EXPLORING THE LEARNING STRATEGIES USED BY SECONDARY STUDENTS IN LEARNING SCHOOL BIOLOGY: THE CASE OF FOUR ZOMBA BOARDING SECONDARY SCHOOLS

M.Ed. (CURRICULUM AND TEACHING STUDIES –MATHEMATICS EDUCATION)

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M.Ed. (CURRICULUM AND TEACHING STUDIES – MATHEMATICS EDUCATION) THESIS

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DECLARATION

I, the undersigned, hereby declare that this thesis is my own original work which has not been submitted to any other institution for similar purposes. Where other people's work has been used, acknowledgements have been made.

TAKONDWA ZOLOWERE

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Date

CERTIFICATE OF APPROVAL

The undersigned certify that this thesis represents the student's own work and effort and has been submitted with our approval.

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Dorothy C. Nampota, PhD (Professor)
Co- Supervisor.

DEDICATION

This thesis is dedicated to my family for their continuous support during my study period.

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ABSTRACT

Self-regulated learning is an essential process of learning that is recognised as a predictor of a student's academic achievement. This process requires students to independently use learning strategies that facilitate planning, organisation, monitoring and evaluation. The purpose of this study was to explore the learning strategies which secondary school students use in learning school biology and if there are any differences between boys and girls, students of different classes and between low and high performing students. The study was conducted in four boarding secondary schools of Zomba district. The study was guided by metacognition and self-regulation as theoretical perspectives. In addition, Plan, Organise, Monitor and evaluate (POME) model was used as a conceptual framework. The study collected both quantitative and qualitative data by administering questionnaires to 385 boarding students in four participant secondary schools, and by interviewing four students in each of the schools. The findings showed that students used learning strategies that facilitated planning, organisation, monitoring and evaluation. However, there is poor usage of some of the strategies as compared to the others. There were differences in the use of the learning strategies between girls and boys. Girls surpassed boys in using strategies that facilitate planning and monitoring while more boys than girls used strategies that facilitate organisation and evaluation. There were also differences regarding the frequency of using learning strategies between students of different classes. More form one than form three students used strategies that facilitate planning, organisation and monitoring while more form three than form one students used evaluation strategies. There were differences between high and low performing boys. More low performing boys used the strategies than high performing boys. The study discusses possible explanations for these findings.

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LIST OF ABBREVIATIONS AND ACRONYMS

DDSS	:	District Day Secondary School
ED	:	Education Division
MANEB	:	Malawi National Examinations Board
MSCE	:	Malawi School Certificate of Education
NED	:	Northern Education Division
POME	:	Plan, Organise, Monitor and Evaluate
SEED	:	Southern East Educational Division

CHAPTER 1

INTRODUCTION

1.1 Chapter overview

Chapter one gives the background information to the topic of study, statement of the problem, purpose of study, research questions, hypothesis, significance of the study, organization of thesis and summary.

1.2 Background information

Malawi is a landlocked country which is found in southeastern Africa. The education system in Malawi covers: primary, secondary and College/University education. The primary education is free and lasts eight years. Secondary education also free and lasts four years. It starts in form one and ends in form four. One of the important aims of secondary school education is to prepare students for college or university education. Students pay fees for college or university education which lasts either 3, 4 or 5 years depending on the program. In the public sector, there are four types of secondary schools. The first type is National Secondary Schools to which best performing students from the whole country are selected based on their perfomance on a national examination called Primary School Leaving Certificate Examination (PSLCE). The second type is District Boarding Secondary Schools, to which students from primary schools that are within the district are selected. The third type is District Day Secondary Schools, to which from the district who perform slightly lower than the second group are selected.

The fourth type is Community Day Secondary Schools to which the next level of students in the district are selected. In the secondary school curriculum, subjects are categorised into science, humanities and language and are offered as compulsory and optional subjects. Compulsory subjects are subjects which all students have to take and include: English, mathematics, biology, Chichewa and agriculture. Optional subjects are subjects which students can choose to learn and include geography, chemistry, physics, history, home economics, technical education, social studies, bible knowledge, life skills, technical drawing, wood work and metal work, computer studies and French. There are three subject categories: science, language and humanities subjects. Chemistry, physics, mathematics, agriculture, home economics and computer studies are science subjects. While, English, Chichewa and French are language subjects. On the other hand, history, bible knowledge, life skills, social studies are humanities subjects.

The core subjects are, Biology, Chemistry, Mathematics and Physics. This study will focus on Bioloy.

Students' difficulties in biology have been studied across the world. Many researchers have suggested overloaded curriculum, abstract terminology, teaching methods, students' attitude, resources and learning strategies as some of the causes of poor performance (Cimer, 2012). It seems in Malawi, memorisation is a common strategy among secondary school students. For example, Ngwira (2011) in a study on the learning strategies used by form four students in the Northern Education Division (NED) found that most students in secondary schools employ rehearsal strategies that reinforce simple memory rather than critical thinking or mastery of concepts. It might be that they have not yet developed other learning strategies.

In secondary schools, the content becomes more advanced than the primary level content hence requires the use of more learning strategies and studying skills instead of mere memorisation. Dzama (2006) found out that one of the causes of poor performance in science subjects among secondary students in Malawi was lack of knowledge of learning strategies that they can use to learn science. Using good learning strategies helps to improve students' performance, increase students' independence and engagement with learning. This enables students to realise that it is sometimes the use of ineffective strategies not lack of ability that hinders good performance (Clarke & Protheroe, 2008).

Biology like any other subject requires students' use of learning strategies in order to understand the content. Some of the learning strategies are: space time, retrieval practice, elaboration and self-questioning. Space time involves students studying in advance instead of waiting for the date of a test to be announced. Retrieval practice involves putting aside all notes and textbooks and then recalling the information studied. Elaboration helps students to go beyond simple recall of information and start making connections within the content. Lastly asking oneself questions after studying to check understanding is another strategy. However, a model used in the management of learning called Plan, Organise, Monitor and Evaluate (POME) uses self regulation. Self-regulation is a metacognitive process which is needed for learning. In planning category, students are expected to plan for their tasks, class work and examinations. In organisation category, students are expected to arrange their learning materials and identify key or hard to understand points. In monitoring category, students are expected to check feedback on assignments and tests and compare performance on tests. In evaluation category, students are expected to identify the useful strategies and to assess

themselves after learning to check their understanding. Thus this research was conducted to explore how students manage the learning of secondary biology and if there are: gender, class and grade differences in the management of learning.

1.3 Statement of the problem

Dzama (2006) observed that there was generally poor performance of students in science subjects at primary and secondary levels of education. Among other reasons, lack of knowledge of the learning strategies was found to be the cause of poor performance of students. In addition, a study conducted by Chika, Okafor and Obodo (2003) revealed that self-regulated learning enhanced students' achievement in basic science. Biology like any subject requires students' use of metacognitive skills to learn. Ngwira (2011) studied the metacognitive skills that were used by form four students when learning biology in Malawi. His study focused on mastery of content and he did not look at how students use self-regulated learning strategies. It is not known if students use the self-regulated learning strategies in learning secondary biology in Malawi. Therefore, this study focused on the self-regulated learning strategies.

The study will explore what metacognitive strategies students use and if differences exist in the use of learning strategies between boys and girls, students of different classes and high and low performing students.

1.4 Purpose of the study

The purpose of the research study was to explore the learning strategies that secondary students use in learning school biology and to explore the differences in their use between boys and girls and between students of different classes.

1.5 Main question

What learning strategies do secondary students use in learning school biology?

1.5.1 Sub-questions

1. What differences are there in learning strategies between boys and girls?

2. What differences are there in the learning strategies between students of different classes?

3. What differences are there in the learning strategies between high and low performing students?

1.6 Hypothesis

1. There are no differences in the use of learning strategies between boys and girls

2. There are no differences in the use of learning strategies between students of different classes.

3. There are no differences in the use of learning strategies between high and low performing students.

1.7 Significance of the study

This study would help to bring insight into the use of learning strategies by students. From this knowledge, interventions to assist students to acquire the appropriate learning strategies can be developed. In addition, this study would be an eye opener to most researchers who would want to conduct further research based on some of the findings from this research.

1.8 Organisation of Thesis

Chapter one introduces the study on learning strategies by giving reasons why most students fail science subjects then states the statement of the problem, the research questions the purpose and significance of the study. Chapter two is the literature review. This chapter explores the categories and the definitions of learning strategies by different scholars. Thereafter, metacognition, self-regulation and socio cognitive theories are outlined as theoretical perspectives of learning. POME model of self-regulation is outlined as a conceptual framework. Finally, studies by other scholars are also presented. Chapter three presents the methods used in this study. A questionnaire has been used to generate quantitative data while interviews have been conducted to collect the qualitative data. Chapter four presents and discusses the findings of the study. Chapter five concludes the study by summarising the findings and stating the implications of the study.

1.9 Chapter summary

In this chapter, I have outlined some of the causes of poor performance in science subjects among students which researchers have found. The statement of the problem and research questions have been stated. I have also discussed the impact which this study will bring. This study is therefore important since it will bring insights into learning strategies that students use and those that they do not use. Lack of appropriate use of learning strategies may be one of the causes of poor performance in science subjects among students.

CHAPTER 2

LITERATURE REVIEW

2.1 Chapter overview

Chapter two discusses the definitions of learning strategies, and the theoretical perspectives of Metacognition and Self-regulation. It further discusses the conceptual framework (POME), the link between the theories and POME as well as a review of some related studies.

2.2 Definition of learning strategies

Every learning process requires a manner or strategy to be adopted in order to achieve the main purpose of learning (Hardan, 2013). Many researchers have defined learning strategies differently. Shi (2017) defines learning strategies as steps taken by students to enhance their learning. According to this definition, the key word is steps. This means there are steps that are followed by students in the learning process. However, this definition is limited in a way that it does not specify whether these steps are already outlined for students or self-directed. If they are outlined already, then it is like putting the student in a box and only allowed to do what is within that box. The student is not allowed to decide or think of how to modify certain activities. That will mean that, even after self- evaluation, the student will not be able to consider other steps to take in order to achieve learning. Marian (2002) says that learning strategies are essential components of a curriculum, as bridges between competence. This implies that the learning strategies that students use are outlined in the curriculum. Components of a

curriculum is key in this definition. This definition implies that the learning strategies are already incorporated in the curriculum and students are expected to follow the curriculum. This definition is limiting students from coming up with their own strategies that will best apply to each one of them. Students learn differently. A strategy that makes one student understand the content may not work for another student, hence the need for the students to develop their own strategies and not to be forced to use the ones that are already in the curriculum.

Weinstein and Mayer (1986) explain that learning strategies are behaviors and thoughts that a learner engages in during learning which are intended to influence the learner's encoding process. Behaviors and thoughts are the key words used in this definition. However, the definition also does not mention whether students regulated their own behaviors or not. Lastly, Ngwira (2011) defined learning strategies as activities and thoughts which a student engages with in order to enhance learning skills and improve performance. This definition is weak in a way that it also does not specify whether the activities mentioned are regulated by the students themselves or just imposed on the student.

Hence, for the sake of this study, I will define learning strategies as self-directed activities and behaviors that students engage in to improve their academic performance. These strategies are taken both inside and outside the classrooms. The idea is that students must regulate their own learning. They must think of what activities to do in order to understand what they learn and study. These self-directed activities and behaviors are geared towards planning, organisation, monitoring and evaluation. These activities help students not only to understand and master the content but also to check their understanding of that content.

These activities also give students an opportunity to evaluate their methods of learning and studying in order to improve on them and be able to read with understanding.

2.2.1 Types and importance of learning strategies

Mandi and Friedrich (2006 as cited in Minnart et al (2013) described 6 categories of learning strategies. These are; cooperation strategies, elaboration strategies, motivational and emotional strategies, revision strategies, organisation strategies and control strategies.

Cooperation strategies are based on the assumption that learning is a cooperative process. Therefore, cooperation means that students support each other in working to reach a common goal. Group work is an example of a learning strategy in this category.

Elaboration strategies are elaborative techniques that encourage both understanding and remembering of new knowledge by creating links between new knowledge and the already existing knowledge. Analogies and mnemonics are examples of elaboration techniques that help in remembering knowledge.

A learner's motivation is regarded as a central condition for successful learning. Motivational and emotional strategies are described by interesting activities such as biological experiments and field visits. Revision strategies on the other hand are strategies that help students to store information learned in a long-term memory.

Active repetition and reciting of content learnt are some of the revision strategies.

Organisation strategies are strategies that aim at organising new knowledge by making connections between different knowledge elements (Minnart et al, 2013). Highlighting is an example of organisation strategies.

Control strategies are the last category. Effective learning needs strategies of controlling one's own learning and thinking. Apart from understanding, students are also able to check their understanding. Competent students are able to plan and monitor their own learning. These are the metacognitive strategies that all students need to have.

2.3 Theoretical Perspectives

Metacognition and Self-regulation are the theoretical perspectives which have guided this study.

2.3.1 Metacognition

Metacognition is a term that was introduced by John Flavel in the early 1970s. He viewed metacognition as knowledge or cognition about cognitive phenomena. Brown (1987 as cited in Mitchell, 2015) say that, a metacognitive learner is characterised by the ability to recognise, evaluate and where needed reconstruct existing ideas. Metacognition encompasses the processes of planning, monitoring and evaluation. Therefore, a metacognitive student is expected to plan, monitor and evaluate his or her understanding.

When students' metacognitive abilities increase, they achieve better good results in class. Research shows that, self-awareness plays a critical role in improved learning because it helps learners become more efficient at focusing on what they still need to learn. Most metacognitive ability growth happens between ages of 12 to 15. Therefore,

when teachers cultivate learners' abilities to reflect on, monitor and evaluate their learning strategies, young people become more self-reliant, flexible and productive (Mitchell, 2015).

