

AN INVESTIGATION OF LEARNING STRATEGIES IN LEARNING SCHOOL
BIOLOGY.

Master of Education: Curriculum And Teaching Studies (Science Education).

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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 peoples' work has been used acknowledgements have been made.

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Certificate of Approval/Certification

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DEDICATION

This thesis is dedicated to my wife, Ettidah, in appreciation for her support particularly during my study period.

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ABSTRACT

One of the basic skills in the knowledge society is the ability to learn (Hoskins and Fredriksson, 2008). Effective and meaningful learning requires the use of appropriate learning strategies to achieve the learning goals. In this thesis, learning strategies are defined as activities and thoughts in which the learner engages for the mastery and retrieval of knowledge and skills to improve academic performance. Studies done within and outside Malawi show that learners' academic failure, among other factors, is due to lack of knowledge of learning strategies. The purpose of this study was, therefore, to explore the learning strategies used by students in learning biology at MSCE level in selected rural and urban conventional day secondary schools in the Northern Education Division. The study design, data collection and analysis were guided by constructivism as a theoretical framework in addition to concepts emphasized in metacognition. On the other hand, the Learning And Study Strategies Inventory (LASSI) was used as a conceptual framework. The Case study design employing interviews and a questionnaire was the means of collecting data from purposefully selected schools and participants. The findings show that basically learners mentioned to use a number of rehearsal strategies with group study technique being the core and common means of learning. However, textbook use was noted to be poor. There is neither gender related nor urban/rural divide strategies. The main challenges are study time particularly for the rural girl learner and disparities in the availability of types of learning materials between schools. These

negatively affect the application of some strategies by many learners. The study, therefore, recommends that learners should be guided in developing meaningful learning strategies, effective use of textbooks as well as the incorporation of learning strategies in teacher training programmes since teachers ought to play a big role in helping learner to learn.

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LIST OF ACCRONYMS AND ABBREVIATIONS

1. CDSS: Community Day Secondary School
2. DBSS: District Boarding Secondary School
3. DDSS: District Day Secondary School
4. DEC: Distance Education Centre
5. ED: Education Division
6. EDM: Education Division Manager
7. FGD: Focus Group Discussion
8. FPE: Free Primary Education
9. JCE: Junior Certificate of Education
10. LASQ: Learning And Study Questionnaire
11. LASSI: Learning And Study Strategy Inventory
12. MoEST: Ministry of Education, Science and Technology
13. MSCE: Malawi School Certificate of Education
14. MSLQ: Motivated Strategy Learning Questionnaire
15. NACDSS: Non Approved Community Day Secondary School
16. NBSS: National Boarding Secondary School
17. NED: Northern Education Division
18. RGC: Rural Growth Centre
19. SQW3R: Surveying the chapter, Questioning oneself, Writing short notes, Read
the chapter, Recite some concepts, Review the section
20. ZPD: Zone of Proximal Development

Chapter 1: Introduction

1.0 Chapter overview

In this first chapter I present the general background information to my exploratory study of the learning strategies. I then state the problem statement, the purpose of study, and the research questions. I finish by highlighting the significance and limitations of my study and then I make a summary of the whole chapter.

1.1 Background information.

This work was an attempt to explore the learning strategies employed by learners in learning biology as a school subject at the Malawi School Certificate of Education level. One of the basic skills in the knowledge society is the ability to learn (Hoskins and Fredriksson, 2008). Learning to learn is a prime aim and fundamental principle of education and all schooling (Nisbet and Shucksmith, 1986;Turmo, 2005).

In Malawi, research shows that students' performance, particularly in the sciences, has gone down and the trend for poor performance continues (Dzama, 2006). A number of reasons including students' attitude towards sciences, difficult nature of science subjects, lack of teaching/learning materials, poor teaching methods have been cited as major causes of poor performance in schools. Interventions to these problems have been tried

and efforts are continuing, however, not much is seen to change. Despite students' poor performance, biology remains a core subject. It is a prerequisite to many fields in one's life such as personal and public well-being. It is also a prerequisite to training opportunities and higher learning opportunities, hence an important subject in the school curriculum. Since current interventions seem inadequate in addressing learners' low performance, students' learning strategies should be explored to determine how they learn the subject. This is because as Vermunt (1996, p. 25) argues, that "the learning activities that students employ to a large extent determine the quality of the learning outcomes they achieve." A similar point is made by Prevatt (2006, p. 448) that

"Determination of learning and study strategies can help screen and identify students at risk for poor performance, be used diagnostically to evaluate areas of difficulty, and be useful in advising students seeking a better awareness of their academic strengths and weaknesses."

Thus an exploration of students' learning strategies in their learning process may reveal further causes of the poor performance by the learners.

1.2 Statement of the problem

The problem for this study is that there is very little research done in Malawi to explore the learning strategies of the learners in our school systems to enable the offering of appropriate interventions if need be. In particular, not much is known about the learning strategies used by students in learning biology as one of the main science subject in Malawi. Yet these strategies determine how much one masters and achieves. Therefore, a

study of the learning strategies used by learners could be useful in explaining students' performance in biology.

Effective learning ought to be accompanied by improved academic performance; however, students' performance has been dwindling. With proper guidance, learning is a skill that can be developed as one learns. Thus, knowledge about learners' learning strategies may give the teacher interesting insights and opportunities to support and help the learner to learn. Therefore, we need to ask that without formal help and guidance, what learning strategies do Malawian learners use in learning biology?

1.3 Purpose of study

The purpose of this study was to explore the learning strategies used by students in learning biology at the Malawi School Certificate of Education (MSCE) level.

1.4 Research questions

What learning strategies do students use in learning biology at the MSCE level?

Are there differences in the learning strategies between boys and girls?

What differences are there in the learning strategies between the rural and urban secondary school students?

1.5 Significance of the study

The study contributes to the body of knowledge regarding the learning strategies of biology learners in Malawi. It therefore adds on to the relatively limited research done in Malawi concerning the classroom and outside classroom learning strategies in general,

but more importantly that of biology. It is hoped that such information will be useful to various stakeholders like biology teachers, learners and curriculum developers. Thus these findings may stimulate international and local debate, dialogue and further research regarding learners' learning strategies.

1.6 Limitations of the research

This study was an attempt to explore learners' strategies in learning biology. This meant asking learners to explain the activities and thoughts they get engaged in to learn. Some learners find it very difficult to describe what goes on in their mind and/or what they do to learn. Attempts were made to probe through interviews and learners were led to bring these issues up in cases where they applied. The study was done in very few selected secondary schools in one Education Division (ED) only due to time and financial constraints. Therefore no generalization of the findings can be made. However, challenges like overcrowded classrooms, inadequate textbooks, and rote learning simply to pass examinations seem to limit students, choice of learning strategies.

1.7 Chapter summary

In this chapter, I have stated the background information to this study. There is a need to do more research to determine if there are other factors that contribute to students' poor performance by exploring their learning strategies. This is necessary because little has been researched and is known on what learners do to learn biology. The purpose and research questions of the study have been stated. The study is worthwhile because it will

contribute to the body of knowledge about how learners learn hence applicable to the classroom situation and to education in general. This was a small scale study and it requires replication to validate its findings.

Chapter 2: Literature review

2.0 Chapter overview

This chapter begins by presenting constructivism as the umbrella theoretical framework guiding this study. The concepts of social constructivism and metacognition in relation to learning are outlined. What follows is the definition and discussion of learning strategies. Thereafter a section on classification and importance of learning strategies is presented. The link between constructivism, metacognition and Learning And Study Strategies Inventory (LASSI) is then stated. The last part is a review of studies on learning strategies and lessons learnt from reviewed studies. A short chapter summary closes the chapter.

2.1 Theoretical framework

Constructivism as an umbrella theory of learning guided this study. Furthermore, the study has used social constructivism and metacognition as main concepts in the learning theory.

