics as a subject is fun					
117	I would be glad to do something Mathematics based for my work experience					
118	I think the field of Mathematics is interesting					
I19	I think what we are studying in Mathematics classes is useful to know					
I20	Investigating Mathematics ideas which are already understood is a waste of time					
I21	My lessons in other subjects are more interesting than those in Mathematics					

I22	I am not really interested in using Mathematics in my future career					
123	Mathematics is enjoyable					
124	I plan on taking more Mathematics courses even when I don't have to					
125	Mathematics lessons bore me					
126	Someday I want to have a job that involves Mathematics					
I27	Teachers should make Mathematics lessons interesting					
I28	To be honest, I just don't find Mathematics interesting					

Section D: Teaching strategies

I would further wish to rate the teaching strategies your teachers use in teaching Mathematics in your school. Please rate the statements below that concern the teaching strategies that your teachers use.

Strongly Disagree (SD)	**Disagree (D)**	**Not Sure (NS)**	**Agree (A)**	**Strongly Agree (SA)**
1	**2**	**3**	**4**	**5**

Tick the most appropriate in the table below

NO.	**ITEM DESCRIPTION**	**SD**	**D**	**NS**	**A**	**SA**
	In Mathematics lessons, teachers;					
T1	Do most of the talking.					
T2	Act out the skill to illustrate and put into context what I am talking about.					
T3	Let students solve real life problems in class.					
T4	Evaluate students through their products instead of written tests.					
T5	Encourage students to explain the reasoning behind their ideas.					
T6	Assign students to work in groups.					
T7	Reinforce learning through the use of audio-visual media.					
T8	Lead the whole class discussion (students listen and answer question).					
T9	Demonstrate to the class how to do the task					
T10	Let the students decide their own procedures or techniques in solving problems and discuss among themselves their techniques and result.					

T11	Require students to produce a product (project) based on the lessons discussed in class.					
T12	Emphasize students' thought process by asking them how they figured out something.					
T13	Provide opportunities to work in groups.					
T14	Use computer/projector when applicable in teaching.					
T15	Tell the students what skill they need to learn.					
T16	Model how to use the skills on certain tasks.					
T17	Encourage the students to show how a particular concept can be applied to an actual problem or situation.					
T18	Require students to present in concrete form the results of the information gathered about the concept or topic.					
T19	Ask probing questions that clarify concepts.					
T20	Encourage students to learn from ideas of others.					
T21	Prepare video presentation to stimulate students' interest and enhance learning.					
T22	Encourage students to raise questions during the discussion.					
T23	Let the students conduct return demonstration after showing the skills needed to learn.					
T24	Acts as facilitator, allowing students to come up with their own generalization of the concept.					
T25	Apply the knowledge learned through project method.					
T26	Get the students to justify their reasoning.					
T27	Pair students to work as peer tutors.					
T28	Use technology to effectively advance learning.					
T29	Provide generalization on the topic discussed after the lecture.					
T30	Give students the opportunities to practice or put into action the skills learned.					
T31	Let the students formulate problems from given situations.					
T32	Give recognition for well-constructed project to add to students' feeling of confidence and accomplishment.					
T33	Expose students in constructing arguments.					
T34	Encourage students to work cooperatively with other students on course assignment.					
T35	Use computer to get information or pictures from the Internet for use in lesson.					

Section E: Self-Regulated Learning

Please respond to the following statements as candidly as possible by indicating the extent to which you agree or disagree with the statements. There are no right or wrong answers to the questions.

Strongly Disagree (SD)	Disagree (D)	Not sure (NS)	Agree (A)	Strongly Agree (SA)
1	2	3	4	5

SN	Think about revising or studying Mathematics and tick appropriately	SD	D	NS	A	SA
RH1	When studying/revising Mathematics notes, I practice saying the material to myself over and over.					
RH2	When revising Mathematics, I read my class notes and the materials from relevant books over and over again.					
RH3	I memorize key words to remind me of important concepts in Mathematics.					
RH4	I make lists of important items in Mathematics and memorize the lists.					
EL1	When reading for Mathematics, I pull together information from different sources, such as class lessons, notes, and discussions					
EL2	I try to relate ideas in Mathematics to those in other subjects whenever possible.					
EL3	When reading Mathematics, I try to relate the material to what I already know					
EL4	I try to understand the material in Mathematics by making connections between the notes from library books and the concepts from the notes					
EL5	I try to apply ideas from notes in Mathematics in other class activities such as lessons and discussions					
OR1	When revising Mathematics, I go through different books and my class notes and try to find the most important ideas					
OR2	When revising Mathematics I go over my class notes and make an outline of important concepts.					
CT1	When a theory, interpretation, or conclusion is presented in class or in the books, I try to decide if there is good supporting evidence.					