Metacognition concerns the knowledge of mental processes involved in knowledge acquisition as well as procedures of control and adjustment of the knowledge acquisition mechanisms. Jacob and Paris (1987 as cited in Cera et al, 2013) identified three types of metacognitive knowledge as: declarative, procedural and conditional knowledge. Declarative knowledge is the knowledge that every individual has regarding the characteristics of his own learning. It includes knowledge of activities and strategies. For example, knowing the formula for calculating momentum in a physics class as 'Momentum=Mass times velocity'. Procedural knowledge is the knowledge of procedures to use with regard to study strategies. This includes how to perform the steps in a process. Conditional knowledge is about when and why certain strategies have to be used. It is also about when to use a procedure, skill or strategy and when not to use it. In addition, it is about knowing why a procedure works and under what conditions. Metacognitive regulation is the regulation of cognition and learning experiences through a set of activities that help people to control their learning. It further describes how an individual monitors and assesses his or her knowledge. It includes knowing how and when to use some skills and helps to control their learning. Nelson and Narens (1990 as cited in Buttner et al, 2008) identified two levels of Metacognitve regulation in their model, which are: object level and meta level. In the object level, cognitive processes or one's thinking occurs. In addition, cognitive strategies are used to help the students to achieve a particular goal. For example decoding a text helps the students to understand the meaning of the text. In the meta

level, thinking about thinking takes place. The metacognitive strategies are used to ensure that the students reach the goal they have set. Students make sure that a particular goal is achieved by monitoring and controlling their cognition. Monitoring is when students think about how well they have understood the paragraph they have just read. One of the ways in which students monitor their understanding is through self-questioning. If they are happy with their comprehension level, they will continue reading. If they are not happy, that is when they use control processes. In controlling the cognition, if students are not happy with their comprehension, they may decide to reread the paragraph, read slower or use dictionary to aid in understanding the difficult words. These control processes change the students' cognitive processes or related behaviors based on the monitoring feedback. For example if one has read a certain paragraph and wants to check his or her understanding by self-questioning technique. If he or she fails to answer questions, he or she may decide to reread the paragraph, read slower to understand or perhaps use another studying strategy to understand.

Flavel (1979 as cited in Lai, 2011) defined Metacognition as "cognition about cognitive phenomena" or simply "thinking about thinking". This refers to the knowledge and control children have over their own thinking and learning activities. Metacognition involves the awareness and regulation of thinking processes. Metacognitive strategies are important for students to use when learning biology as they facilitate understanding and improve their academic achievement. In addition, they help students to transfer what they have learnt from one context to the next, or from a previous task to a new task. They also help students to monitor their own progress and take control of their learning as they read, write or solve problems in the classroom. Further to this, research has indicated that metacognition is a powerful predictor of learning as the metacognitive processes make a unique contribution to learning over and above the

influence of intellectual ability (Buttner et al, 2008). This theory has strenghts. Firstly the educators and psychologists can use the theory in their practice. Secondly, it highlights the flaws of behaviorist approaches to education, which fail to encourage higher order meta-thinking. Lastly, it is widely accepted as a useful way of thinking that is considered very advanced. Much as the strengths are there, it also has some weaknesses. It is hard to measure a meta-thought since it is an internal process rather than externally observable thing by its nature. Another weakness is that it is not clear whether a meta thought is entirely conscious or not (Drew, 2020).

2.3.2 Self-regulation

Self-regulation is a system of conscious personal management that helps learners to control what they think, say and do. It is a subset of metacognition. Self-regulation is the self-directive process by which students transform their mental abilities into academic skills (Zimmerman, 2002). Self-regulated students possess self-generated thoughts and feelings and portray behaviors that are oriented towards attaining their goals. Students think about their own thinking as they engage in academic tasks by using the metacognitive strategies. Zimmerman (1990) discusses that, self-regulated students are distinguished by their awareness of strategic relations between regulatory processes or responses and learning outcomes. The second distinguishing factor is their systematic use of metacognitive, motivational and behavioral strategies to achieve their academic goals. Zimmerman also argues that, self-regulated learning involves more than the capability to execute a learning response by one self and more than a capability to adjust learning responses to new or changing conditions from negative feedback.

It involves proactive efforts to seek out and profit from learning activities. At this level, learners are not only self-directed in a metacognitive sense, but are self-motivated as

well. Outside a classroom, self-regulated learners are able to monitor their academic progress and are able to choose good studying environments. In classrooms, these learners will use self-regulated strategies like goal setting, self-monitoring and environmental structuring. Zimmerman (2000 as cited in Cera et al 2013), reports that the process of the development of self-regulation competence comprises of three phases: preparation, implementation and reflection. In the preparation phase, a plan of action is drawn up and the integration among the various dimensions of the self and the perception of the problem occurs.

In this process, learning objectives are identified. In the implementation phase, the action is accomplished through self-control and self-observation. Self-control involves self-education actions and it is based on the use of appropriate strategies to achieve the learning objectives. Self-observation on the other hand is based on actions aimed at monitoring the activities and collecting information on the effects of learning. The reflection phase comprises of two distinct processes: the evaluation of the results achieved and detection of the subject's cognitive and motivational reactions to the results he has achieved. This theory is important in the study because it encourages students to apply the four self-directed learning strategies of: planning, organisation, monitoring and evaluation. Unlike the theories of metacognition and social cognitive theories, self-regulation also promotes the application of self- motivation strategies.

2.4 Conceptual framework

A theoretical framework in a study is based on existing theory or theories while a conceptual framework is something that one can develop based on a certain theory. This means that in a conceptual framework, one is free to add his or her own concepts, constructs or variables that are relevant to the study.

The Plan, Organise, Monitor and Evaluate (POME) model of teaching has been used in this study as a conceptual framework which helped in coming up with questions for the questionaire and interview guide using its concepts. This model was developed from the theory of self-regulation using the metacognitive concepts that emphasise self-regulation. These concepts include: planning, organisation, monitoring and evaluation. These are the variables that this study will look at. In this study, this instructional model was used as a research tool to find out how students are managing their learning that is if students are applying the metacognitive concepts on their own instead of waiting for teachers to instruct them on what to do. Thus it forms my conceptual framework.

2.4.1 POME model

Categories of leaning strategies using the POME model of self-regulation

POME stands for Plan, Organise, Monitor and Evaluate

This is an instructional design model that emphasises self-regulation. It was designed by Ley and Young. According to Young and Ley (2001), this model of self-regulation instructional support identifies four broad data-based, self-regulation activity categories for embedding self-regulation in learning. These categories and their strategic self-regulation skills are as follows; planning (preparation), organisation, monitoring and

evaluation. In the planning category, students are expected to prepare the environment to concentrate and attend to the learning process.

Organisation is the second category where students are expected to organise the materials for studying. Monitoring is the third category where students are expected to keep records, monitor and review tests. Lastly, in the evaluation category, students are expected to evaluate completed work, reread tests to prepare for a class or further testing.

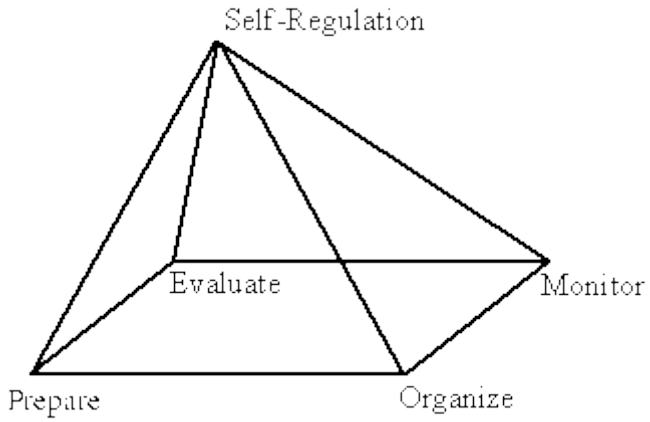

Figure 1: Types of Learning Strategies as outlined in POME Model: Ley and Young, 2001

Table 1: Examples of the learning strategies outlined in POME model

Regulating Activity	Definition	Instructional Support Examples
Preparing and Structuring learning environment	Select or arrange the physical setting to make learning easier	Provide checklist of study environments and strategies to cope with distractions. List common distractions with advice for eliminating
Organising and transforming instructional materials	Overt or covert rearrangement of instructional materials to improve learning	Give partial content outline for students complete Advise students on how to arrange or use online sources Distribute outline of reading materials
Keeping records and monitoring progress	Record events or results	Give students approximate time required for activities and courses Provide assignment table with due date, tittle, readings and submission requirements. Collect goals/study time monitoring forms Give self-test questions for reading
Evaluating performance against a standard	Evaluate completed work quality, reread tests to prepare for a class or further testing	Provide collective feedback that compares assignments, did or did not meet which criteria or not and why. Analyze feedback from tests and assignments Compare effort to learning Identify effective/ ineffective learning

Since the instructional model was used as a self-instructional and self-reflective model, the categories above were rephrased as shown in table 2.

Table 2: Examples of learning strategies according to the study

Category	Definition	Strategy examples
Prepare	-Setting time for studying and timeline -Finding suitable environment for studying -preparing for a class lesson -preparing for a test	-setting time for studying --reading just before a class lesson -looking for a quiet place to study in e.g Library, ground or classroom - -setting timeline for studying a certain material.
Organise	Organising resources /materials Organising how to study and learn (strategies) Organising what to study (content)	-Borrowing textbooks from friends -taking short notes in class while the teacher is teaching -marking where one does not understand, Listing the order of studying, identifying key points, choosing a topic to study
Monitor	Monitor progress Monitor performance Check understanding	-Checking objectives of topics after reading notes, answering end of topic questions, Checking for the correct answers after completing an assignment, asking oneself questions about the material before beginning a class or study
Evaluate	Evaluating strategies Evaluating study resources/materials Evaluating performance Evaluating progress Evaluating Effort Evaluating quality of work.	-Comparing effort to learning/ scores in a test Identifying effective/ ineffective learning strategies -comparing one's score to the previous score.

2.5 Previous studies on learning strategies

In this section, I report findings on studies that looked at how learning strategies vary with age, gender, level of education and ability.

2.5.1 Gender

Bidjerano (2006) conducted a study to explore the extent to which the self-regulated learning strategies of metacognition, elaboration, critical thinking, organisation, rehearsal, time and effort management, help seeking and peer learning vary with gender. In his study, he administered the Motivated Strategies for Learning Questionnaire (MSLQ) to 198 undergraduate students at a large university in the northeastern of United States. He analysed the obtained data through multivariate analysis of variance. The results showed that there were statistically significant differences observed between boys and girls in some of the learning strategies.

For example, more girls than boys reported the frequent use of rehearsal, organisation, metacognition, time management skills, elaboration and effort. It was also found out that there were no significant differences between boys and girls in the help seeking and critical thinking skills.

Cadime, et al. (2017) conducted a study to investigate the self-regulated learning strategies in homework behavior. A questionnaire (Ktpc) was used. One thousand and four hundred elementary and middle school students were sampled. The reliability of the results was high. He found out that girls had obtained higher scores in planning, execution and evaluation than boys. Middle school students had lower scores in planning than the elementary school students.

Soyogul (2015) conducted a study to examine the motivational beliefs and learning strategies with respect to gender and grade level of academically talented students enrolled in Scholar Development Programme (SDP) within a private school in Ankara –Turkey. The research was conducted with one hundred and forty nine students from 9th, 10th and 11th grade students.

An adapted version of the Motivated Strategies for Learning Questionnaire (MSLQ-TR) was used. Apart from that, 6 teachers were interviewed. The interview was designed to identify teachers' opinions about using different teaching techniques to enhance students' use of learning techniques. The data analysis revealed that students enrolled in the program were engaged in learning and developed different strategies in learning. There were significant differences in the learning strategies between boys and girls.

The findings showed that, female students surpassed male students in using the learning strategies such as rehearsal, organisation, elaboration, metacognitive self-regulation, time and study environment management and effort management. His qualitative findings also supported that "girls are more organised and that they take notes regularly than boys.

Ngwira (2011) conducted a study in Malawi on form four students that were learning in the rural and urban district day secondary schools (DDSS) found in the Northern Education Division (NED). His aim was to explore the learning strategies which are used by form 4 students in learning Biology. The Learning And Study Questionnaire (LASQ) was administered. The findings revealed that students employed self-evaluation strategies more than other strategies. In addition, his study revealed that

there were more boys than girls who reported that they use evaluation strategies such as answering end of topic questions and past paper questions when studying. In addition, more boys than girls reported that they use time management strategies such as; owning a time table and setting up study goals. These time management strategies facilitate planning.

The findings of Soyogul (2015), Bidyerano (2006) and Cadime, et al (2017) in the above studies all show that planning, organization, monitoring and evaluation strategies are more used by girls than boys. The general idea from these studies is that girls are more organised, plan, monitor and self-evaluate their work more than boys. These findings are appearing despite the type and level of school. Similar results are found among elementary or university students as well as private or public institutions.

Cultural factors such as gender roles that girls are given at home and even at school might have helped them to be more organized and time conscious hence use planning when doing things. Contrary to these findings, Ngwira (2011) found that in Malawi, boys are the ones who use evaluation strategies more than the girls.