2.2 Constructivism

Constructivism is one of the theories that explain modern thinking in science education. The paradigm explains the nature of knowledge and the process of learning. It is therefore referred to as a theory of knowledge and a theory of learning. As a theory of knowledge, it emphasizes that reality exists in an individual's point of view therefore there are multiple realities. It further states that knowledge is useful and important when it can be put to practical use by an individual to help him achieve a goal (Doolittle, 1999).

As a theory of learning, constructivism argues that knowledge is individually and socially constructed through interaction with the physical and social environment. The learner herself is an important agent in the learning process. She must be considered and treated as an active participant in knowledge construction and acquisition. However, what the learner already knows (prior knowledge) on any concept is very vital to enable her to learn effectively (Ausubel, 1968). The theory emphasizes that learning engages the mind (mental processes) and the hands, and language is important. Learning is enhanced through social interaction and mediation. Learning is not instantaneous; it takes time to learn, people learn to learn as they learn (Hein, 1991). Learning is goal oriented. Motivation (reasons for learning) is a key component in learning if students are to avoid mere regurgitation of the facts, but learn application of the concepts to their contexts. The learning process ought to be done in a problem solving context to make it meaningful and permanent. Learning is a personal involvement and self-initiated. The learner's ability to evaluate and reflect on her process of learning determines progress or success. These

concepts are further explained under social constructivism and metacognition in the next paragraphs.

2.3 Social constructivism

Lev Vygotsky theorized that learning takes place in the presence of knowledgeable others. It is a social activity. Knowledge and meaning are social constructions through mediation and interaction between peers, with teachers and/or other adults in cooperative settings, Vygotsky (1978). On the other hand, the learner is capable of performing certain tasks and operations alone but she needs assistance from others who know better to perform other tasks beyond her level. It is therefore necessary to determine her level of competency and comprehension before offering necessary assistance to advance her competency. The learner is therefore scaffold through the zone of proximal development (ZPD) to achieve higher performance.

2.4 Metacognition

Literature shows that the term metacognition was first introduced by John H. Flavell in the 1970s. He defined it as cognition about cognition, or thinking about one's own thinking (Garner, 1988). This theory emphasizes the learners' knowledge of the nature of learning, learning strategies and knowledge of ones' strengths and weaknesses in the learning process (Baird, Fensham, Gunston & White, 1993). Furthermore it emphasizes the learner's awareness, and control of the processes by which they learn. The metacognitive learner is thought to be characterized by the ability to recognize, evaluate, and reconstruct her existing ideas in the learning process. The essential features are that

the learner must exercise self-appraisal for the reflection of the effectiveness of her learning strategies, self-management and control of her learning as she learns. She must know how to learn and know which learning strategies work best in a given learning context and for the particular learning goal. There is a need to monitor one's progress and making relevant changes whenever necessary.

Young (2008) shows that current researchers and theorists have broken down metacognition into two subcomponents. These components are metacognitive knowledge and metacognitive regulation. Metacognitive knowledge is about what one knows about one's cognitive process and nature of learning. In this component the learner must have declarative knowledge, procedural knowledge and conditional knowledge. Declarative knowledge is about what one knows about how she learns and what influences (motivates) what she learns. Procedural knowledge is about one's knowledge about different learning and memory strategies that are best to use in specific learning situations. Conditional knowledge is one's knowledge about the best conditions of learning, when, why and how to use the learning strategies.

Metacognitive regulation emphasizes actual activities done to facilitate learning and memory. These include planning, whereby one sets up learning goals, estimates the time required to complete a task and select the learning strategies to accomplish her goals. There is also monitoring, whereby one must be aware of the learning progress and performance she makes. One keeps track of what works and what does not work to provide self feedback. This implies the need to evaluate the process whereby the learner

must examine the learning outcomes and match with the set goals and effectiveness of the strategies. It is necessary here to understand that metacognition empowers learners to take responsibility of their learning. Learning cannot be done on somebody's behalf. Successful learners must learn how to learn effectively, hence its use in this study.

2.5 Defining learning strategies

Theorists and researchers in educational psychology have defined learning strategies in a number of ways. For example, Hoskins & Fredriksson (2008) define learning strategies as specific actions or behaviors of learners to improve their memory or make sense of complex information. Such actions and behaviors help learners to reflect on their learning with the aim of improving performance. Garner (1988) refers to them as well organized plans of actions designed to complete a task and achieve a learning goal. Learning strategies are not accidental but deliberate and consciously engaged-in activities. They are purposeful and the learner must know when to use them, how and why to use them. They are flexible, examinable and adaptable by the learner. Nisbet & Shucksmith (1986, p. 6) say that "these are integrated sequences of procedures selected by successful learners, with a purpose in view and flexibly adapted to meet the needs of a specific learning situation." For the purposes of this study, learning strategies are defined as activities and thoughts which the learner engages with in order to enhance learning skills and improve performance. These activities and thoughts are learner's selection, acquisition, retention, comprehension, organization, retrieval and integration of new knowledge and skills. The implication is that learning strategies should facilitate reading with understanding, assist the learner to identify the main ideas in paragraph/chapter and

summarize it. For instance, during the process of reading of a book chapter, the learner could Survey the chapter by skimming through it, Question oneself to find out the purpose and main ideas of the paragraph/chapter, Write down short notes as one Reads the paragraph/chapter, pause to Recite certain concepts that have just been read and finally Review the section to check one's comprehension of the materials. This technique is termed SQW3R Knutton (1994).

Literature shows that there is a variety of terminologies, which theorists have used to refer to the concept of learning strategies and there is no consensus on its definition. For instance, the following terms have been used by some theorists interchangeably: cognitive strategies, study skills, metacognitive strategies, executive control processes, etc. These can hardly be separated as distinctive concepts (Gu, 2005). On the other hand, common elements are that learning strategies are purposeful, self-initiated, sequenced planned activities, monitored and evaluated, and may turn to be automatic with continued effective use. More importantly, the learner needs to organize herself by planning what to study, preparing her environment, developing mnemonics to enhance memory, and making use of certain features available in books to enhance understanding of the associated concepts.

Gu (2005) states that a complete discussion of learning strategies must involve the learner, the task and the context for a particular learning situation because the effectiveness of the strategy used depends on these variables. He emphasizes that a strategy may depend on:

the learner (her attitudes, motivation, prior knowledge, competence etc).

the learning task (type, complexity, difficulty, generality).

The learning environment or situation (learning culture, resource availability, social setting, etc).

2.6 Classification and importance of learning strategies

Studies on learning strategies have been in existence for over a century to-date. McKeachie (1988) reports of Wellesley College offering a course in learning strategies in 1894 and since then courses in reading and study skills proliferated in the 1930s. Since then learning strategies have been named, discussed and classified in different ways. According to Weinstein (1983) the learning strategies fall into five groups: rehearsal, elaboration, organizing, comprehension monitoring, and affective strategies. The rehearsal, elaboration, organizing and comprehension monitoring strategies are used to act directly on information. The affective strategies are used to offer support services and motivation for the learning process.

Duncan & McKeachie (2005) state that the rehearsal (reciting information) strategies help learners to process information from texts and lectures for memory. These basic strategies include reading, discussing, underlining, note-taking, drawing diagrams, doing experiments, creating and using mnemonics.

The elaboration, organizing and comprehension monitoring strategies are for critical thinking. They are complex strategies and they include paraphrasing and summarizing

texts for example by creating tables. These strategies show the learner's ability to relate and select ideas, think and find relevant examples, and to apply ideas to appropriate situations (Vermont, 1996). The learner also applies previous knowledge to new situations or makes critical evaluation of ideas. By making use of these strategies, the learner employs some of the concepts in constructivism where the learner is expected to engage the mind (critical thinking) and the ability to relate ideas by use of previous knowledge to new situations.