CT2	I treat the material in my Mathematics notes and books as a starting point and try to develop my own ideas about it.					
CT3	I try to play around with ideas of my own related to what I am learning in Mathematics.					
CT4	Whenever I read or hear an assertion or conclusion in Mathematics, I think about possible alternatives					
MS1	When I become confused about something I'm reading in Mathematics, I go back and try to figure it out					
MS2	If Mathematics notes are difficult to understand, I change the way I read the material.					
MS3	Before I study new material in Mathematics thoroughly, I often scan it to see how it is organized.					
MS4	I ask myself questions to make sure I understand the material I have been studying in Mathematics					
MS5	When studying/revising Mathematics I try to determine which concepts I don't understand well.					
MS6	When revising Mathematics, I set goals for myself in order to direct my activities in each revision period					
TSE1	I usually revise in a place where I can concentrate on my course work.					
TSE2	I make good use of my revision time for Mathematics.					
TSE3	I have a regular place set aside for revising Mathematics					
TSE4	I make sure that I keep up with the weekly readings and assignments for Mathematics.					
ER1	I work hard to do well in Mathematics even if I don't like what we are doing.					
ER2	Even when Mathematics' notes and lessons are dull and uninteresting, I manage to keep working until I finish					
PL1	When revising for Mathematics, I often try to explain the material to a classmate or friend.					
PL2	I try to work with other students to complete exercises and assignments.					
PL3	When revising Mathematics, I often set aside time to discuss with a group of students from the class.					

HS1	Even if I have trouble learning the material in Mathematics, I try to do the work on my own, without help from anyone					
HS2	I ask the Mathematics teachers to clarify concepts I don't understand well					
HS3	When I can't understand the material in Mathematics, I ask another student for help					
HS4	I try to identify students at school class whom I can ask for help in Mathematics if necessary.					

Appendix D. Focus group interview guide for students

Focus group interview questions for students

1. How interested would you describe Students in your school in Mathematics?
    a. Explain your answer (why do you say so? Why do you rate them so?)
2. What do you think makes some students be interested in Mathematics and others not?
3. How do you describe how best to learn/study Mathematics?
    a. Describe the best way of learning Mathematics that you observe from students who are interested in Mathematics
4. What beliefs do you/your friends hold about Mathematics?
5. How do those beliefs affect the way you relate with Mathematics
6. How interested are you towards Mathematics?
7. In what ways do teachers teach you Mathematics?
8. What reasons would you give for continuing or discontinuing with Mathematics at A level?
9. What can be done to enhance student's interest in Mathematics?
10. What can be done to help students adopt better Mathematics/mindsets?

Appendix E. Key informants' guide for teachers

1. How interested would you describe Students in your school in Mathematics?
    a. Explain your answer (why do you say so? Why do you rate them so?)
2. What do you think makes some students be interested in Mathematics and others not?
3. How do you describe how best to learn/study Mathematics?
    a. Describe the best way of learning Mathematics that you observe from students who are interested in Mathematics.
4. What beliefs do students in this school hold about Mathematics?
5. How do those beliefs affect the way students relate with Mathematics?
6. How interested are your learners towards Mathematics?
7. In what ways do you teach Mathematics to students?
8. What reasons do students normally give for continuing or discontinuing with Mathematics at A level?
9. What can be done to enhance student's interest in Mathematics?
10. What can be done to help students adopt better Mathematics mindsets?

Appendix F. Article Publications

Why and How is the Difference? Fixed and Growth Mindsets in Mathematics among O-level Secondary School Students in Wakiso District, Uganda

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Article DOI: https://doi.org/10.37284/eajhs.6.2.1650