2.5.2 Level of education

Gasco, Goni and Villarroel (2014) conducted a study on differences in the use of learning strategies in mathematics in 8th and 9th graders in Spain that is the transition from middle school to junior high school. 403 participants were sampled (8th and 9th graders) from different public and concerted private schools in Spain. Research was conducted using the questionnaire developed by Berger and Karabenick (2011) which is a version of the Motivated Strategies for Learning Questionnaire (MSLQ) adapted to the study of mathematics and translated into Spanish by the authors. The results showed

that there was an increased use of learning strategies upon reaching junior high school from middle school. More 9th grade students used the organisation strategies than the 8th grade students. In addition, 9th grade students exercised greater monitoring of their own learning than 8th grade students.

Zimmerman and Martinez-pons (1990) conducted an investigation on student differences in self-regulated learning relating grade, sex and giftedness to strategy use. 45 boys and 45 girls of the 5th, 8th and 11th grades from a school for the academically gifted and an identical number from regular schools were asked to describe their use of 14 self-regulated learning strategies. The study revealed that the gifted (high performing) students displayed greater use of organisation strategies than the regular students.

In addition, there was significant increase in use of planning, monitoring and organization strategies by the 5^{th} to 8^{th} grade. However, this was followed by a decline in the use of these strategies by the 8^{th} and 11^{th} grades. The results indicated that students' use of self-regulated strategies levelled off after junior high school. Gender differences in use of self-regulated strategies revealed that girls reported significantly more planning and monitoring strategies than boys did. In contrast, boys surpassed girls in non-self-regulated strategies. The common idea in class differences is that use of strategies is increasing upon reaching junior high school from middle school. However, after junior high school, the differences vary depending on the school. For example; the study by Gasco, Goni and Villarroel (2014) shows an increase in monitoring and organisation strategies by grade 9. While the study by Zimmerman and Martinez-pons (1990) shows a decline in planning, monitoring and organisation strategies by 8th to 11th grades.

2.5.3 Ability

Sebester and Speth (2017) conducted a study with the aim of finding out which learning strategies were associated with higher achievement. The students wrote two biology examinations. They completed a questionnaire with 14 self-regulated strategies. The findings showed that students with high grades of 'A' on examination one reported using planning strategies more than the students with lower grades of D and F. On the second examination, the higher achieving students reported using the monitoring and self-evaluation more than the lower achieving students.

2.6 Chapter summary

Chapter 2 has discussed the definition of learning strategies, theoretical perspectives which are metacognition socio cognitive theory and self-regulation. It has also discussed the conceptual framework (POME), the link between theories and POME. In addition, the chapter has reviewed studies related to the topic of study.

In the next chapter, the quantitative, qualitative and mixed research approaches are discussed. Research methods for the different approaches are also discussed. These research methods are: surveys, ethnographies, experiments and focus group discussions.

CHAPTER 3

METHODOLOGY

3.1 Chapter overview

This chapter starts by discussing the philosophical worldviews which are: post positivist, transformative, constructivist and pragmatic. Then the quantitative, qualitative and mixed research approaches are discussed. Data collection methods, sample size, sample selection and data analysis are also discussed. The chapter ends by discussing the test for significance using Chi-square.

Research approaches are plans and procedures that span the steps from broad assumptions to detailed methods of collecting data, analysis and interpretation (Creswell, 2014). He came up with a frame work that shows approaches to research. The framework describes the interconnection of three important components of a research methodology which are: philosophical world views, research designs and specific research methods. The interconnection of the three components is shown in the figure 2.

Figure 1. Is a framework for research- The interconnection of world views, design and research methods.

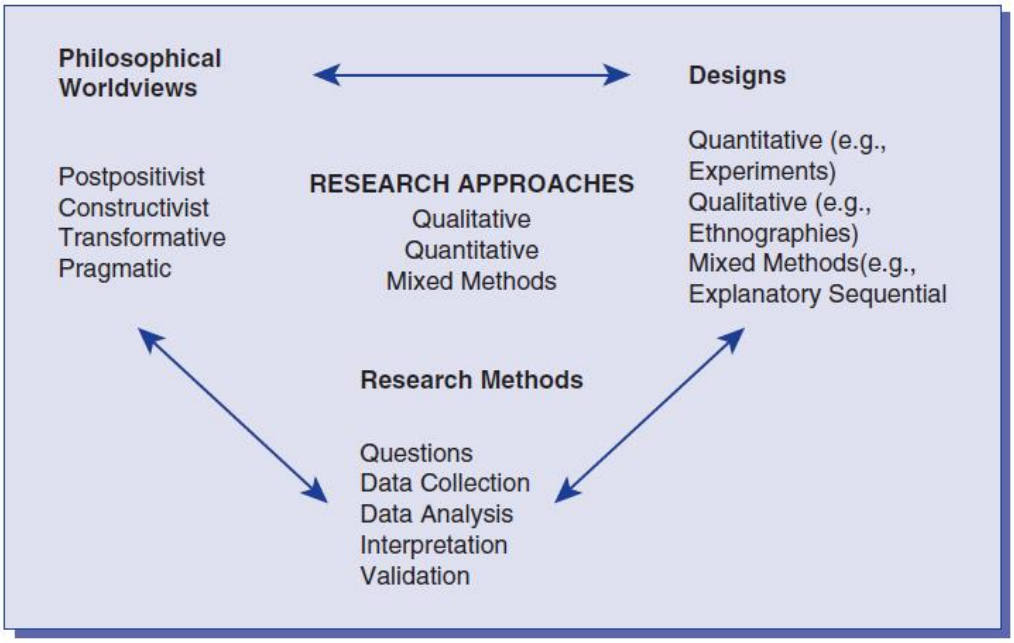

Figure 2: Philosophical World views adapted from Creswell (2014).

3.2 Philosophical world views

According to Creswell (2014), the term world view means a set of beliefs that guide action. The world views may also be referred to as paradigms. There has been an ongoing debate about what world views or beliefs researchers bring to inquiry, however the four widely discussed world views in literature are: Postpostivism, constructivism, transformative and pragmatism.

Post positivism holds the belief that knowledge develops on observation and measurement of the objective reality that exists in the world. It is also emphasised that this reality is independent of people's experience. With this worldview, researchers seek to develop relevant or true statements that can explain a situation of concern or that can describe the causal relationships of interest. Researchers obtain knowledge from using the quantitative research approach.

There exists another worldview known as constructivism. Constructivism advances the belief that reality is a construct of human mind and is therefore perceived to be subjective. Researchers generate knowledge from using the qualitative research approach. Besides post positivism and constructivism, lays another school of thought known as the transformative worldview. This worldview holds the belief that research inquiry needs to be intertwined with politics and a political change agenda to transform the lives of the socially oppressed participants. Therefore, in studying these diverse oppressed groups, the research focuses on inequities based on gender, race, ethnicity, disability, sexual orientation and socio-economic class (Creswell, 2014).

However, pragmatism‘s view is that instead of focusing attention on the methods, researchers must emphasize a research problem and use all approaches available to understand the problem. Researchers with this world view draw their knowledge from using both the quantitative and qualitative research methods. This view is therefore not committed to one philosophy or reality (Creswell, 2014).

In view of the various worldview, this study was guided by the post positivist worldview. It was felt that there was a need for a quantitative research approach to be used in this study since it was measuring an objective reality.

3.3 Research Approaches

According to Creswell (2014), there are three research approaches. These are qualitative research, quantitative research and mixed research approach. Qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem.

The process of research involves emerging questions and procedures, data typically collected in the participants setting, data analysis inductively builds from particulars to general themes and the researcher makes interpretations of the meanings of data (Creswell, 2014). In addition, data is collected through ethnographies and focus group discussions. On the other hand, a quantitative research is an approach for testing objective theories by examining the relationship among variables. The variables are then measured and the numerical data is analysed using statistical procedures. Data is collected through surveys and experiments. This is an approach that uses a deductive style. Hence, a mixed research is an approach that involves integrating the qualitative and quantitative research forms. The core assumption of this approach is that a combination of these two approaches provide a complete understanding of a research problem than either approach alone (Creswell, 2014).

In this study, a mixed research approach was used to achieve the objectives. Cathain, Murphy and Nicholl (2010 as cited in Creswell 2014) say that, integration of the qualitative and quantitative approaches gives readers more confidence in the results and the conclusions they draw from the study. The quantitative approach was used to enable generalisation of results to the population since a large sample size was used. On the other hand, the qualitative approach was used to help me get a detailed understanding of the participants' responses. Hence my choice for the mixed approach.

3.4 Research designs

Research designs are also called strategies of inquiry. There are several quantitative and qualitative research designs. The quantitative design include: surveys and experiments. According to Fowler (2008 as cited in Creswell, 2014) mentions that the survey design

provides a numeric description of attitudes or opinions of a particular population by studying a sample population. This makes use of questionnaires or semi structured interviews for data collection. For the sake of this study, a survey quantitative design was used. This was done through administering a questionnaire. This design was chosen in order to increase the number of participants for easy generalisation of results to the population of students in boarding secondary schools in Zomba district. In addition, In-depth interviews were conducted in order to get detailed information on the activities and thoughts students engage in.

3.5 Research sample

Sampling is the method of selecting a representative subset of the population called Sample (Showcat & Parveen, 2017). There are two types of sampling: probability and non-probability sampling. Probability sampling is any method of sampling that utilises some form of random selection. In order to ensure that the different units in the target population have equal probabilities of being chosen, a process or procedure is set up (Trochim, 2006). Some of the various probability methods are simple random sampling, stratified random sampling, systematic random sampling, cluster random sampling and multi-stage sampling. Non- probability sampling is any method that does not use randomization to draw the sample but rather uses judgement. These include: purposive sampling, convenience sampling, quota sampling and snowball sampling (Showcat & Parveen, 2017).

In this study I used non-probability sampling. The schools were purposively sampled for gender. One boys only, one girls only and too coeducational institutions. The classes were also purposively sampled. I chose form 3 from the senior section and

form one from the junior section in order to see how different their learning strategies are. I did not use all the classes because I was not stable financially and time for data collection was limited. The participants in each class were conveniently sampled based on who turned up after their teachers had called them. The students were selected by the teachers since they are the ones who knew them. In all the schools, I met students after knocking off time. So it is either they were just lingering around their campuses or studying in the Libraries, hostels or classrooms. So I could not tell who the form ones were and who the form 3s were. Being assisted by the teachers also helped me to have a good number of participants (since students obey and listen to their teachers more than just a mere visitor) though not all turned up since some were so reluctant to come and listen to what I had gone there for. Hence, the reason for my reduced number of participants.

The planned sample size was 400 students. This sample comprised of 100 students from each of four participant schools. With equal proportion of boys and girls; and form one and form three students respectively. I had planned for 100 participants from each class because I wanted a large sample. According to the Law of Large Numbers, the larger the sample the better the estimate. So the Law recommends a number more than 30 and 100 per school is a good sample. I had also planned for equal numbers of participants in each of the four schools, equal numbers of participants in form 1 and 3 classes and equal numbers of boys and girls in each class for fairness. However, only 385 students (96%) completed the questionnaire and 15 students (4%) did not turn up due to absenteeism on the day of administration for some, and lack of interest for others. The sample representation for those who participated from each school was as shown in the table 3.

Table 3: Target school, Participants, method, Sample size and criteria

Target school	Participants	Data collecting method/Instrument	Sample size N= 385	Gender distribution	Form distribution
A (boys and girls school)	Students	Questionnaire	98	Boys 60%, Girls 40%	Fm1 49% Fm3 51%
		Interview	4	Boys 50%, Girls 50%	Fm1 50% Fm3 50%
B (boys and girls school)	Students	Questionnaire	96	Boys 36%, Girls 64%	Fm1 54% Fm3 46%
		Interview	4	Boys 50%, Girls 50%	Fm1 50% Fm3 50%
C (boys only school)	Students	Questionnaire	91	Boys 100%	Fm1 56% Fm3 44%
		Interview	4	Boys 100%	Fm1 50% Fm3 50%
D (girls only school)	Students	Questionnaire	100	Girls 100%	Fm1 50% Fm3 50%
		Interview	4	Girls 100%	Fm1 50% Fm3 50%

3.6 Research Instruments

The research instruments used in this study were questionnaire and interview guide.

3.6.1 Questionnaire

Quantitative data was collected using questionnaires. Questions were rated using a four point likert scale and students responded by encircling the option that best applied to them. The options are Always, Often, Sometimes and Never. Always means “students use the strategies all the time”. Often means “they use the strategies not all the time but most of the time”. Sometimes means “students may use the strategy at times and at times, they do not use the strategy”. Never means “they do not use the strategy at all”.

In each participant school, questionnaires were administered by the researcher. The development of the questionnaire was based on the categories of the POME model of self-regulation. This questionnaire was testing the students' self-regulated strategies of planning, organisation, monitoring and evaluation. The questionnaire had three parts. The first part contained students' personal details. The second part comprised of nine questions. Initially, there were three questions for each of the categories of POME model of self-regulation. The questionnaire was tested for reliability and validity as described in the next section. After the tests, the questionnaire was revised and three questions were removed. The last part of the questionnaire comprised of two open ended questions (refer to copy in appendix 1).

3.6.1.1 Validity

Validity is the degree to which a measurement measures what it purports to measure (Bolarinwa, 2015). There are four types of validity which are: face validity, content validity, criterion validity and construct validity. The methods for testing validity differ with type of validity being tested. Face validity is established when an individual or a researcher who is an expert in the research subject reviews the questionnaire and concludes that it measures the trait of interest. This implies that the researcher evaluates whether each of the measuring items matches the given conceptual domain of the concept. This type is the most widely used validity in developing countries. However, this validity is not considered as an active measure of validity hence it is deemed casual and soft. Content validity on the other hand measures the construct of interest. Development of content validity is achieved by a rational analysis of the questionnaire by the raters (experts in the research subject). The raters review all of the questionnaire items for readability, clarity and comprehensiveness and then come to some level of

agreement to which items should be included in the final questionnaire. Criterion validity is measured when one is interested in determining the relationship of scores on a test to a specific criterion. It is a measure of how well questionnaire findings agree with another instrument or predictor. However, the challenge is that the predictor is not always available or easy to establish. Construct validity is the degree to which an instrument measures the trait or theoretical construct that it is intended to measure. Unlike the criterion validity, construct does not have a criterion for comparison but simply uses a hypothetical construct for comparison. It is the most valuable and most difficult measure of validity (Bolarinwa, 2015). In this research, face validity was used because it was an easy and convenient form to apply. This validity was done by my supervisor.