Vermont (1996) adds that as support services to learning, affective strategies are necessary to help the learner develop positive attitude towards the learning process. These strategies include the ability to enable her to be alert and relaxed to study and learn. More importantly the learner must be able to create a quiet learning environment and/or avoid different forms of distracters as well as finding help for difficulties. The other step is planning one's work by setting learning goals and monitoring the extent to which the goals are accomplished.

Guven (2008) and Vermont (1996) add another component of learning strategies: that the learner must be able to monitor, reflect and control her learning process by regulating the effort applied and using the study timetables effectively. The learner also needs to have strategies for identifying sources of difficulties by analyzing her past examination papers. These strategies help in regulating and monitoring one's learning process to determine the way-forward. The ability to conduct self reflection and monitor oneself as well as

being able to determine sources of difficulties is highlighted in metacognition. Hence the learning strategies described above depict a metacognitive learner.

Thus, learning strategies help in achieving specific academic goals. Mayer (1988) argues that some strategies aim at improving attention, memory, thinking, comprehension and selection of relevant and important details in a text. Furthermore, complex processes of organizing ideas and concepts as well as ability to: (a) integrate old and new knowledge, (b) apply acquired knowledge and skills to new situations, and problems as a problem solving skill, these too require particular strategies.

McKeachie (1988) asserts that knowledge of learning strategies also helps learners to attribute their success or failure to the use or lack of use of effective, learning strategies. Science learners should be able to identify and use appropriate learning strategies as a way of engaging in science as an activity. In this way the science they learn becomes useful for socio-economic development. Learning biology by using suitable strategies must enable the learner to develop skills and acquire knowledge to understand social issues like health and nutrition, environmental degradation, alternative energy source etc. In so doing, science learners would be able to participate fully in the socio-economic development of their community and therefore be engaged in socially responsible science for sustainable development. The ability to transfer classroom knowledge and skills to solve personal and societal problems is a vital key to socio-economic development.

Norman (1957) cited in Weinstein (1983, p. 3) argues that as learners pass through the school system they are supposed to learn (acquire academic content and skills) and learn how to learn (learn the process of how to learn). However, he wonders that:

“it is strange that we expect students to learn yet we seldom teach them about learning. We expect students to solve problems yet seldom teach them about problem solving. And similarly, we sometimes require students to remember a considerable body of material yet seldom teach them the art of memory. It is time we made up for this lack, time we developed the applied disciplines of learning, problem solving and memory. We need to develop the general principles of how to learn, how to remember, how to solve problems and to develop applied courses, and then to establish the place of these in the academic curriculum.”

The argument is that learners ought to be assisted to master the art of learning for example in problem solving and acquisition of memory techniques. This can be done if we know the learning strategies that the students are using currently. Proper mechanisms could be devised in our school systems to help the learners to learn. Turmo (2005) argues that determination of learning strategies in schools should be regarded as one of the major goals of schooling because they are seen as important tools to further develop students' competency in life-long learning. Further, Wittrock (1988, p. 289) emphasizes that “by becoming aware of learning strategies, by naming them, by measuring them, and by trying to teach them to students, we believe we can enhance learning in class and also performance at the jobs.” All this shows the importance attached to the need of knowing and understanding the learning strategies used by our learners as they go through the process of their schooling.

2.7 The Learning And Study Strategies Inventory (LASSI)

LASSI was developed by Weinstein et al. (1997) to assess processes used by learners in learning. Among its aims are: (1) to use it in improving students' learning and study strategies, (2) to use it as an assessment to help identify areas in which students could benefit most in educational interventions. (3) to use it to measure students' strengths, weakness and predict academic performance. LASSI has 80 items with 10 categories of the learning strategies. These 10 categories of learning strategies are: time management, test strategies, study aids, self-testing, selecting main ideas, motivation, information processing, concentration, attitude and anxiety strategies. LASSI in this study is also used as a conceptual framework because most of the strategies are closely related to constructivism and metacognition. For instance self-testing, time management and study aids strategies are closely linked to metacognition. These strategies emphasize strategies for self-reflection, effective use of time and ability to identify external help. The other strategies captured in motivation, information processing and selection of main ideas mostly relate to constructivism where the learner must be self driven, relate old and new information as well as taking responsibility of own learning.

2.8 The link between constructivism, metacognition and LASSI

Learning is consensually defined as an active and social construction of knowledge by the learner so that she makes her own meaning through mediation with others. Learning is goal oriented. In the learning process the learner must also take stock of the effectiveness of her strategies to determine whether or not she is making meaningful progress towards her set goals. There is positive relationship between constructivism, metacognition and LASSI. These three principles are derived from cognitive psychology which views the learner as active and self-motivated learner. She should have the desire and responsibility to learn. Therefore all the three concepts put the learner as the pivot of the learning activity. The concepts in all the three are derived from cognitive psychology. For instance, constructivism emphasizes on the active participation of the learner; metacognition emphasizes that the learner should own the learning process by being strategic and goal driven. She must also use strategies that are effective in helping her achieve her learning goals. LASSI furthermore encourages the learner, among other strategies, to use those strategies that motivate and maintain her to learn and accept responsibility of her actions in the learning process. In all the three concepts, the learner is expected to be active, initiative, strategic and reflective in order to be successful in the learning process. The main and common elements emphasized in them are that the learner must develop effective skills to learn, must be motivated and willing to learn, and must be self-regulated. The focus is that students learning strategies affect the learning outcome. Hence learning strategies have been defined as activities and thoughts performed by the learner to make her understand her academic material and improve performance.

2.9 Previous studies on learning strategies

A number of research studies on learning strategies used by students have been conducted by various researchers. The following section provides a review of studies that are linked to the present study.

Akinoglu and Saribayrakdar (2006) conducted a study to determine how secondary school students learn history and the learning strategies they used in the learning process. They used both the qualitative and quantitative methods to increase reliability of findings. They employed a 5-point likert format questionnaire with 54 items on learning strategies and conducted personal interviews to generate data. Their sample was comprised of 346 randomly selected students from three public secondary schools in Uskudar district, Istanbul. The students were of different ages and grades, that is, 143 from grade 9, 169 from grade 10 and 34 from grade 11. Of these sampled students 13 were selected by their teachers as high achieving students to participate in the personal interviews to obtain in-depth analyses and reliable information.

Results showed that a large majority of students studied history a few days before examinations and for 2.5 hours on average. The students were contemplating to drop out of history classes because they did not know how to study for it except by studying alone by simple repetition (rote learning) or by asking elder siblings in their families. Most of them failed to understand the subject hence developed boredom in the process. A small proportion of the participants reported that they used elaboration and effective memory strategies to enable them in understanding concepts. The researchers concluded that

failure of students in school is not wholly due to low intellectual levels but lack of skill of learning (learning process deficiencies). The findings in this study reveal that most learners are deficient of the constructivistic and metacognitive learning strategies. This implies that the majority of the learners fail to learn because they do not know how to learn. By studying history a few days to examinations and for a few hours, would imply that learning is quick, instantaneous and that it requires little effort.

The study by Akinoglu et al. (2006) revealed significant weaknesses in students' learning strategies in history courses, which would give new insight to teachers on how to improve students' learning practices. However, the study did not show and emphasize whether there were any significant differences in the use of strategies between students of different ages/grades, sex and abilities. It is also not known what type of schools these were (rural, urban or boarding). My current study is targeting conventional day urban & rural secondary schools and in biology course. This is a science subject as opposed to history.

Thomas and Bain (1982) did a study to investigate the factors that influence some students to use particular learning strategies that involve reproduction of materials, for example rote memory, while others use strategies that involve understanding through active reorganization of materials. Thomas and Bain wanted to determine whether the use of strategies depended on the subject matter or in anticipation of the mode of assessment (objective or essay tests) or on students' generalized cognitive style. They did this by comparing the learning strategies used by the high and low achieving learners.