Abstract

People's beliefs tend to impact them in all aspects of life. One of the things that can solve the puzzle of mathematics and science, in general, is the mindset, which is a view of one's ability as either static or malleable. This study evaluated the mindsets of Senior 3 students in Mathematics in Wakiso District and the reasons for adopting those mindsets as revealed in student and teacher narratives. Three hundred thirty-two (332) students participated in the quantitative study, while six students from each school took part in qualitative focus group discussions, and one O-level mathematics teacher from each school took part in a qualitative key informant interview. The quantitative results showed that more students had a growth mindset (M = 14.86, SD = 3.81) than a fixed mindset (M = 11.63, SD = 3.88). However, a considerable number of students held a fixed mindset; as also evidenced by the qualitative data, there were no statistically significant differences in mindsets among the various demographics. Qualitative findings showed that past performance, peers, parents, teachers, and other socialisers were influential in promoting growth or a fixed mindset. The study concludes that even though many students have a growth mindset, many external factors can cause them to adopt a fixed mindset in mathematics. Since mindsets can change at any time, it is everyone's responsibility to change students' mindsets toward mathematics for the best results.

Keywords: Mindset, Fixed Mindset, Growth Mindset, O-level Secondary School Students.

Mathematics Interest among O-Level Secondary School Students in Wakiso District, Uganda

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Article DOI: https://doi.org/10.37284/eajhs.6.2.1648

Abstract

The study investigated interest levels and differences in mathematics among O-level students in Wakiso District. Since interest is a psychological state, people can be unaware of it, making it simple for educators to presume that it is or is not present. In the current study, mathematics interest levels among Senior Three pupils in the Wakiso district were evaluated, and narratives from the students and teachers revealed the causes of the low interest. Three hundred and thirty-two students were used for the quantitative data; six students from each school took part in focus group discussions, and one O-level mathematics teacher from each school took part as key informants for the qualitative data. Quantitative results revealed that; students had high interest in mathematics (84%), had more situational (M = 37.00, SD = 8.10) than individual interest (M = 30.67, SD = 5.82). There were significant gender differences in overall interest Males (M = 73.61, SD = 13.22) than females (M = 69.93, SD = 13.60) individual interest Males (M = 31.32, SD = 5.76) than females (M = 30.03, SD = 5.83), and situational interest males (M = 38.19, SD = 7.81) than females (M = 35.83, SD = 8.21), $p < .05$ in mathematics, but not in other demographics. Qualitative findings, however, revealed low interest in mathematics, pointing out various reasons for their low interest (mathematics being tough, complex, boring, full of calculations, unrelated to real life, intended for the intelligent, previous poor performance). According to the study's findings, the challenge of low interest should not be left to students only, but all stakeholders in education should take part in developing and maintaining students' interest in mathematics. There are still gender differences in mathematics interests, which impacts females' interest in the subject.

Keywords: Interest, Individual Interest, Situational Interest, O-Level Secondary School Students.

Teaching Strategies as Predictors of Students' Mathematics Interest among O-Level Students in Wakiso District, Uganda

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Article DOI: https://doi.org/10.37284/eajhs.6.2.1649

Abstract

Interest in Mathematics is a factor that most educators are interested in because of its impact on mathematics learning, and teachers are considered key players in fostering students' interest in mathematics. The study investigated the predictive effect of perceived teaching strategies on students' interest in mathematics among O-level students in the Wakiso district. A mixed methods approach was used; 332 Senior Three students in total were used for the quantitative data, six students from each school took part in focus group discussions (FGDs), and one O-level mathematics teacher from each school was a key informant for the qualitative data. The findings revealed that teacher-centred strategies did not significantly predict overall interest, individual interest, and situational interest in mathematics, learner-centred strategies positively predicted overall interest and individual interest in mathematics and did not significantly predict situational interest, student- teacher interactive strategies positively predicted overall interest, individual interest and did not significantly predict situational interest. The qualitative results confirmed the quantitative results complemented the qualitative results. The study concluded that teachers need to develop more innovative strategies that can tap into students' interests in mathematics lessons and overall interest in mathematics.

Keywords:

Teaching Strategies, Teacher-Centred Teaching Strategies, Learner-Centred Teaching Strategies, Student-Teacher Interactive Strategies, Interest.

Appendix G. Table for determining the sample size from a give population

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

Appendix H: Data collection letter from Kyambogo University

KYAMBOGO UNIVERSITY

P. O. BOX 1 KYAMBOGO
Tel: 041 - 4286792 Fax: 256-41-220464
Website :www.kyu.ac.ug, Email: drgt@kyu.ac.ug

Directorate of Research and Graduate Training

Office of the Director

Date: 13-10-2022

TO WHOM IT MAY CONCERN

RE: NAKASIITA KIRABO NKAMBUYI

Dear Sir/Madam,

This is to introduce to you the above named student Reg: No 18/U/GDED/20071/PD ....pursuing A PHD IN EDUCATION, Department of FOUNDATIONS OF EDUCATION AND EDUCATIONAL PSYCHOLOGY, Kyambogo University.