3.6.1.2 Reliability

Reliability refers to the consistency of a research study or measuring test (McLeod, 2013). There are two times of reliability; internal and external reliability. Internal reliability is the reliability that assesses the consistency of results across items within a test. The method for testing reliability of a question is 'split half'. This method measures the extent to which all parts of the test/questionnaire contribute equally to what is being measured. A test is split into two halves. Thereafter, the second half is compared to the first half. If they have similar results, then the questionnaire is reliable. While external reliability refers to the extent to which a measure varies from one use to another (McLeod, 2013). This reliability uses the test-retest method of testing questionnaire. This method measures the reliability obtained after administering the same test twice over a period of time to a group of individuals and correlating the results. If equal results are obtained, then there is external reliability of the

questionnaire. However, a limitation to this method is when the duration is short between the first and second test as students simply provide answers that they recall from the first test. This leads to bias of results. Therefore, for effective results, this method takes long. Though not too long, it is feasible for the participants to have changed in some way which could also bias the results.

3.6.1.3 Pilot study

A pilot study was conducted at one of the boarding secondary schools in Zomba district. 40 students were involved in the pilot study. A questionnaire was administered to 40 students. This was the first test. After two weeks from the first test, the same questionnaire was administered to the same group of students. This was the second test. Thereafter, results of the two tests for each participant were correlated and reliability for each item in the questionnaire was calculated. The reliability results are presented in the table 4.

Table 4: Reliability test results.

Item	correlation	
1.Before attending a class, I study notes of the previous lesson to remind myself on what was covered.	0.489	Reliable
2. At the beginning of a term, I make up a study time table	0.523	Reliable
3. When preparing for a test, I study past test papers	0.738	Reliable
4.when I want to study after classes, I move to a quiet place if there is noise in the classroom.	0.708	Reliable
5. when studying from a text book, I mark where I do not understand so that I can go back to it at a later time.	0.594	Reliable
6.when the teacher is teaching, I write short notes	0.397	Reliable
7.when I am not sure about the answer to an assignment question, I check in my notes for the correct answer	0.417	Reliable
8. I keep all my biology test papers in a file to help me monitor my performance.	0.836	Reliable
9.i ask myself questions from what I have studied	0.282	Not reliable
10. when I get an answer wrong, I try to understand why it is wrong and look for the correct answer	0.192	Not reliable
11.In any test, I compare my test score with my previous test score	0.0297	Not reliable
12. I am able to identify useful methods of studying.	0.567	Reliable

Items that had a low correlation coefficient (r) of less than 0.3 were removed from the questionnaire. This implied that those items were not reliable. Initially, there were 12 items on the questionnaire. After removing the items that were not reliable, the questionnaire remained with 9 items. Items number 9 and 10 from the monitoring category and item 11 from the evaluation category were found not to be reliable, hence were removed. This implies that the last item which was number 12 became number 9. The remaining items on the questionnaire are the ones that the researcher used to collect quantitative data in the four target schools. Together with the 2 open ended questions, the questionnaire had 14 questions in total.

3.6.2 Interview guide

Qualitative data was collected using an open ended interview guide. Four students were interviewed from each participant school. These students were chosen randomly from the students who had completed the questionnaire. During the interviews, students' responses were recorded using a phone. The qualitative aspect sought to complement the quantitative phase in answering my three research questions out of four questions in order to ensure validity and reliability of results. These are: "What learning strategies do secondary students use?", "what are the differences in the learning strategies between students of different classes?" and "what are the differences in the learning strategies between boys and girls?". The development of the interview guide was based on the categories of POME model of self-regulation. The interview guide had nine main questions (refer to copy in appendix 2). Supporting questions arose from the students' responses as I tried to probe for more information from them. All the questions were open ended and were testing the students' self-regulated activities inside and outside a classroom. Face validity of the questions in the interview guide were

assessed by my supervisor. Reliability of the questions in the interview guide was assessed during a pilot study that was conducted at one of the boarding schools which was not part of my research sample. This was done by interviewing two students from the school. The questions were revised as based on the reviews from the supervisor and from the pilot results.

3.7 Data analysis

In quantitative analysis, descriptive statistics were calculated for each item of the questionnaire using the excel software. All questions were rated using a 4-point likert scale ranging from always to never. Descriptive statistics was used to measure the frequencies and percentages to describe the dependent and independent variables in the study. A chi-square test was conducted to compare the percentages of the groups in the study and draw conclusions for the research questions. The descriptive statistics revealed some interesting differences in the learning strategies between these groups of participants: boys and girls, form one and form three students as well as high and low performing students.

In qualitative analysis, the interview recordings for each participant were transcribed into a word document format. Colour Coding was done on important learning strategies. Then a cross-case analysis was done on the codes. Categories and sub-categories were formed to connect similar content to each other. The categories were formed according to categories of my conceptual framework POME. After the analysis, all findings were reported in English.

3.7.1 Test for significance using Chi-square

Chi-square test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies between one or more categories (Sharp, 1979). Since the study was looking to see if there are differences between: boys and girls, form one and form three students as well as high and low performing students, an analysis of Chi-square was done to test if the differences were significant. A Chi-square value of less than 0.05 ***was taken to be statistically significant. Above 0.05, that value was not statistically significant***.

3.8 Limitations of the research

A short questionnaire with three questions for each category and three questions were removed due to reliability test results. I could not replace them due to time. Using few questions in some categories means I might not be so confident about the results of the category since interpretation is based on few items. However, I also had questions in the interview guide which required students to report on their use of learning strategies for each category. So this complemented the information I needed.

3.9 Chapter summary

This chapter has discussed quantitative, qualitative and mixed research designs. In addition, methods such as experiments, interviews, ethnographies, focus group discussions and surveys have been discussed. The philosophical worldviews which are: pragmatic, post positivist, transformative and constructivist have been described. The research instruments such as questionnaire and interview guide were also described.

In the next chapter, findings of the research study will be outlined and a discussion of the findings will be presente

CHAPTER 4

FINDINGS AND DISCUSSION

4.1 Chapter overview

This chapter presents and discusses the findings of the research study. It starts by presenting the findings, discussion and summary for question one, then for research question two, three and four respectively. It ends by presenting the chapter summary.

4.2 Research question 1: what learning strategies do secondary students use in learning school Biology?

On this question, I was exploring the learning strategies for secondary school students based on the four categories of planning, organising, monitoring and evaluation. These categories were in accordance with the POME conceptual framework. A questionnaire of 9 questions was developed and administered to 385 students in 4 schools. To answer the research question one, each question in the questionnaire was analysed using excel and results that were found are presented in the table 5.

Table 5: Learning strategies students use in learning school biology

Strategy	% of learners (n = 385)			
	Always	Often	Sometimes	Never
Planning strategies				
Study previous lesson notes	26	22	47	5
Make study time table	75	12	10	3
Go through past papers	59	19	21	1
Organization strategies				
Move to a quiet place	45	19	30	6
Mark points when studying	33	22	32	13
Write short notes	61	17	21	1
Monitoring strategies				
Check for correct answer	40	15	23	22
File test papers	76	9	10	5
Evaluating strategies				
Identify useful methods	46	24	26	4

As shown in Table 5, students differ in their use of learning strategies for school Biology which have been described graphically by item in the section below. On interpretations of results, more students using the strategy means a bigger value after adding the "always and Often" columns while few students using the strategy means a bigger value after adding "sometimes and Never" columns.

Responses for the questionnaire

Planning category

Question 1: Before attending a class, I study notes of the previous lesson to remind myself on what was covered.

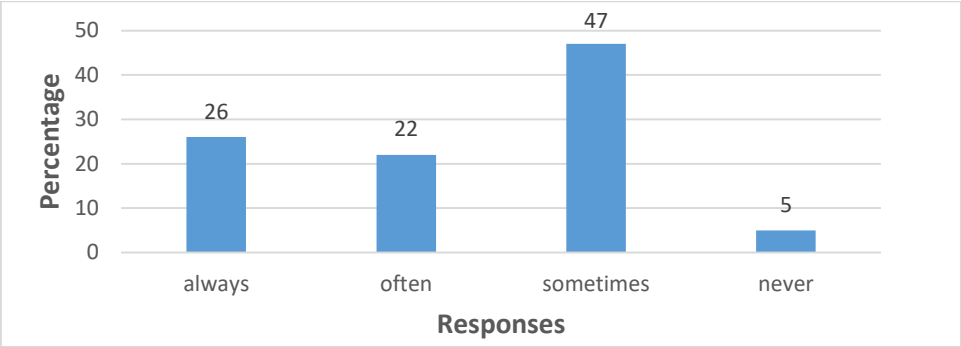

Figure 3: Graph showing number of responses for question 1

From the results, it appears that more students (52%) do not study the previous notes to remind themselves on what was covered in the previous lesson.

Question 2: At the beginning of a term, I make a study time table for the evening preparations

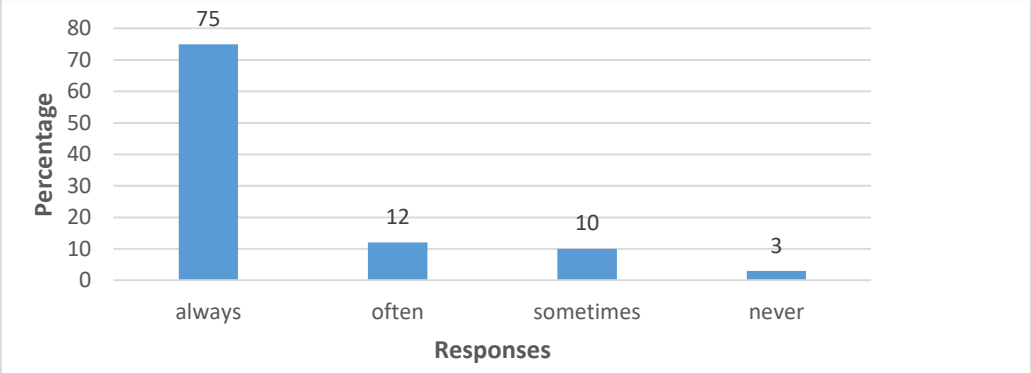

Figure 4: Graph showing the number of responses for question 2: Researcher

It seems that most (87%) of the students make a study time table at the beginning of a term. Having a study time table helps students to manage their time well. Question 3: when preparing for a test, I study past papers.

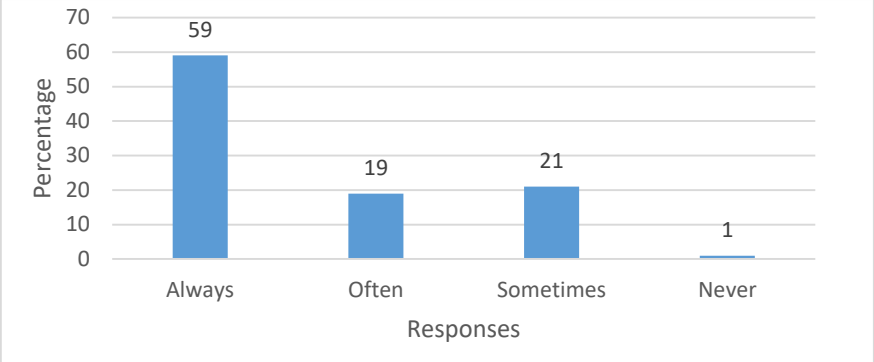

Figure 5: Graph showing the number of responses for question 3: Researcher

There is a higher percentage of learners who always or often study their past papers as they are preparing for a test (78%). So, it appears that, most students go through their past papers as they are preparing for a test.

When learners were asked to mention everything that they do when preparing for a test (open ended question number 10), most of them said, they engage themselves in group discussions, revisit their class exercises, borrow different books from friends or library, revise all the notes a day before the test, consult their teacher or their friends for clarification of some concepts and the studying of past papers came up again. The findings have also shown that very few learners read their previous lesson notes in preparation for the next lesson.

Generally, in the planning category, the results show that most students plan their work by making a study time table at the beginning of a term. When preparing for test, they study past papers, engage in group discussions and revisit all their class exercises and notes. However, the results also show that the reading of previous lesson notes in preparation for the next class is not usually done by most students.

Planning in learners was also evident through the oral interview when I asked the learners how they make sure that they have done all that they wanted to do in a day. The responses were:

- Student 1: “I make like a to do list. I have a special book where I write my to do list for the Day”
- Student 2: “I have a little exercise book in which I write my daily tasks and I make sure that I complete all tasks for that particular day”.
- Student 3: “I write a time table sometimes to make sure that I follow each and every step I do daily”.i usually write my plan for the day on a paper so that I can use it when I am within the school area”.
- Student 4: “I have a paper where I write activities for the day”.

Even though I did not go through the learners’ school bags to check for the little books or papers where they write their daily tasks, I concluded that learners are able to plan for their time.

Organisation category

Question 6: when I want to study after classes, I move to a quiet place if there is noise in the classroom.