The study involved 92 first year Australian College of Advanced Education students enrolled in an introductory psychology course for a three-year teacher preparatory programme. These were 88 males and 4 females. They designed a 7-item questionnaire which was suitable to be used repeatedly across the different types of courses and assessments taken by the same sample of students. The students completed this designed questionnaire soon after they took tests in psychology, mathematics and language studies. Each of the three courses had three objective tests and one essay test in the first semester of their studies. The questionnaire asked students to report on the learning and study strategies they used to learn and prepared for each of the tests.

The findings showed that irrespective of the type of assessment and course (subject matter), the high achieving students reported use of elaboration and organization strategies for critical thinking, eg paraphrasing and summarizing texts. These lead to understanding and reorganization of material. The low achievers used strategies like rote memory that lead to reproduction of material. This study suggests that students were consistent in the use of learning strategies across the learning and assessment situations in the three courses. Thus, different categories of learners have particular and routine learning strategies without necessarily evaluating the effectiveness of the strategy in use.

Thomas and Bain's study was done in one semester only, used three subjects and 92 participants. A longer time frame would have been ideal. It would also be worthwhile to include more subjects to make a better generalization of students' consistent use of the learning strategies across courses. The sample too needed to be gender balanced, because

the female proportion is underrepresented. The questionnaire contained seven items only representing seven learning strategies. The students were assessed on very limited use of learning and study strategies.

Some researchers have argued that there is interplay of factors that make some students fail to use particular strategies. Palmer & Goetz (1988) say that some strategies demand more effort and may not be used by other students. Some students perceive themselves as incompetent and may not attempt to use some strategies. Some strategies require a great deal of content knowledge; so, those students who lack the content knowledge may not use them. Rothkopf (1988, p. 276) adds that “this is not due to deficiencies of methods, or lack of knowledge or skill, but simply, from failure to use the strategy.” This could imply that some students just opt not to employ some particular strategies. There is a need then to encourage learners to make use of relevant strategies as they learn.

Nielsen (2004) investigated the learning strategies employed by advanced music students who had different beliefs about their music abilities, confidence and competence. Naturally, some students have more confidence in themselves while others doubt their abilities and competence. Their sample had 130 first year-advanced music students at six Norwegian institutions of higher music education. There were 71 women and 59 men aged 18 to 43 ($M = 20.4$ years).

They adapted the Motivated Strategy Learning Questionnaire (MSLQ) by translating it into Norwegian and altering some items to suit the Norwegian music education students. The MSLQ was designed by Pintrich, and De Groot, (1990). Besides the classroom learning strategies, the MSLQ covers both intrinsic and extrinsic motivational factors to learning. The questionnaire contained all types of the learning and study strategies on a 7-point likert scale.

The results showed that first year advanced college students applied a full range of strategies though they used the time and environment management strategies to a lesser extent. These findings then imply that learners do not maximize the metacognitive learning skills. An expert metacognitive learner values the time and environment management strategies because these strategies involve planning. A metacognitive learner must plan her activities to estimate time required to complete a task as well setting priorities.

Similar to the study above, Hallem (2000) and Jorgensen (1998) cited in Nielsen (2004) also found that professional musicians adopted a range of strategies in response to their needs but that they seem not to use strategies that involve planning. These learners could be said to be constructivist and metacognitive learners since they employed a number of strategies like peer learning and using such strategies in different learning contexts. As has been stated in the earlier sections, some learning strategies are contextual. Furthermore on a comparative note, they found that those students who had confidence in their abilities applied more of the organizing, elaboration, critical thinking, peer-learning

and effort regulation strategies. On the other hand those who doubted their abilities used more of the rehearsal and simple memory and persevered less at the difficult music tasks. This finding again suggests that some learning strategies are learner dependent. The learner's attitude to learning and her motivation and competence also influence the type of strategies used. However, gender differences did not affect use of learning strategies though male students reported making significantly more critical evaluations with respect to standards of excellence than female students.

A number of studies have shown that students who judge themselves as capable and have confidence in themselves tend to persist longer at 'boring' tasks, use more strategies, regard difficult tasks as challenges to surmount with more effort (Countinho, 2008; Pintrich & DeGroot, 1990). On the other hand Bandura (1997) cited in Cleary & Weinstein (2004) states that low self-confidence in one's abilities causes loss of motivation in learning and contributes to drop-out of a learning task.

The purpose of a study conducted by Cubukcu (2007) was to compare the learning strategies used by students in different cultural contexts, that is, Turkish and Western European University students. The study sample had 348 students enrolled in the English department in Turkey, Holland, Belgium and Spain. There were 300 females and 48 males all in the last year of their teacher-training programme. The age range was 21 to 24 years. Of these 204 were Turkish, 64 Belgium, 47 Spaniards and 33 Holland. The study used the Learning And Study Strategies Inventory (LASSI) which students filled to report their learning and study strategies. The questionnaire was a 5-point likert scale.

Findings indicated that underlining was the most commonly used strategy cross-culturally but Turkish students used it more than the European students. All students used quiet environments for studying. Spaniards used more listening skills than the other students. On the other hand, Turkish students did not prefer peer learning but depended more on their teachers as sources of information and they worked longer at tasks. The interpretation for this was that the Turkish entered higher learning institutions on a competitive level through entrance examinations. However, the European students enjoyed peer learning and entered universities without much competition. The Turkish lacked transfer of English knowledge because they were exposed to English at school only unlike their counterparts. Cubukcu (2007) concluded that students' culture and background had a role to play in students' choice and use of the learning strategies. Zhu, Valcke and Schellens (2007) also made similar observations in their study between Chinese and Flemish university students about their perceptions on motivation and learning strategies. The Chinese students regarded their teachers as the only source of knowledge, the center of learning, and an expert. This background did not encourage peer learning for the Chinese unlike the Flemish students.

The attitude observed in the Chinese students where the teacher is the supplier of knowledge and plays a central role in the learning process is contrary to constructivist classroom. The lack of appreciation of peer learning again does not support constructivist learning. A constructivist learner learns by constructing her own meaning in a social environment through the interaction with her peers. The learner must not just absorb the knowledge from others but must be part of the knowledge construction.

These findings, however, were made on a sample that was predominantly female. However, learning strategies employed in languages, such as English, may not be identical to those strategies used in biology (sciences), which is the focus of the current study.

Dzama (2006) explored the problem of poor performance in science among students who are provided secondary school places on merit in Malawi. The study was about learning practices in physical science. In his sample, Dzama had 725 boys and 578 girls (a total of 1303 students) in form 3 drawn from a total of 18 secondary schools from all the education divisions in the country. He used both qualitative and quantitative approaches to collect and analyze data by conducting in-depth interviews and focus group discussions as well as using a likert-format questionnaire. He adapted a 31-item questionnaire on learning beliefs and practices, self-efficacy and attribution of failure. All the selected participants responded to the questionnaire while 40 students were involved in the one-to-one interviews or focus group discussion (FGDs). He used the descriptive statistics, interpretive and inductive analysis to analyze data obtained from the instruments.

The study revealed that students had very limited knowledge and use of learning skills. They mostly used and depended on reading, consulting peers, discussing in small groups, repeating class work and problem solving. These were regarded as strategies merely for reproducing class work with very shallow understanding hence the poor performance in physical science. The interpretation of these findings is that learners are very limited of

metacognitive learning strategies. As such it would be strange to expect the learners to perform wonders during examinations when such learners did not know how to learn the content they were supposed to master.