She/he intends to carry out research on MINDSET, INTEREST AND SELF-REGULATED LEARNING IN MATHEMATICS AMONG SECONDARY SCHOOL STUDENTS IN WAKISO DISTRICT: THE MODERATING EFFECT OF TEACHING STRATEGIES in partial fulfillment of the requirements for the award of DOCTOR OF PHILOSOPHY IN EDUCATION OF KYAMBOGO UNIVERSITY

The purpose of this letter therefore is to request you to grant him/her permission to carry out his/her study in your institution.

Any assistance rendered to him/her will be highly appreciated.

Yours sincerely,

Prof. Bosco Bua
AG. DIRECTOR

KYAMBOGO UNIVERSITY
13 DEC 2022
DIRECTOR
DIRECTORATE OF RESEARCH AND GRADUATE TRAINING

Appendix I: Data collection letter from Wakiso District

WAKISO DISTRICT LOCAL GOVERNMENT

Office of the Chief Administrative Officer
P.O. Box 7218,Kampala Uganda ,Tel: +256 392 723334
Email : wakisodlg@yahoo.co.uk / Website: www.wakiso.go.ug

THE REPUBLIC OF UGANDA
CR: 305/1

30TH January, 2023.

To: Head teachers,

Private & Government Secondary Schools

Wakiso.

RE: RECOMMENDATION LETTER FOR NAKASIITA KIRABO NKAMBWE.

This is to introduce to you the above mentioned person who is aiming at carrying out a study about ***"Mindset, Teaching and Learning Strategies in Sciences among secondary School Students in Wakiso District." (SS1591ES)***

The aim of the study is to investigate students/ Self-regulated learning strategies in science subjects in Wakiso District in 16 sub-counties aiming at both Government aided & private Secondary schools.

The study will benefit all stake holders in Education, help students change their mind-set and interests and learning strategies towards science subjects. Teachers will benefit from the study by changing the way they handle & teach science subjects in secondary schools.

Any assistance given to her will be highly appreciated.

DISTRICT EDUCATION OFFICER * 30 JAN 2023 * WAKISO

Fredrick Kiyingi Kitobe

DISTRICT EDUCATION OFFICER.

In any correspondence on this subject please quote the reference number above.

Appendix J: Mbarara University ethical approval

MBARARA UNIVERSITY OF SCIENCE AND TECHNOLOGY
RESEARCH ETHICS COMMITTEE

Mbarara University of Science & Technology
P. O. Box 1410, Mbarara
RESEARCH ETHICS COMMITTEE
10 NOV 2023
APPROVED
VALID UNTIL DATE SHOWN ABOVE

10/11/2022

To: KIRABO NAKASIITA

KYAMBOGO UNIVERSITY
+256773105812/+256700450980

Type: Initial Review

Re: MUST-2022-616: Mindset, Teaching and Learning Strategies in Sciences among Secondary School Students in Wakiso District: The mediating effect of Interest, ,

I am pleased to inform you that at the **148th** convened meeting on **05/10/2022**, the MUST Research Ethics Committee, committee meeting, etc voted to approve the above referenced application.
Approval of the research is for the period of **10/11/2022** to **10/11/2023.**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **10/11/2023** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by MUST Research Ethics Committee:

CamScanner

Appendix K: Uganda National Council for Science and Technology

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

UNCST

Our Ref: SS1591ES **21 February 2023**

KIRABO NAKASIITA
KYAMBOGO UNIVERSITY
Kampala

Re: Research Approval: <u>Mindset, Teaching and Learning Strategies in Sciences among Secondary School Students in Wakiso District: The mediating effect of Interest</u>

I am pleased to inform you that on **21/02/2023**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **21/02/2023** to **21/02/2024**.

Your research registration number with the UNCST is **SS1591ES**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project. As the Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. Keeping all co-investigators informed of the status of the research.
2. Submitting all changes, amendments, and addenda to the research protocol or the consent form (where applicable) to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority and a notification to the UNCST.
4. Unanticipated problems involving risks to research participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST notification after review by the REC.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. An annual progress report and approval letter of continuation from the REC must be submitted electronically to UNCST. Failure to do so may result in termination of the research project.