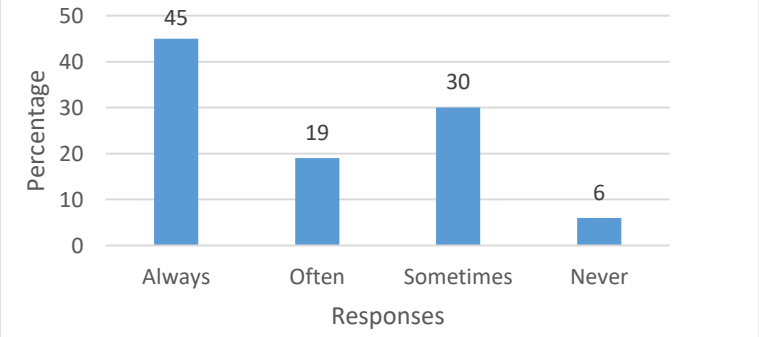

Figure 6: Graph showing the number of responses for question 4: Researcher

It appears that many (64%) students move to a quiet place when there is noise in the classroom. This implies that after knocking off time, there are learners who find their own studying environment when they feel that there is too much noise in classrooms which might affect their concentration. Moving to a quiet place facilitates personal reflection and concentration.

Question 5: when studying from a textbook, I mark where I do not understand so that I can go back to it at a later time.

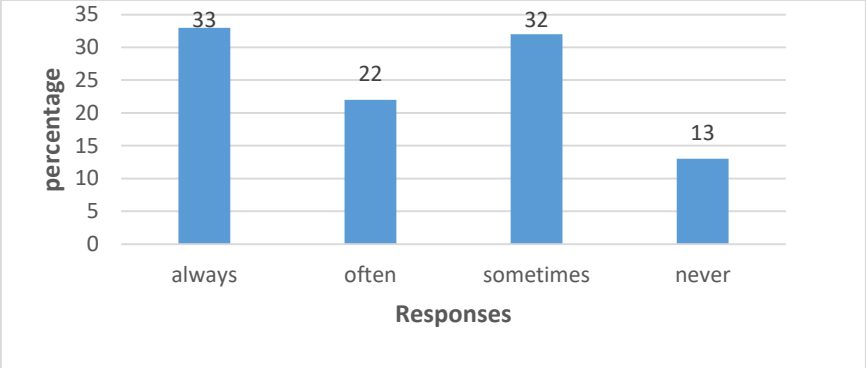

Figure 7: Graph showing the number of responses for question 5: Researcher

From the graph, it appears that an average number of students (55%) mark where they do not understand when reading so that they can go back to it at a later time. This may be so because the textbooks are not personal but borrowed from the school and hence not allowed to make marks.

Question 6: when the teacher is teaching, I write short notes

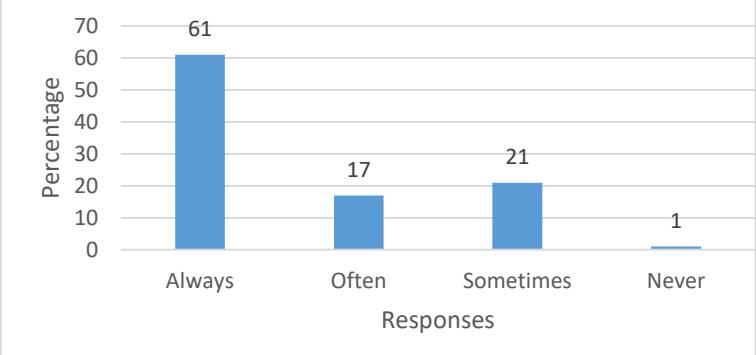

Figure 8: Graph showing number of responses for question 6: Researcher

From the graph, it shows that most (78%) of the students write short notes when the teacher is teaching. Writing short notes facilitates concentration and understanding. This is because, writing down a certain point when the teacher is teaching or when someone is studying requires one to pay close attention to detail. Learners also write short notes when they are studying their notes.

Generally, from the organisation category, results show that writing short notes when the teacher is teaching and moving to a quiet place when there is noise in the classroom are the strategies that are used by many students to organise their work. Marking in the text book where one does not understand is not usually done by most students.

In addition, students mentioned during interviews that they are able to organise their learning materials. For example, most of them said that they borrow text books from the library. When I probed for more information on how they select the biology books they use, these were the responses;

> student 1: " I take 2 to 3 books and compare the way authors write the information. Then I go for the book which is well explained so that I can understand the information"
>
> student 2: "I get a book that has more information"

student 3: “our teacher gives us the syllabus. So I choose a book that is in accordance with the syllabus”

student: "I go for the books that have relevant information for my studies”

Monitoring category

Question 7: when I am not sure about the answer to an assignment question, I check in my notes for the correct answer.

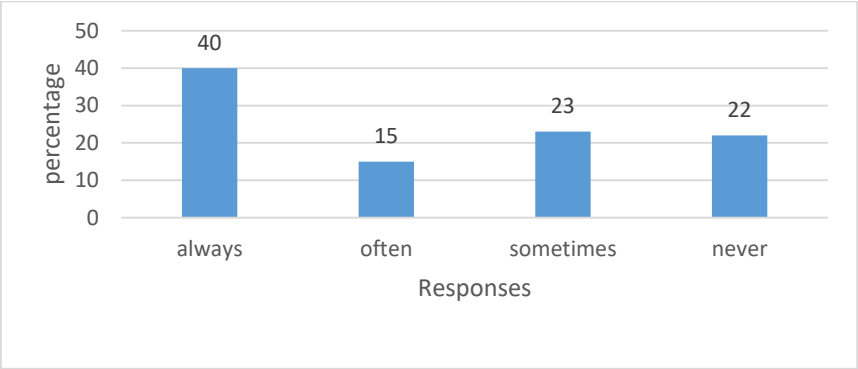

Figure 9: Graph showing the number of responses for question 7: Researcher

It appears that an average number of students (55%) check in their notes for the correct answer when they are not sure about the answer to an assignment question. In Malawi secondary schools, use of text books and class notes is encouraged. Such that students are expected to use them at all times when they are not sure about something.

Question 8: I keep all my marked biology test papers in a file to help me monitor my performance.

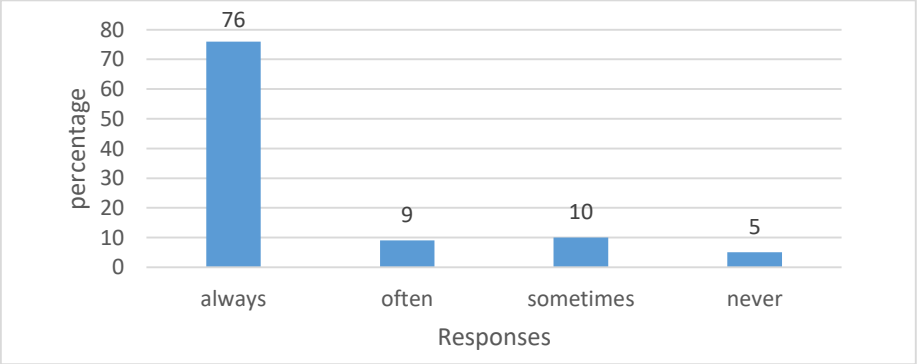

Figure 10: Graph showing the number of responses for question 8: Researcher

From the graph, it appears that most students (85%) have a file where they keep their marked biology test papers.

Generally, it appears that many students monitor their work by having a file where they keep their test papers. This file helps them to check their progress by comparing the previous and present scores. The results also show that very few students go back to their notes to check for the correct answer when they are not sure about the answer to an assignment question.

Evaluation category

Question 9: I am able to identify useful methods of studying

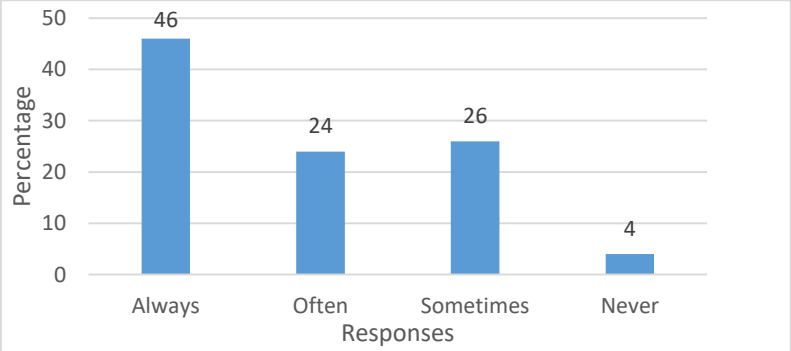

Figure 11: Graph showing the responses for question 9: Researcher

In this category, it appears that most of the students (70%) are able to evaluate their learning through identifying useful methods of studying. Students study using different methods. It is therefore important for the students to identify useful methods that help them to understand well. The useful methods are the effective methods that yield good results in students.

More strategies that facilitate evaluation were reported by students on the open ended question "list all the activities you do to make sure that you have understood the content you were studying". Students' responses were as shown in the table below;

Table 6: Students' responses on the question "list all the activities you do to make sure that you have understood the content you were studying"

Activity	**N= 385**	**% of students**
Ask myself questions	183	48
Friend asks questions	86	22
Summarize Information after studying	49	13
Make short notes while studying	42	11
Self-testing	25	6

The table indicates that the most frequently used strategy by students is asking oneself questions. These findings were consistent with the results of Ngwira (2011) which indicated that the common strategy reported by the learners was answering learner's own formulated questions. Self-assessment is a valuable learning tool as it helps the students to identify their knowledge gaps as well as to track their own progress.

Table 7: Results for qualitative data analysis (form 3)

Activity Mentioned	**Main Category**	**Sub Category**
1. To make sure all work is done	Planning	-activity books -activity paper "*I have a paper where I write activities for the day*"
2. Study materials	Organizing	-text books from Library or personal -short notes

		-personal notes or friends' -other books not biology "*Most of the times, I borrow books from the Library. Sometimes I use my friend's notes"*
3. Choosing text books	Monitoring	-check syllabus -check relevance/quality -check easiness of the book to understand -check amount of content "*I go for books that have relevant information for my studies"*
4. Checking performance	Monitoring	-exam results. Compare previous and current test scores. -trying to answer past papers -checking school report Student S"*I compare the score I had last term with what I have this term"*
5. Identifying weakness	Monitoring	-checking exam score -friends' comments -write in diary Student 4 "*I keep a general diary that I can see how I am fairing".*
6. Dealing with weakness	Evaluating	-teacher's advice -friends' advice -Revise time table (personal) "I *revise my time table in a way that the subject I failed appears more than before on my study time table".*
7. What to do after failure	Evaluating	-consult teachers or fellow students to understand mistakes "*I ask my teacher or friends who have got it right*".

Table 8: Results for qualitative data analysis (form 1)

Activity Mentioned	**Main Category**	**Sub-Category**
1. To make sure all work is done	Planning	-Activity books -to do list Student 1*:" I have like a little exercise book which I write my daily tasks".*
2. Study materials	Organisation	-use text books from Library -notes -writing materials Student 2"I use my text books and exercise books for reference".
3. Choosing text books	Monitoring	Use books with more content -syllabus based -gets from home Student 3:"*the book I like to use is achievers because the information in it is very good and I understand it very well compared to other books*".
4. Check performance	Monitoring	-compare test scores- current and previous -compare with other students' scores Student 2:"*I go through my past and current papers and compare my performance"*
5. Identifying weakness	Monitoring	Use diary Friends' comments Class performance Student 3: "*through the times I chart with my friends*".
6. Dealing with weakness	Evaluating	Use friends' advice Study hard Positive attitude Revise study time table-giving more time

		to biology student 4"*Sometimes I discuss with my friends to see how they can help me".*
7. What to do after failure	Evaluating	Asking teachers were they went wrong Asking fellow learners Sutdent 5 "*I ask the teacher to help me*"

From the interviews, these were the issues that were mentioned by form one and form three students.

4.2.1 Discussion on research question 1: the learning strategies used by the

students

The findings on research question one show that the most frequently used strategies are making a study time table at the beginning of a term (87%), studying past papers (78%), moving to a quiet place when there is noise in the classroom (64%), writing short notes when a teacher is teaching (78%), keeping test papers in a file (85%) and identifying useful methods (70%). Making a study time table and studying past papers are strategies that facilitate planning. The findings from the open ended question 10 "mention everything that you do when preparing for a test" also revealed the same on using past papers. Many students reported that they use past papers. Making a study time table, helps learners to manage their time effectively.

Ngwira (2011) found out that students shun answering past papers. Findings from this study may be due to availability of past papers in the school libraries. After MANEB examinations, the remaining past examination papers are disseminated to various schools for use by students. Moving to a quiet place and writing short notes are strategies that facilitate organisation.

Keeping test papers in file is a strategy that facilitates monitoring. To monitor their performance, most learners mentioned through interviews that they compare their test scores for the previous term and the test scores for the current term. Students might be using this strategy because they are afraid of examinations. They believe that having gone through the past papers, they are in a better position to pass well because some questions can be repeated. Identifying useful methods of studying is a strategy that facilitates evaluation.

Summarising the content studied is another learning strategy that is used by few students. Soyogul (2015) also reports that elaboration techniques help learners to store knowledge into long-term memory by summarising and paraphrasing.

This is opposed to rehearsal strategies which simply activate schema and recall information instead of storing information into long-term memory and transferring new information to prior knowledge. The study has also found out that the least used strategies are: checking in the notes for correct answer, marking points when studying and studying previous notes in preparation for the next class. These strategies facilitate understanding. Therefore, it is important for students to use these strategies in order to learn with understanding. Highlighting (underlining) and folding a page are some of the ways learners use to mark a portion or a point of the material to be learned in a textbook. This portion is marked either because it is so important or is hard to understand such that the learners would want to go back to it at a later time.