From these findings, Dzama concluded that among the many causes of poor performance of students in physical science are limited knowledge and use of learning skills and self-regulatory learning skills. The lack of self-control and management of study time and environment also contribute to poor performance. Dzama's study was comprehensive and it uncovered a lot of factors regarding the learning and performance of students in physical science in Malawi. However, the study did not tackle learners' strategies in biology or between genders then between rural/urban secondary school settings. A lot of factors may operate between these set-ups, which may have significant impact on one's behaviour. The current study intends to explore learners' strategies in such localities.

Shucksmith (1986) argues that children must be directed to reflect on the learning process rather than concentrating on the final product. There is a need that learners should be monitoring their activities to check if what they are doing is helping them learn the material. The ability to reflect on one's process would enable the learner to evaluate the strategy used and then make the relevant changes if necessary to do so.

2.10 Lessons from reviewed studies

Information from literature shows that studies on learning strategies have mostly focused on countries outside Africa. These studies have been conducted in universities and colleges. In the present study, I intend to explore learning strategies of biology learners in secondary schools. There is a need to conduct these studies in secondary schools

especially in Malawi because waiting to do so in colleges would mean leaving out the majority of the population since very few students proceed to higher learning. Hoskins & Fredriksson (2008) emphasize that citizens must learn to learn in order that they can maintain their full and continued participation in employment and civil society or risk exclusion. These studies have also shown that most learners have problems with keeping up with study time hence time management strategies are a big challenge. It was also observed that learners' cultural backgrounds influences their way of learning implying that learners' background knowledge by the teacher is important. Studies have also revealed that the high achievers stay long on difficult tasks and apply more strategies while the low achievers use limited strategies and give up easily.

2.11 Chapter summary

In this chapter I have reviewed literature on constructivism, metacognition, learning strategies and some studies on learning strategies. In constructivism as a philosophy of learning, the accent is on the learner rather than the teacher. It is the learner who interacts with her environment in order to gain an understanding of its features and characteristics. The learner finds her own solutions to problems and learning is the result of individual mental construction. On the other hand, metacognition inspires the learner to develop the skills essential to becoming critical thinkers, strategic learners and life-long-learners. Though there are various ways of defining learning strategies, the common elements are that these are meant to facilitate learning by enhancing understanding and memory to improve the learner's performance. Studies show that there are various factors that affect the learner's use of learning strategies.

Chapter 3: Methodology

3.0 Chapter overview

For this chapter I begin by stating a brief overview of the two research paradigms then proceed on to describe the research methodology and strategy. A description of the research instruments come next and followed by research sample and the sampling procedures. Finally I give a description of the four research schools where my research was conducted. These schools are: Maghemo, Luwinda, Mzenga and Bolero secondary schools is done and I wind up the chapter by stating the way data were analyzed.

3.1 Brief overview of research paradigms: Qualitative & quantitative.

It should be noted here that this thesis is using constructivism as a theory about learning. Thus to gain insights about learning, any research paradigm can be used depending on the nature of the research questions. There are two paradigms to research, qualitative & quantitative. However, three approaches are used to conduct research. These approaches are qualitative, quantitative and mixed methods approach (Creswell, 2003, p.18). The approaches vary in (1) epistemological and theoretical stance of what constitutes knowledge (subjective or objective). (2) general procedures or strategies of inquiry to link methods to outcomes (survey, case study etc). (3) detailed procedures of data collection and analysis (questionnaires, interviews etc) (Creswell, 2003).

In a qualitative paradigm knowledge is viewed to be personal, subjective and unique. The researcher interacts with the participants to understand the constructed knowledge and its nature. One of the assumptions in a qualitative research is the existence of multiple realities in some situations as seen by the stakeholders in such particular situations (Creswell, 1994). The interpretation of features of the social environment is situational. Qualitative researchers therefore seek for meaning in terms of how people view and understand their experiences and actions by conducting in-depth interviews. Major strategies used include case studies, ethnographies, phenomenologies etc. Multiple methods to generate data and cross-check information are used. These methods are in-depth interviews, observations, focus group discussions and document analysis. The use of purposefully selected participants with desired information is preferred (Fraenkel & Wallen, 2000). Findings are narrated, described, and interpreted by inductive and deductive reasoning.

A quantitative paradigm views knowledge to be objective and tangible (Creswell, 1994). The researcher is independent from the participants as she generates information from them. The quantitative researcher establishes relationships between cause and effects thereby generating theories to explain human behaviour. Humans are regarded as passive individuals who only react to external stimuli just like any other objects. The researcher's role is to explain human's reaction to the stimulus. Common strategies are various forms of surveys and experimental enquiry. Data, which is obtained through predetermined instruments, is analyzed through statistical procedures. Usually attitudes, behaviours and performance are measured and rated. Study variables are identified and related to

research questions. The validity and reliability of findings is determined by standard measures and procedures.

A third approach is when the researcher decides to mix the two paradigms. However, the researcher ought to present a rationale for combining the two paradigms in her study. Creswell (2003, p. 22) asserts that “a mixed method design is useful to capture the best of both quantitative and qualitative approaches.” In this approach, usually data is integrated at different stages of inquiry or concurrently.

3.2 Research methodology & strategy

This study employed a mixed methods approach. It combined both qualitative and quantitative designs. This implies collection and analysis of both types of data: numerical (through a questionnaire) and rich text (through interviews) (Creswell, 2003). The purpose was to explore the learning strategies in a holistic and an in-depth manner. Le & Shi (2006) contend that the use of a qualitative method is a strong way of understanding and interpreting human behaviour. On the other hand, the quantitative approach through use of a questionnaire allows for a large representation of participants, which increases reliability of the study. Furthermore numerical data from the quantitative approach also helps the researcher to compare and discuss behaviour between groups of individuals. (Cohen, Manion & Morrison, 2007). Similarly, Creswell (2003) states that the use of diverse types of data is the best way to understand a research problem. He argues that data from a survey helps to generalize findings to the population while interviews aim at

collecting detailed views from participants. These two methods were merged to complement each other (Fraenkel and Wallen, 2000; Creswell, 2003).

The study, however, put more weighting on the qualitative approach which probed into the learning strategies of the learners. It emphasized on the ‘why’ and ‘how’ to understand human behaviour (Cohen, et al., 2007; Nherera, 1999). Fraenkel & Wallen, (2000) further state that the qualitative researcher lends to obtain a more holistic picture in a naturalistic inquiry and personal contact.

This study used a case study. “A case study is an in-depth investigation of an individual, group or institution to determine the variables, and relationships among variables influencing the current behaviour or status quo of the subject of the study” (Fraenkel & Wallen, 2000, p. 662). A case study seeks to uncover real-life experiences of the participants on issues relevant to this study. The study produces a thick and rich description of the events from the participants’ point of view. The aim is to portray a true and vivid picture of the issue being researched by inductive interpretation of the participants’ views. Data is mainly collected in natural settings through interviews, observations, document search, and focus groups. The participants and other sources are purposefully selected to achieve the aim of a case study (Creswell, 1994).

There are different types of case study approaches. Jensen & Rodgers (2001) cited in Garson (2008) outline the following approaches:

Snapshot case studies: a study that is done at one point in time. Usually individuals or entities are compared within the case under study.

Longitudinal case studies: this is when a research is conducted at multiple time points.

Pre-post case studies: this is when a research entity is conducted at two time points; the two points are separated by a critical event. This critical event is viewed to have some significant effect on the participants within the case under study.

Patchwork case studies: this is when a research is conducted by employing the three approaches so as to obtain a broad view of the research subjects.

The present study is a snapshot since it was done at one point in time. It was also done in selected entities which are identical in certain characteristics. These were selected rural and urban DDSS in the Northern Education Division in Malawi.

3.3 Research instruments

In this study a Learning And Study Questionnaire (LASQ), and an interview schedule guide (see appendices 1 and 2 attached) were developed and used. First, the LASQ was administered and interviews followed thereafter. These two instruments were used to complement each other on all the research questions to ensure validity and reliability of responses. In addition the interviews also sought to probe participants further for personal descriptions and explanations of learning strategies employed in biology.