According to Dunlosky (2013), highlighting/underlining is considered as one of the 10 learning strategies that students can use to improve learners' success across a wide variety of content domains. It was also reported that this strategy was chosen based on

the frequent usage by the learners. However, this finding is contrary to what this study has found since there are few students who mark a portion of what they do not understand. This could be the case because there are very few learners in secondary schools who own text books. This was noted when I asked the learners through an oral interview where they get the text books they use from. Most of them said they borrow from the library. Only few of them mentioned using their own books which their parents buy for them. This is because, not all learners selected into government boarding secondary schools come from well to do families such that they cannot afford to buy their children all the required text books. Since most of the learners use school text books that are found in the library, it becomes difficult for them to be highlighting/underlining portions or folding pages in the school books.

This would be taken as not properly taking care of library books. Once found doing this, learners are either asked to buy another book to replace the marked one or given a punishment so that they do not repeat that. The Malawian education system gives opportunities to students to plan, organise, monitor and evaluate their learning. Disseminating MANEB past papers is one way the system uses to ensure that there is proper planning for examinations among students. Furnishing school libraries with adequate textbooks is one way the system uses to enhance the use of organization strategies by students. In addition, our education system encompasses termly assessments that help students to evaluate themselves.

4.3 Research question 2: what differences are there in the learning strategies between boys and girls?

On this question, I was exploring the differences in the learning strategies between boys and girls in form one as well as boys and girls in form 3. These are the boys and girls

who are in boarding secondary schools found in Zomba district. To answer this question, categories in the POME model of teaching instruction were used. Chi-square test was used to test the significance of the differences between boys and girls. A chi-square value of not more than 0.05 shows that the differences found are statistically significant. The differences are based on each item of the questionnaire.

Table 7: Differences in students' use of learning strategies in school biology between form one boys and girls.

Table 9: Differences in students' use of learning strategies in school biology between form one boys and girls

Strategy	% of form one girls				% of one boys				P-values of chi-square test	Significance
	A	**O**	**S**	**N**	**A**	**O**	**S**	**N**		
Planning strategies										
Study previous lesson notes	32	29	37	2	36	20	39	5	0.0608	NS
Make study time table	74	15	8	3	62	18	12	8	0.401	NS
Go through past papers	61	19	19	1	59	13	26	2	0.156	NS
Organising strategies										
Move to a quiet place	40	21	35	4	55	13	25	7	0.00541	S
Mark points when studying	31	23	40	6	38	21	28	13	0.0168	S
Write short notes	82	9	7	2	55	15	27	3	0.000	S
Monitoring strategies										
Check correct answer	40	11	25	24	30	14	22	34	0.0579	NS
File test papers	81	11	7	1	75	7	11	7	0.025	S
Evaluating strategies										
Identify useful methods	43	20	34	3	43	24	28	5	0.339	NS

Key: A=Always, O= Often, S=Sometimes, N=Never

Key: S=significant (p-values < 0.05), NS= Not Significant (p-values ≥ 0.05)

On interpretations of results, more students using the strategy means a bigger value after adding the “always and Often” columns while few students using the strategy means a bigger value after adding “sometimes and Never” columns.

At the level of probability of 5% ($p < 0.05$), form one boys and girls do not differ in their planning strategies as learning strategies but they differ significantly in their organisation strategies. On monitoring, they differ significantly on filing test papers and not on checking the correct answer. With respect to evaluating learning strategies, boys and girls do not differ significantly.

Organisation category

More boys (68%) move to a quiet place and mark points than girls (61%) while more girls (91%) write short notes than boys (70%).

Monitoring category

It appears that more girls (92%) keep their test papers in a file than boys (82%).

Table 8: Differences in students’ use of learning strategies in school biology between form three boys and girls.

Table 10: Differences in students' use of learning strategies in school biology between form three boys and girls

Strategy	% of form 3 girls **A O S N**				% of form 3 boys **A O S N**				P-values of chi-square Test	significance
Planning strategies										
Study previous lesson notes	12	20	59	9	26	19	53	2	0.000	S
Make study time table	82	9	6	3	78	6	14	2	0.00159	S
Go through past papers	63	17	18	2	51	29	19	1	0.049	S
Organisation strategies										
Move to a quiet place	31	20	38	11	55	21	19	5	0.000	S
Mark points when studying	28	23	32	17	34	20	30	16	0.0327	S
Write short notes	51	25	22	2	55	18	25	2	0.00447	S
Monitoring strategies										
Check correct answer	46	14	23	17	46	16	23	15	2	NS
File test papers	73	12	8	7	74	6	13	7	0.00165	S
Evaluating strategies										
Identify useful methods	43	33	23	1	59	20	16	5	0.000	S

Key: A=Always, O= Often, S=Sometimes, N=Never

Key: S=significant (p-values < 0.05), NS= Not Significant (p-values ≥ 0.05)

At the level of probability of 5% ($p < 0.05$), form three boys and form three girls differ significantly in their planning, organization and evaluation strategies as learning strategies. However on monitoring, they differ significantly on filing test papers and not on checking the correct answer.

On the other hand, the interview results have shown no gender differences in the planning and monitoring strategies that students use. For example, when they students were asked to mention what they do to make sure that they have done all they wanted to do in a day, they said that;

Female student: “I make a to do list of the day”.

Female student: “I write daily tasks in my novel”

Male student: “I write a table of activities to be done on that particular day”

Male student: “I have an activity book where I write activities for the day”

Generally, both boys and girls plan their daily activities by writing them down and whenever they finish a certain activity, they are able to refer to their activity list to check what has not been done yet.

4.3.1 Discussion on question 2: difference between boys and girls; form 3 and form 1 students

It appears that girls are surpassing the boys in using learning strategies that facilitate planning. There are more boys in form three who are using strategies that facilitate organisation than form three girls. This generally means that boys are surpassing girls in using strategies that facilitate organisation. The findings have also revealed that, girls are surpassing boys in using strategies that facilitate monitoring. The findings have also revealed that more boys surpass girls in using evaluation strategies. The results of Zimmerman and Martinez-pons (1990) also found similar results in the use of

planning and monitoring strategies in favor of girls compared with boys. However, their results disagree with these findings on organisation strategy where they found out that girls surpass boys. While in this study, it appears boys are more organised than girls. The differences might be attributed to the school practices or socio-cultural background of learners.

Generally, there is not much difference between form one girls and boys but there are differences between form three girls and boys in almost all the categories. However, there is need for further research to find out why these gender differences are existing in the learning strategies.

4.4 Research question 3: what differences are there in the learning strategies between students of different classes? (Form one and form three students)

On this question, the researcher wanted to explore the differences in the learning strategies between students of different classes. Between boys in form one and boys in form three and between girls in form one and girls in form three. Chi-square test was also used to test the significance of the differences found between form one and form three students. A chi square value of not more than 0.05 means that the difference is statistically significant.

Table 9: Differences in students' use of learning strategies in school biology between form one boys and form three boys

Table 11: Differences in students' use of learning strategies in school biology between form one boys and form three boys

Strategy	% of form one boys				% of form three boys				P-values of chi-square value	Significance
	A	O	S	N	A	O	S	N		
Planning strategies										
Study previous notes	36	20	39	5	26	19	53	2	0.030	**S**
Make a study time table	62	18	12	8	78	6	14	3	0.000	**S**
Go through past papers	59	13	27	1	51	29	19	1	0.004	**S**
Organisation strategies										
Move to a quiet place	55	13	25	7	55	21	19	5	0.125	**NS**
Mark points when studying	38	21	28	13	34	20	30	16	0.749	**NS**
Write short notes	55	15	27	3	55	18	25	2	0.883	**NS**
Monitoring strategies										
Check correct answer	30	14	22	34	46	16	23	15	0.000	**S**
File test papers	75	7	11	7	74	6	13	7	0.893	**NS**
Evaluation strategy										
Identify useful methods	43	24	28	5	59	20	16	5	0.002	**S**

Key: A=Always, O= Often, S=Sometimes, N=Never

Key: S=significant (p-values < 0.05), NS= Not Significant (p-values ≥ 0.05)

On interpretations of results, more students using the strategy means a bigger value after adding the "always and Often" columns while few students using the strategy means a bigger value after adding "sometimes and Never" columns.

At the level of probability of 5% ($p < 0.05$), form one boys and form three boys differ significantly in their planning strategies as learning strategies. However, they do not differ in their organisation strategies. On monitoring, they differ significantly on checking the correct answer but not on filing test papers. On evaluation learning strategies, form three boys and girls differ significantly.

Question 7. When I am not sure about the answer to an assignment question, I check in my notes for the correct answer.

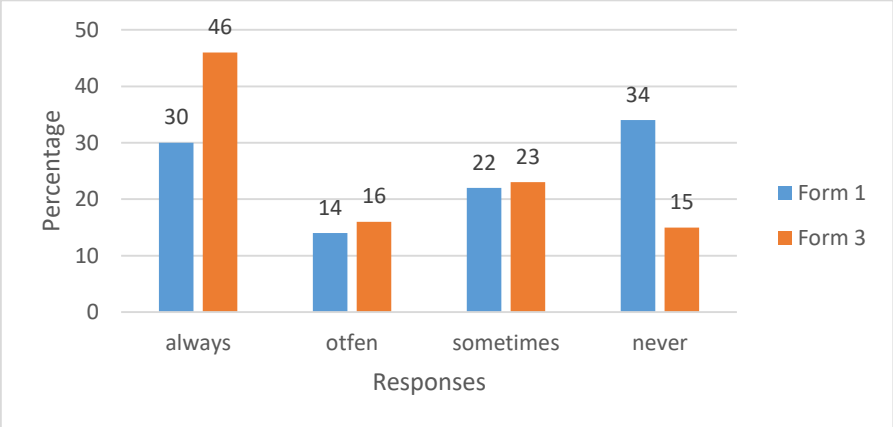

Figure 12: Responses for question 7: Researcher

It appears that more form three (62%) boys check for the correct answer than form one boys (44%).

Question 9. I am able to identify useful methods of studying through the score I get in a test.

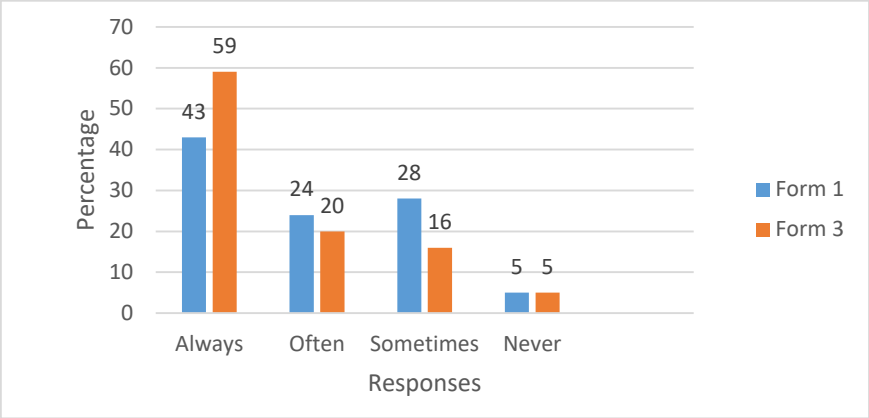

Figure 13: Responses for question 9: Researcher

From the graph, it seems that more form three boys (79%) identify useful methods of studying than form one boys (67%).

Table 10: Table 9: Differences in students' use of learning strategies in school biology between form one girls and form three girls

Table 10 shows differences in students' use of learning strategies in school biology between form one girls and form three girls.

Table 12: Results for the quantitative data analysis of form one girls and form three girls

Strategy	% of form one girls				% of form three girls				P-values of chi-square test	Significance
	A	O	S	N	A	O	S	N		
Planning strategies										
Study previous notes	32	29	37	2	12	20	59	9	0.000	**S**
Make a study time table	74	15	9	2	82	9	6	3	0.0635	**NS**
Go through past papers	61	19	19	1	63	17	18	2	0.950	**NS**
Organising strategies										
Move to a quiet place	40	21	35	4	31	20	38	11	0.0614	**NS**
Mark points when studying	31	23	40	6	28	23	32	17	0.0240	**S**
Write short notes	82	9	7	2	51	25	22	2	0.000	**S**
Monitoring strategies										
Check correct answer	40	11	25	24	46	14	23	17	0.0122	S
File test papers	81	11	8	0	73	12	8	7	0.0298	S
Evaluation strategies										
Identify useful methods	43	20	34	3	43	32	25	0	0.0517	NS

Key: A=Always, O= Often, S=Sometimes, N=Never

Key: S=significant (p-values < 0.05), NS= Not Significant (p-values ≥ 0.05)

At the level of probability of 5% ($p < 0.05$), form one girls and form three girls differ significantly on studying previous notes but not going through past papers and making a study time table as planning learning strategies. On organization strategies, form one and form three girls differ significantly on writing short notes and marking points when studying but not on but not on moving to a quiet place. On monitoring, they differ significantly. On evaluation, they do not differ.

Question 1. Before attending a class, I study notes of the previous lesson, to remind myself on what was covered.

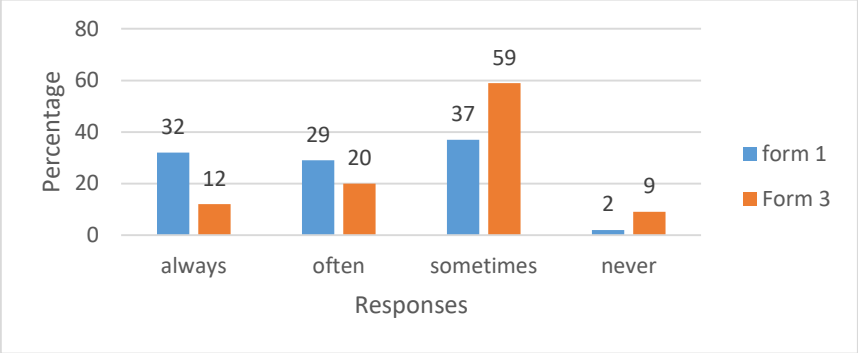

Figure 14: Responses for question 1: Researcher

From the graph, it appears that there are more form one girls (61%) who study previous lesson notes than form three girls (32%).

Question 5: when studying from a textbook, I mark where I do not understand so that I can go back to it at a later time.

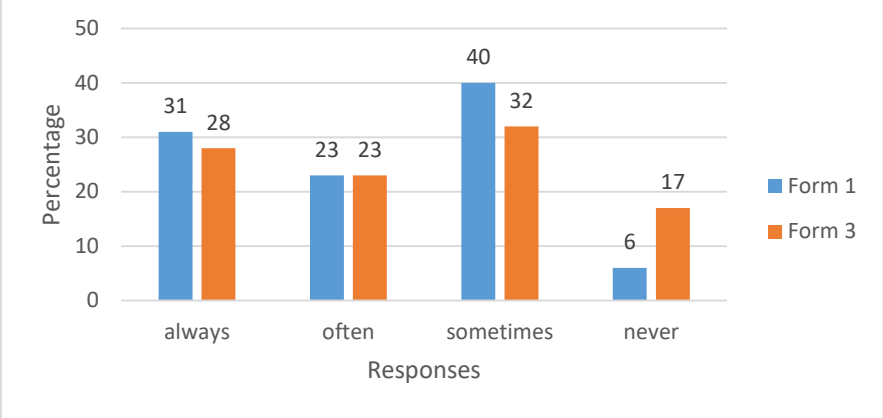

Figure 15: Responses for question 5 (form one and form three girls): Researcher

The graph shows that more form one girls (54%) mark where they do not understand than form three girls (51%).

Question 7. When I am not sure about the answer to an assignment question, I check in my notes for the correct answer.

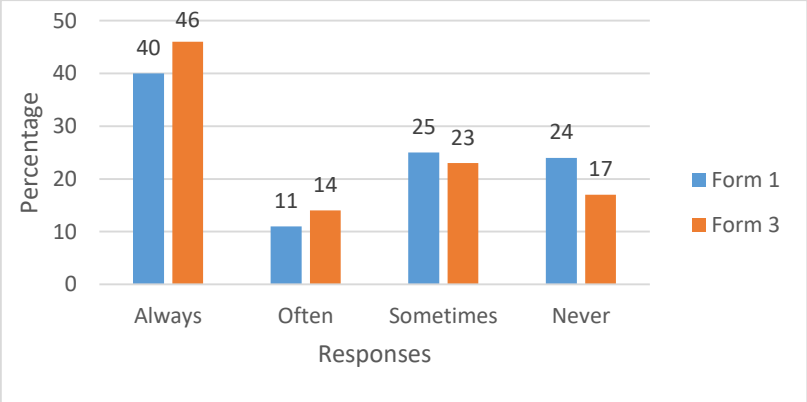

Figure 16: Responses for question 7 (form one and form three girls): Researcher

From the graph, it appears that more for three girls (60%) check for correct answer than form one girls (51%).

The qualitative study results also showed that more form one students check for the correct answers than the form three students. This was evidenced through the results of the interviews reported when students were asked to mention what they do when they see that they have failed an exercise or a test, almost all the form one students unlike

form three students mentioned ‘consulting a teacher or a friend who has done well’ as strategies they use in checking for the correct answer. The responses were as shown below;

Form one student: “I make a correction and ask the teacher to mark”

Form one student: “I consult my friends to assist me”

Form one student: “I search for answers”

Form one student: “I ask the teacher to tell me the right way of answering the questions”

Form three student: “when I see that I have failed an exercise, I worry”

Form three student: “I ask myself more questions”

Form three student: “I feel pain”

Form three student: “I meet my teacher”

4.4.1 Discussion on question 3: difference between form one and form three; boys and girls

In the planning category, the findings have revealed that both form one boys (56%) and form one girls (61%) surpass form three boys (45%) and form three girls (32%) in studying previous lesson notes. Studying lesson notes is a strategy that facilitates planning. On the other hand, form three boys surpass form one boys in making a study time table and studying past papers. In the organisation category, the findings have revealed that there are more form one girls using the strategies that facilitate organisation as compared to the form three girls. In the monitoring category, it appears that there are some strategies where form one students surpass form three students. The study has revealed that form one students surpass form three students in checking for the correct answer when they are not sure about the answer to an assignment question.

While form three students surpass form one students in keeping their test papers in a file. Both of these strategies facilitate monitoring.

Form the qualitative data, it can be deduced that there is more effort by the form one students in to find answers to the problems they have failed. On the other hand, there is less effort by some of the form three students who instead of trying to search for answers, they resort to worrying and feeling pain. Worrying and feeling pain by form three students may be common since at form three level, they are nearing an examination class, hence they tend to have fear for the national examinations.

In the evaluationng category, the study has found out that the form three students (75%) surpass form one students (63%) in identifying useful methods of studying. This might have resulted because form three students are at an advanced level. Thus they are more experienced in choosing the strategies that help them to learn better at a particular time. In all the categories except evaluation, more form one students are using the strategies than the form three students. This is for both boys and girls. The other factor would be decreased motivational levels among the learners in higher classes. When they see that they keep failing as they continue using all other strategies, they start to think that certain strategies are not good enough, so they shun using them. In the evaluation category, more form three students are using evaluation strategies than the form one students, although the difference is not much. Zimmerman (1990), also found similar results. He found out that significant increases in learners' use of goal setting and planning strategies between the 5th and 8th grades. However, the increase was followed by a significant decline between the 8th and 11th grades. Therefore, senior high school students engage less planning and goal setting than junior high school students. On the

other hand, he found out that student's use of the organising strategy increased significantly between the 5th and 8th grades, but declined none significantly by the 11th grade. Therefore, the results indicated that students' use of the organising and monitoring strategies levelled off after junior high school.

4.5 Research question 4: what differences are there in the learning strategies between high and low performing students?

On this question, I was exploring the differences in the learning strategies between high and low preforming students. End of term two Biology results were collected and used. All questionnaires were used and results were divided into two (high and low prfoming). High performing students are those that had scored 50 and above while low performing students are those that had scored below 50. Each school was analysed independently. Because of limited time which I had during the analysis period, i concentrated on form three students only from two schools.

Table 11: Differences in students' use of learning strategies in school biology between high and low performing girls

Table 13: Differences in students' use of learning strategies in school biology between high and low performing students

Strategy	% of high performing Girls		% of low perfoming Girls		P-values of chi-square test	Significance
	Do	**Dont**	**Do**	**Dont**		
Planning Strategies						
Study previous lesson notes	12	88	29	71	0.051	NS
Make study time table	88	12	96	4	0.052	NS
Go through past papers	94	6	79	21	0.055	NS
Organisation strategies						

Move to a quiet place	29	71	37	63	0.123	NS
Mark points when studying	53	47	37	63	0.071	NS
Write short notes	76	24	71	29	0.136	NS
Monitoring strategies						
Check correct answer	47	53	42	58	0.139	NS
File test papers	76	24	96	4	0.000	S
Evaluation strategies						
Identifying useful methods	71	29	71	29	0.153	NS

Key: S=significant (p-values < 0.05), NS= Not Significant (p-values ≥ 0.05)

'Do' means using the strategies while 'Don't' means not using the strategies.

On interpretations of results, more students using the strategy means a bigger value after adding the "always and Often" columns while few students using the strategy means a bigger value after adding "sometimes and Never" columns.

At the level of probability of 5% (p <0.05), form three high performing and form three low performing girls do not differ significantly in their planning, organisation and evaluation learning strategies. On monitoring, they differ significantly on filing test papers but not on checking the correct answer.

Table 12: Differences in students' use of learning strategies in school biology between high and low performing form three boys.

Table 14: Differences in students' use of learning strategies in school biology between high and low performing form three boys

Strategy	% of high preforming Boys **Do**	**Dont**	% of low performing Boys **Do**	**Dont**	P-values of chi-square test	Significance
Planning Strategies						
Study previous lesson notes	4	96	18	82	0.000	S
Make study time table	65	35	73	27	0.000	S
Go through past papers	57	43	64	36	0.000	S
Organisation strategies						
Move to a quiet place	35	65	45	55	0.000	S
Mark points when studying	22	78	27	73	0.000	S
Write thort notes	57	43	64	36	0.000	S
Monitoring strategies						
Check correct answer	26	74	27	73	0.000	S
File test papers	70	30	73	27	0.000	S
Evaluation strategies						
Identifying useful methods	43	57	55	45	0.000	S

Key: S=significant (p-values < 0.05), NS= Not Significant (p-values ≥ 0.05)

'Do' means using the strategies while 'Don't' means not using the strategies

At the level of probability of 5% ($p < 0.05$), form three high performing and form three low performing boys differ significantly in their planning, organisation, monitoring and evaluation learning strategies. This implies that the high performing boys use strategies that are different from the strategies used by the low performing boys

Planning category

Question 1: Before attending a class, I study notes of the previous lesson to remind myself on what was covered.

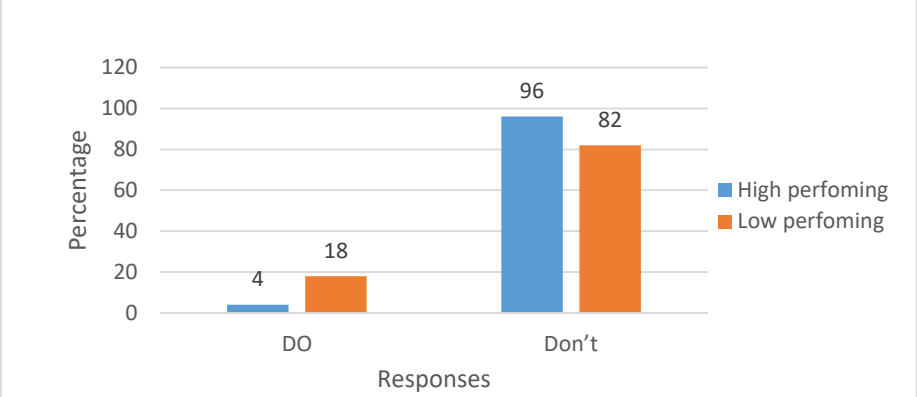

Figure 17: Responses for question 1: Researcher

From the graph, it seems that more low performing students (18%) study the previous lesson notes than high performing students (4%). Studying before the next lesson reminds the students of what they covered in the previous lesson. This helps them to connect the concepts from the two lessons thereby understanding the lesson. When they understand something, they perform well during examinations. Therefore it is very surprising that the students who do not study before a lesson are the ones who perform better than students who study before a class. It may be that the students who do not study but pass are able to pick up the information easily during class time and keep it in memory until the next lesson while those that study but fail may just be memorising the information upon without thorough comprehension.

Organisation category

Question 4: when I want to study after classes, I move to a quiet place.

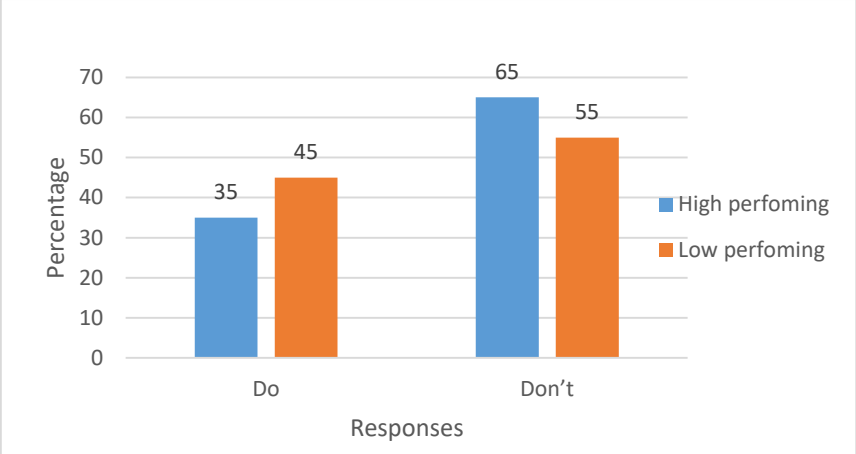

Figure 18: Responses for question 4: Researcher

It appears that more low performing boys (45%) than high performing boys (35%) move to a quiet place when they want to study after class time. Moving to a quiet place one to concentrate and understand what one is studying. However, due to biological differences between people, some students may not be affected by the noise in classrooms and may still concentrate, hence they prefer to remain in noisy place. This might be the reason why more high performing students may not prefer to go into quiet places.

Monitoring category

Question 8: I keep all my marked Biology papers in a file.

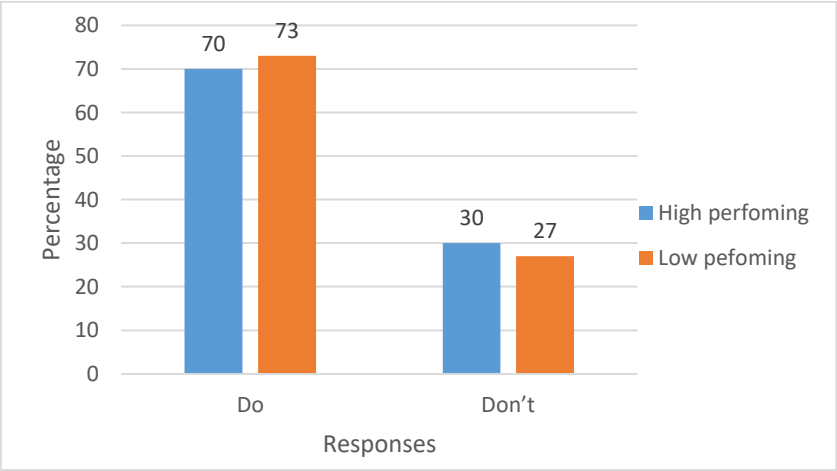

Figure 19: Responses for question 8: Researcher

It appears that more low performing boys (73%) keep their biology test papers in a file as compared to the high performing boys (70%).