3.4 Adaptation of LASSI

The LASQ and the interview schedule guide were adaptations of the LASSI. These instruments were designed using concepts emphasized in the Learning And Study Strategies Inventory (LASSI), constructivism and metacognition as discussed earlier.

LASSI comprise the following:

study aids - These are support or resource material which help students to learn or retain information. These include use of italics or headings in the textbooks.

self-testing - These are reviewing or comprehension monitoring activities which help students determine their level of understanding. Example include mentally going over what was said or stopping periodically during reading to review.

Concentration - This is students' ability to direct and maintain attention on academic work. Examples include: listening and avoiding distracters.

time management (self- organization) – This is students' application of time management principles to academic work. Examples include: creating study schedules and setting aside more time for difficult topics.

information processing - This is how well students use reasoning skills to bridge gaps between known and unknown. Examples include: paraphrasing and translation.

selecting main ideas - This refers to the ability to identify important information from less important. For instance the student may distinguish main ideas from minor ones.

anxiety strategies - These are feelings of panic and worry when approaching a task. Strategies used include the ability to break tasks to smaller and manageable levels.

attitude strategies - This is a measure of how one values academic work. The strategies used include increasing effort on studies.

motivation strategies - This is a measure of reasons for studying. The strategies used include setting goals to achieve ones aims.

I adapted the LASSI by leaving out anxiety, attitude, motivation and test strategies because these would not be easy to study and obtain accurate information from students. This is so because these three seek for feelings and motives. This also helped reducing excess data for analysis. The remaining categories were regrouped into four main categories (themes) of the learning strategies in order to relate them to the concepts in constructivism and metacognition. I developed subcategories for these main categories during the coding process by considering what each main category involves. The main categories and subcategories that emerged are:

Study strategies: The student reads and scrutinizes academic material to learn and master her work. This involves processing and analyzing information in groups or individually. The student uses study aids, is focused and avoids distracters, and aims at identifying critical information. Hence under this main category, the subcategories are: information processing, study aids, concentration and selecting main ideas. These are issues in both constructivism and metacognition for active learners.

Help seeking strategies: The student seeks and identifies alternate and support sources of information. This is done by using peers and other individuals, available literature, and media. Thus the subcategories are use of peers and knowledgeable others, textbooks and

media. This is social learning in constructivism and metacognition for effective use of available support material.

Time management strategies: This refers to the students' ability to maximize available time for learning and having learning goals. This is emphasized in metacognition.

Self-testing strategies: This implies being reflective of ones' learning process. The learner could use textbook study aids and personally created testing activities in reviewing one's achievements. Self evaluation is emphasized in metacognition.

3.5 Data analysis

Though the study employed a mixed method design, the main approach was qualitative. Creswell (2003) contend that data collection and analysis must be a simultaneous process in a qualitative research. Cohen et al. (2007) claim that qualitative data analysis entails classifying things or events which characterize them. They go on to say that qualitative researchers seek to identify and describe patterns and themes from the perspective of the participants, then attempt to understand and explain these patterns and themes. However, numerical data from quantitative approach were also obtained.

Having transcribed the semi-structured interview responses, I carefully read and reread through all the transcriptions and the participants' responses from the LASQ. These processes made me get familiar with participants' responses so as to obtain and understand key issues which would fit into common categories or themes. The categories or topical issues in this case were the various goals of the learning strategies which were initially adapted from the LASSI. I then developed subcategories by regrouping some of

the LASSI categories. Having read through the responses, I had to find the common and best descriptive wording of the participants' responses. These were sorted out and placed into the subcategories of the learning strategies; see Table 1 in section 4.1.0.

I analyzed the LASQ data by simply determining the frequency of a particular learning strategy by reading through all responses from the participants. Percentages were calculated and tables created. For example in the analysis of the study strategies I regarded studying as a process during which a student reads and discusses academic material to understand and master the concepts during her learning process. She must be able to select and process information to identify main ideas to enhance comprehension. This process also involves using study aids and concentration on one's work. Information processing, study aids, concentration and selecting main ideas were thus merged as subcategories. Having familiarized myself with participants' responses from the LASQ and the interview guide, I was able to code and place their activities in relevant subcategories.

3.6.0 Research sample and sampling procedures

3.6.1 Participating schools

The research targeted form four students in biology, learning in rural and urban District Day secondary schools (DDSS) in the Northern Education Division (NED). The aim was to explore the learning strategies that form 4 students use to learn biology. It was assumed that being in form 4 students have had a long experience in biology learning, therefore, they are capable of describing what they do in order to learn biology.

Secondary school education in Malawi has five categories of government (public) secondary schools. These are National boarding secondary schools (NBSS), District boarding secondary schools (DBSS), District Day secondary schools (DDSS), approved Community Day secondary schools (CDSS), and Non- Approved Community Day secondary schools (NACDSS).

Officially, the best of the primary school leavers are selected to the NBSS. The next category of the candidates are selected to the DBSS. The DDSS accommodate the third category of the candidates while the CDSS and the NACDSS take up the forth and fifth category of the primary school leavers. Some of the DDSS, and all the CDSS and the NACDSS were just converted from what used to be known as Distance Education Centres (DEC). The students commute to and from school on daily basis.

Most of the DDSS are newly constructed schools under a World Bank Project to increase students' access to secondary education. Students are selected from primary schools

within a five-kilometer radius. These schools are well furnished in terms of teaching/learning materials. The NED has six DDSS: Maghemo (Karonga urban), Mlare (Karonga rural), Bolero (Rumphi rural), Katoto and Luwina (Mzuzu city) and Mzenga (Nkhata Bay rural). However, Mlare and Bolero were recently upgraded in terms of infrastructure hence elevated from their former existence as DEC's.

Since there are four education districts (ED) that have DDSS in the north, a convenience sampling procedure was adopted so that all these districts could be represented in this study. A convenience sample is an individual or group of individuals who are available for study (Fraenkel et al., 2000). These sample schools were convenient to me the researcher for their availability and accessibility. Thus to ensure that each ED was represented, therefore, Maghemo and Luwina (as urban schools) and Bolero and Mzenga (as rural schools) were selected.

I was interested in the DDSS because the students spend their learning days between their respective schools and homes on a daily basis. I wanted to explore their learning strategies both at school and home. For instance, in a study done by Akinoglu et al. (2006) some of his participants reported that they used their elder siblings to learn material or do homework at home. However, McKeachie (1988) suggests that most learners rarely get special or extra advice and help on how they should go about with their academic work at home. These issues need to be investigated further.

I was also interested in determining the learning strategies used by students in rural and urban DDSS. Rural and urban students operate and exist in different environments. For example their cultural and social experiences may not be the same. The study went further to compare learning strategies between male and female students. Since these learners operate from their homes to school, traditionally and in most cases boys and girls are treated differently within the families.

3.6.2 Participant learners

For Maghemo and Luwinga 40 students from each school participated and were all sampled purposively. Learners who were rated as the top 10 boys and top 10 girls in biology were purposively selected. The bottom 10 boys and bottom 10 girls in biology were also included in the study. Students' rating was based on the subject teacher's classroom assessment from their termly tests. For Bolero and Mzenga I picked 20 students from each school because of their low enrolment. Boys were purposively picked according to performance rate. However, all girls in both schools participated in the study because each school had less than 10 girls in the class. The study intended to compare learning strategies between the low and high achievers in addition to earlier stated variables. However, the learning strategies according to achievement were not analyzed because the data became bulky and unmanageable within the given time.