Evaluation category

Question 9: I am able to identify useful methods of studying.

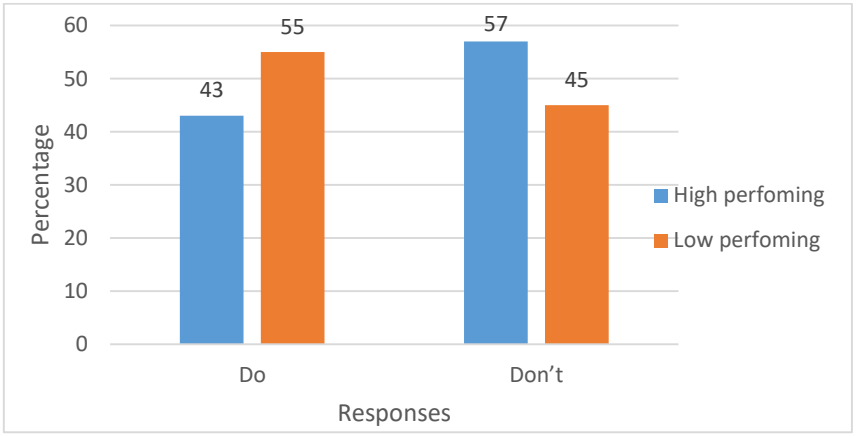

Figure 20: Responses for question 9: Researcher

It seems that there are more low performing boys (55%) who identify useful methods of studying than the high performing boys (43).

4.5.1 Discussion on research question 4: differences between high and low performing; boys and girls

The research on question 4 has found out that there are no significant differences between high and low performing form three girls on all strategies except filing test papers but there are statistically significant differences between form three low performing and high performing boys on all strategies. It is very interesting to note through this research that more low performing boys are using the planning, organisation, monitoring and evaluation learning strategies than high performing boys. Therefore, there is need for further research to explain why the low performing boys are using strategies more than the high performing boys. It is also very surprising to

note that the low perfoming boys are still failing despite their use of self-regulated learning strategies. In a study by Wagner (2010), this was attributed to underdevelopment and ineffective use of the learning strategies by the low perfoming students. He found out that the low perfoming students were able to study for an examination, but the duration of studying was either too little or too long as compared to the medium and high perfoming students. They also found out that the low performing students usually studied with their parents while the low achieving usually studied with their peers. Further to this, it was found out that sometimes examinations brought anxiety to the low perfoming students. Having studied hard for a long time in preparation for an examination, they just rush through to answer questions because they just want to get done with it so that they do not feel nervous. This may be the same case with the low performing students targeted in this study. However, this finding is different from what other researchers have found in other countries. The study of Sebester and Speth (2017) revealed that the self-regulated strategies that were associated with high achieving students (grade A) were: self-evaluation, keeping records and monitoring, planning and goal setting and reviewing notes. The contradiction with the findings of sbeth and Sebester may come as a result of the same underdevelopment and ineffective use of strategies by our students

Students have different metacognitive strategies that they bring to secondary schools. There are some that come to secondary school with well-developed metacognitive skills and others who have not yet developed effective metacognitive skills. A school is a very important institution that helps the students to develop their effective learning strategies. For students that have already developed some learning strategies, they just widen their knowledge on the learning strategies. In a report by Clarke and Protheroe

(2008), it was mentioned that teachers must teach students the learning strategies. This means that teachers in a school play a very important role in the students' development of the learning strategies. They can teach the strategies in the context of content area instruction. In a classroom, teachers can start by modeling a certain strategy, followed by structured opportunities for students to practice and apply the strategies. The teacher then comes with feedback to reinforce the appropriate use of the strategy and correction or teaching again if the strategy is incorrectly applied. The instruction must also include elements that will help students learn how to appropriately generalise use of a strategy to other tasks and classes (Clarke & Protheroe, 2008).

In Malawi, students who are enrolled in the boarding secondary schools come from different primary schools. This explains the differences in the learning strategies that students in secondary schools use. Some students have few and ineffective learning strategies while others have more and effective strategies. Teachers make sure that students are using effective learning strategies by using varied methods of teaching in classrooms. For example, in an English class a teacher may read a short story and ask students questions from what has been read. He or she may also ask the students to summarise what has been learnt from the story to show their understanding. This will automatically help the students to realise that some of the ways they can evaluate themselves are through asking themselves questions or summarising information. With this knowledge, students are able to apply these strategies to other tasks and classes.

4.6 Chapter summary

This chapter has outined the findings of the four research questions. The findings were presented in tables and graphs. A discussion of the findings has also been presented for each question.

In the next chapter, a summary of the key research findings of the study has been presented and the implications of the study have been stated.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Chapter overview

This chapter provides a summary of the key research findings and conclusions drawn. It also provides the implications on the findings of the study.

5.2 Conclusion

This study was conducted to identify the learning strategies that secondary students use. While identifying their learning strategies, students' class, gender and performance differences were also taken into consideration. Participants completed a questionnaire which included nine items related to their learning strategies scales. The data from questionnaires was analyzed using excel. To get a detailed information on the students' learning strategies, face to face interviews were conducted with students. The qualitative data was transcribed and codes were created and put into different categories. The study has revealed that the most frequently used strategies are: making a study time table at the beginning of a term, studying past papers, moving to a quiet place when there is noise in the classroom, writing short notes when a teacher is teaching, keeping test papers in a file and identifying useful methods. Making a study time table and studying past papers are strategies for planning while moving to a quiet place and writing short notes are strategies for organisation. Keeping tests in a file is a

strategy for monitoring and identifying useful methods of studying is a strategy for evaluation.

The least used strategies by students were checking for correct answer, marking points when studying and studying previous lesson notes in preparation for the next class. These strategies facilitate understanding. However, this study has shown that failure to mark a point or portion in the textbook may be attributed to lack of adequate text books since most students do not have text books of their own.

Following the findings, it has also been observed that there are significant differences in the learning strategies between boys and girls. Girls surpass boys in the planning and monitoring categories. This is similar to what most researchers have found in their respective studies. However, on organization strategies, boys surpass the girls. These findings disagree with the findings of Zimmerman and Martinens (1990) who found out that girls surpassed boys. In addition, the findings reveal that there are significant differences between form one and form three students. More form one than form three students use strategies in all categories except evaluation. Similarly, Zimmerman (1990) found that there was a significant increase in the use of planning, goal setting, monitoring and evaluating strategies between the 5th and 8th grade of students. The use declined between the 8th and 11th grade of students. Therefore, the learning strategies leveled off after junior high school. Finally, the study has revealed that there are significant differences between the high and low performing students. The low performing students surpass the high performing students in using the planning, organization, and monitoring and evaluation strategies.

5.3 Recommendations

This study sought to identify the learning strategies secondary students use. The results of this study can provide pedagogical implications for students, teachers and parents to create learning environments where all students can develop skills and reach their academic potentials.

The study has found out that, few students study their previous lesson, summarising content studied and marking of important points in text books. Therefore, teachers can help students to develop this strategy by deliberately incorporating activities that facilitate the use of learning strategies in their lessons. For example, at the end of lesson, teachers may ask students to summarize what they have learnt in the lesson covered. They can also start a lesson by asking students what they learnt in the previous lesson. This will force students to always look at their previous lesson before going for the next lesson. In addition, they can encourage their students to take note of the difficult parts in text books by writing questions in their notebooks.

Finally, According to the hypotheses, the strategies were not expected to be different. This is because students usually copy what their classmates are doing despite the gender difference. There are also some strategies which students acquire through their interaction with teachers in classrooms. So each student has a chance of mastering that particular strategy despite gender difference. This is why I was expecting their strategies to be similar but it is interesting to note that there are significant differences in the learning strategies between girls and boys, form one and form three students and high and low performing students. However, studying the causes of the differences might be of interest to researchers for further research. It has also been revealed in this

study that girls surpass boys in planning and monitoring strategies while boys surpass girls in organisation strategies. Therefore researching if cultural factors (gender roles) at home affect students' development of learning strategies might be of interest for researchers for further research. Studying the cultural factors will enlighten parents on how best they can distribute the roles to their children at home.

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APPENDICES

Appendix 1: The biology learning strategies questionnaire

Biology Learning Strategies Questionnaire

This questionnaire is part of a study that I am conducting on the learning strategies that secondary students use when learning and studying biology. It is intended to help me identify the learning strategies that are commonly used and those that are not commonly used by you. Please answer all the questions in both parts. There are no right or wrong answers. Your answers are confidential. No one including your teachers will know what you answered.

Name _____

Class _____

Gender _____

Date _____

Date of Birth _____

Part A

Instruction: **Circle the answer that best reflects what you actually do or have done as a student to learn Biology.**

Scale: **A.** Always **B**. Often **C**. Sometimes **D.** Never

1. Before attending a class, I study notes of the previous lesson to remind myself on what was covered
   A. Always **B**. Often **C**. Sometimes **D**. Never
2. At the beginning of a term, I make up a study time table for the evening preparations
   A. Always **B**. Often **C**. Sometimes **D**. Never
3. When preparing for a test, I study past test papers
   A. Always **B**. Often **C**. Sometimes **D**. Never
4. When I want to study after classes, I move to a quiet place if there is noise in the classroom. **A**. Always **B**. Often **C**. Sometimes **D**. Never
5. When studying from a text book, I mark where I do not understand so that I can go back to it at a later time
   A. Always **B**. Often **C**. Sometimes **D**. Never
6. When the teacher is teaching, I write short notes
   A. Always **B**. Often **C**. Sometimes **D**. Never

7. When I am not sure about the answer to an assignment question, I check in my notes for the correct answer.

   A. Always **B**. Often **C**. Sometimes **D**. Never

8. I keep all my marked Biology test papers in a file to help me monitor my performance.

   A. Always **B**. Often **C**. Sometimes **D**. Never

9. I am able to identify useful methods of studying through the score I get in a test.

   A. Always **B**. Often **C**. Sometimes **D**. Never

Part B

Instruction: Answer the questions as much as you can remember and write as much as possible

10. Mention everything that you do when preparing for a test.

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

11. List all the activities you do to make sure that you have understood the content you were studying.

    _____

THANK YOU VERY MUCH FOR TAKING YOUR TIME TO COMPLETE THIS QUESTIONNAIR

Appendix 2: Interview Guide

Q1. Describe your yesterday from the time you woke up till you went to bed. What activities did you do?

-How do you ensure that you have done all the things that you wanted to do in that particular day?

Q2. What materials do you use to study?

-Where do you get them from?

-How do you choose the materials you use to study?

Q3. How do you check if your performance is improving or not?

Q4. How do you identify your strengths and your weaknesses?

- How do you deal with your weaknesses?

Q5. When you see that you have failed an exercise or a test what do you do?

Appendix 3: clearance to collect research data

PRINCIPAL
Richard Tambulasi, B.A (Pub Admin), BPA (Hons), MPA, Ph.D

CHANCELLOR COLLEGE
P.O. Box 280, Zomba, Malawi
Telephone: (265) 01524222
Fax: (265) 01524 046
Email: principal@cc.ac.mw

Our Ref:
Your Ref:

12th January 2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

CLEARANCE TO COLLECT RESEARCH DATA: MS TAKONDWA ZOLOWERE

Ms Takondwa Zolowere is a Master of Education student registered in the Department of Curriculum and Teaching Studies at Chancellor College, University of Malawi. She has received clearance to go for field research. The title of her research is '*Exploring Learning Strategies Used by secondary school students in learning Biology*. We shall be grateful if you could allow her to collect the research data, and also provide her with any additional support to enable her generate the required data for the study.

Your support will be greatly appreciated. If you need further details on this request please contact me on email: ekunkwenzu@cc.ac.mw; or mobile: +265993425995.

Sincerely,

UNIVERSITY OF MALAWI
CHANCELLOR COLLEGE
22 FEB 2018
CATS DEPARTMENT
PO BOX 280, ZOMBA

Dr E. D Kunkwenzu
Postgraduate coordinator,
Chancellor College

Appendix 4: Introductory letter

Ref. No. SEED/ ADM/18 4 April, 2018.

FROM : THE EDUCATION DIVISION MANAGER , SOUTH EAST EDUCATION DIVISION , PRIVATE BAG 48, ZOMBA.

TO : THE HEAD TEACHERS, SECONDARY SCHOOLS IN ZOMBA DISTRICT

INTRODUCTORY LETTER

This office is hereby introducing to you the bearer of this letter Miss Takondwa Zolowere.

Miss Takondwa Zolowere is one of the teachers at Masanje Community Day Secondary. However, Miss Zolowere is currently pursuing Master of Education Curriculum and Teaching Studies for Science Education at Chancellor College. She is current on Research and would like to collect data from various Secondary Schools within Zomba District. The title of the Research is ***Exploring Learning Strategies used by Secondary School Students in Learning Biology***.

Miss Takondwa Zolowere has been granted approval to conduct the Research of collection data in your Secondary School by this office.

Please assist her accordingly.

P.K. Nangwale

PRINCIPAL HUMAN RESOURCE MANAGEMENT OFFICER

For : **EDUCATION DIVISION MANAGER (SEED)**