The data presented in this paper were collected from a total of 120 participants of which 65 (54%) were boys and 55 (46%) were girls in form 4 of the research schools. These participants were aged between 16 and 22 with an average age of 18 years for the boys

while the girls were aged between 16 and 20 with an average of 17 years. Of the 120 students 80 (67%) were from urban schools while 40 (33%) were from rural schools.

I spent a day in each school while collecting the data. The sampled students were gathered either in a classroom or a laboratory where the purpose of the study was explained to them. The participants asked some questions and got clarifications their concerns. The LASQ was then distributed to them and read with them the instructions on the questionnaire. Explanations for each item were done. The issues of consent were emphasized, and that they had the right to complete the LASQ or not. No student withdrew from the exercise. After completion of the LASQ I then randomly requested for biology notebooks from a quarter of the participants to examine them. Finally, four participants from each school were separately interviewed and tape- recorded making a total of 16 interviews.

The practical and ethical considerations in the LASQ design included the purpose of the study, and clarity of items. Attempts were also made arouse students' interest and avoid offending them. Questions were arranged in a logical order and leading questions were avoided (Cohen et al., 2007).I personally administered the questionnaire to ensure that the LASQ was also personally and individually completed by the respondents without consultations with others.

3.7.0 Background of research schools

As earlier stated in this chapter, the four research schools are the third category of the secondary school types in Malawi. The learners commute between home and school on a daily basis. Students to these schools are supposed to be selected from the surrounding primary schools within a five-kilometer radius. The boy – girl ratio of 1 : 1 is aimed at during selection to ensure education equity (Malawi Government, 2001). However, there are cases where some students come from primary schools beyond the specified 5-kilometre radius especially in the rural schools. This is because the primary schools are widely spaced and enrolments are low compared to the capacity of the secondary school they feed.

The majority of the students walk to school but few students use bicycles. A small number of the students in the urban schools do use minibuses once in a while. There are some cases, in the rural schools, where students cannot commute from their homes on daily basis because the distances between home and school are much longer. These students find accommodation by renting in the trading centers or villages near to the school. This shows significant variations of students' life experiences in their school days. Three of the four schools were built with funding from the World Bank Project on Education while one was only upgraded from its original status of a Distance Education Centre (DEC).

3.7.1 Maghemo secondary school

This is a modern and well-built urban secondary school. The school is about 6 years old. It is right within Karonga township. Small scale businesses and shops thrive outside the school fence. The school has a brick fence and all structures are in good condition. Students and visitors use the main gate to enter and leave the school campus.

The school has adequate teaching and learning resources including a library and classrooms. Some students were reading in the spacious reading area and I noted that the bookshelves were fully stacked with different kinds of textbooks and reference books for all the subjects. All the books looked relatively new. The books were supplied by the World Bank Project. The laboratories too had all the required equipment and consumables necessary for the teaching and learning of secondary school science.

The official capacity of the school is 400 students (200 boys & 200 girls) and each form is supposed to accommodate 100 students. It is a single shift but double stream school. Students are selected for form 1 from the primary schools around the township. Being at the center of the town it seems most of the students stay within the five kilometer radius. When you visit the school you would be surprised to see a stack of bicycles packed within the school premises. They are for students, however, a few students hire other bicycle owners (locally known as ‘cargo’) as means of transport to/from school. The rest of them walk.

My research class (form 4) had 98 students (65 boys & 33 girls) at a time I conducted this project. Most girls had dropped out of school for various reasons and boys took up their places. Normally vacant places in secondary schools are filled up through student transfers or by admission upon submission of an application for a place by a student to the EDM or the MoEST. My research sample for this school had 40 purposively selected students (20 boys and 20 girls) as described in the section on students' sampling.

3.7.2 Luwinda secondary school.

Luwinda was established five years ago within the city of Mzuzu. It is just behind the campus of Mzuzu University off the M1 (Mzuzu-Karonga) road, about 4 kilometres from the city center. Like Maghembo, the structures are new and surrounded by a brick fence with electric wires to reinforce security.

The school has properly retained its teaching and learning materials and infrastructure as supplied by the World Bank Project. The biology teacher informed me that the availability of a well stocked library and adequately furnished science laboratories make the teaching activity quite easy and enjoyable.

The school was built to have an official capacity of 960 students (480 boys & 480 girls) with 240 students in each form. It is a double shift and triple stream school. The surrounding primary schools within the city form the catchment area for this secondary school. The majority of the students walk to the school passing through the Mzuzu University campus, others catch minibuses from their locations or city center to Mzuzu

University and then walk. Some students ride bicycles to the school. Very few students are sometimes driven to the school by their parents/guardians.

The headmistress informed me that the students' enrolment return for the period I was collecting data for this project showed that the form 4 class had 214 students (126 boys & 88 girls). Again the girls' enrolment had dropped from the official capacity. My research sample had 40 purposively identified students (20 boys & 20 girls) as described in the section on students' sampling procedure.

3.7.3 Mzenga secondary school

Mzenga is in the rural area of Nkhata Bay West. It is about 4 years in operation. One has to branch off from midway on the Nkhata Bay-Mzuzu road through the Kawalazi Tea Estate to access the school which is about 35 kilometres away from this turn-off.

The school stands out isolated and uniquely beautiful in its brick fence wall whose security is also reinforced by the electric wire in this remote area of the district. There is a small trading center about 1^{1/2} kilometres and a primary school is about 500 metres away from the secondary school. The surrounding is woodland with small villages at distant places.

This community is also a beneficiary of the World Bank Project. I was so impressed to see how rich the school was in terms of the teaching & learning materials in the library

and the two science laboratories. Most of the resources appeared to me unused and untouched as some were still in the cartons.

The official capacity of this school is 400 students (200 boys & 200 girls) with 100 students in each form. It is a single shift but double stream school. The headmaster told me that there are only two feeder primary schools within the 5km radius. The third one is slightly outside 5km. These primary schools fail to feed Mzenga secondary school to its capacity hence some students are selected from other schools much further away. He lamented that at the time of my visit the whole school had only 275 students with high absenteeism. The dropout rate for both sexes is extremely high but worse for the girls. Among the many facilities that are not being used because of low enrolment are two beautiful, new classrooms, a stack of desks and chairs, and lots of textbooks in the library storeroom. It seemed to me that almost all students walk to school. I did not see any student using a bicycle; probably because the terrain is not suitable for cycling, it is hilly.

At the period of my visit the form 4 class had 43 students (36 boys & 7 girls) instead of 100 students. Both purposive and convenience sampling were employed to select the 20 students for my research sample. 13 boys were purposively identified and the 7 girls were conveniently picked to participate.

3.7.4 Bolero secondary school

When the MoEST was upgrading some of the DECs to Community Day Secondary Schools (CDSS) in 1999, Bolero DEC was raised to the status of a DDSS. The school is about 20km away from Rumphu Boma along the Rumphu-Nyika road. Bolero has thrived as an active trading center since its establishment as a Rural Growth Centre (RGC) in the early 1980s. The school is in an open area right within the RGC premises and it faces a Community Hall which is about 100metres away. About 250 metres away from the classroom blocks there is a busy market that faces the school. A lot of people gather daily to sell and buy/drink locally brewed beer. A neighbouring primary school is on the other side of the secondary school. A number of tobacco estates are available within the catchment area of the school.

The school has a laboratory and library room but these are not patronized because of lack of the teaching and learning resources. The headmaster and biology teacher both commented that the school is deficient in all resources, but also poorly positioned. It is too close to a busy market and sometimes drunkards make too much noise as they passby.

Bolero has an official capacity of 400 students (200 boys & 200 girls) to enroll 100 students in each form. It is supposed to operate with a single shift but double stream. Some students are selected from primary schools outside the official radius. I also got the impression that while most students walk to school, some use their bicycles, as there were a number of them packed within the schoolyard.

At the time of my visit to this school, the enrolment in form 4 was 48 students (40 boys & 8 girls) as opposed to the official enrolment of 100 students. This indicates a very high dropout rate for both sexes but worse for the girls. The headmaster stated that this is a usual trend. This being the case, my research sample comprised of 20 students (12 purposively selected boys & 8 conveniently picked girls).

3.8 Chapter summary

In this chapter, I stated the use of a mixed methods approach. The aim was to generate rich and generalizable data in order to understand the research problem in full. The study was done in selected rural and urban DDSS in the NED. The data were collected from four biology learners through the LASQ and interviews. Interviews were tape recorded, transcribed, read and reread then analyzed. Constructivism, metacognition and the LASSI all come from cognitive psychology with emphasis on the learner being responsible for her own learning.

Chapter 4: Findings and discussion.

4.0 Chapter overview.

This chapter presents findings of the study in various tables and verbatim. The three research questions are answered and the findings and discussion for each question are presented. The study set out to explore answers to the following questions:

1. What learning strategies do students use in learning biology at MSCE level?
2. Are there differences in the strategies between boys and girls?
3. What differences are there in the learning strategies between the rural and urban secondary school students?

In the rest of the chapter, the data, the analysis and discussions for each research question are presented. The chapter ends with a brief chapter summary.

4.1.0 Research question 1: What learning strategies do students use in learning biology at MSCE level?

Under this question I set out to explore learning strategies for different categories/themes, which are study, help-seeking, self-evaluation and time management strategies that students employ when they study as they learn. These themes are in the LASQ and the interview guide which I developed by incorporating ideas from the theoretical and conceptual frameworks which I have used in this study.

Table 1 is an example of how interview responses from students were coded and analyzed. You may also refer to section 3.5 on data analysis. Common issues in students' responses were identified and placed in appropriate categories and subcategories. For example responses like:

- (a). "I try to join in group work." (b). "We work as a team in our group discussions."
 (c). "We help each other when we meet in our groups." Such types of responses were coded as discussing in groups as a (i) study strategy with the subcategories of information processing, selecting main ideas, for concentration. (ii) help-seeking strategy with the subcategory of study aids.

Table 1 an example of the coding and qualitative analysis.

Activity mentioned	Main categories	Subcategories
1. Discuss in groups.	Study strategy	Information processing Select main ideas Concentration
	Help-seeking	Study aids
2. Answer questions.	Study strategy	Concentration
	Self-testing	Self-evaluation
3. Consult the teacher or peers.	Study strategy	Information processing Concentration
	Help-seeking	Study aids
4. Make own notes.	Study strategy	Select main ideas
5. Develop and use study timetable.	Time management	Time management

4.1.1 Strategies for studying

Table 2 below shows that the most used study strategy is discussing with peers. Next is reading teacher's notes and textbooks, and then reciting and memorizing main ideas. Although 93% of the students say they spend time reading textbooks, only 39% refer to diagrams, tables or charts, 36% answer end of chapter questions and 2% ever used

chapter objectives in their textbooks. Textbooks are the most important and valuable teaching and learning resources which must be fully utilized by capitalizing on all the study aids and illustrations. It is surprising, therefore, to note that the majority of the students do not refer to these illustrations in the chapter they study. A good textbook in science has these features for the benefit of the learner to facilitate learning. It is the main teaching and learning aid. It is expected that the learner must use it wholly and effectively. By not making use of the relevant features in textbooks, it implies that the students are not focussed in their studies hence their failure to specify what to achieve at the end of their learning or study periods. It could also imply that teachers do not make available the teaching syllabus to students to enable them identify the learning objectives for the topics under study. Furthermore students did not show a proper plan in reading textbooks by not highlighting ideas captured in the SQW3R technique to enhance comprehension of content they read/study. However, a strategy can only be selected and effectively used if the learner is able to identify a purpose to accomplish. Nisbet et al. (1986) emphasizes that learning strategies are flexible procedures adapted to meet a specific learning need. These deficiencies signify that students are not reflecting on the success and failure of strategies they are using. The deficiencies are sign of non-metacognitive learning strategies used by the majority of the learners.

Table 2: Strategies for studying to master concepts.

Strategy	N = 120	% of learners
Information processing strategies		
Discuss with peer(s)	120	100
Read teacher's notes & textbooks	112	93
Read teacher's notes only	8	6
Study aids strategies		
(a) <i>use of textbooks</i>		
Answer past paper questions	83	69
Answer end of topic questions	44	36
Refer to diagrams/tables/charts	48	39
Refer to topic objectives	3	2
(b) <i>personal</i>		
Ask & answer own questions	97	81
Concentration strategies:		
Pause/recite & memorize main ideas	100	83
studying in quiet environment	87	72
Selecting main ideas:		
Make own notes to summarize chapter	86	71

Findings from the LASQ were complemented by responses from the interview. Participants emphasized on the importance of group discussions. To the question “what do you do when you discover that you do not understand much of what you are studying?”

The following are some of the responses (the names are not real):

Jean: “I try to join in group work where we teach each other, discuss the things we did not understand.”

Richard: “I usually check with my friends on what I do not understand myself so that they can help me.”

Mercy: “we have colleagues who are somehow experts in biology so they teach us when we discuss.”

Mary: “we work as a team in our group discussions. I can explain a topic to them then another will also explain how he understood it, we discuss and solve the problems together.”

Statements like these were common. Though stated slightly different, the meaning is that students engage themselves in group discussions to help each other and learn. Though peer discussions are not meant to be done only when learners have problems, all students (100%) reported that a common activity they get involved in as they study is discussing in groups. Group discussions are sessions when students get into groups or pairs to solve problems together, share information or help one another in clarifying concepts they find difficult. In group discussions learners are supposed to capitalize on each others strengths and weaknesses. Learning indeed involves discussing and sharing knowledge and experiences among peers and individuals as emphasized in social constructivism.

From the interview responses captured above, it appears they have no proper rules and guidelines to maximize on group work. However, some students said their groups are permanent. Such groups are at times used during class time for class work as well as during home studies. One of the factors in forming such groups was mere convenience in enabling the members to meet when need arises. Participants said that if they came from the same area group members were able to meet easily and discuss problems within their home area.

Working in groups could be more beneficial if students realised that they were linked and if they believed that they could not individually succeed unless they all did it together to show interdependence, rather than dependence or independence. Such a way of learning could enhance interpersonal and social skills. This is one of the themes in social constructivism to enhance learning.

Table 2 also shows that 81% of the students said they create their own questions from the material they have read and answer them.

Students were asked to state all the other activities that they do as they read and study to learn. Common responses were:

- When I read from a book I write my own summary and answer questions in the chapter.
- I formulate questions from the topic I was reading and answer them.
- I memorize main ideas.
- I revise past paper questions.
- I try my best to ask my friend to help me and we discuss together.
- I try to discuss with my classmates or I ask my teacher.
- I ask my friend to help me and we can solve the problem together.

From such responses I concluded that as students read and study to learn the relevant concepts, they also summarize the topics, they ask & answer their own questions and answer questions from past papers.

Interview responses showed a similar trend, for example:

- Maggie: “after reading I ask myself questions to see if I can remember what I have study.”
- James: “I may ask myself some questions and answer them, or I may call a friend to ask me some questions from about a topic and then may try to answer them.”
- Jimmy: “I ask myself what I have read, where I have not understood then I go back to check and find out more on it. For example I ask myself the meaning of something like chromosome.”

The above responses reveal that besides reviewing their class notes and reading texts some students worked on different types of questions for instance past examination and textbook questions as they studied or individually formulated questions as highlighted above. The thinking is that by practicing on such questions, students are able to solve questions of different cognitive levels. By doing so, they are better able to tackle a range of questions during tests. These questions serve as study aids to enhance learning by

exposing students' weaknesses so that they can take up appropriate action. Knutton (1994) asserts that final examination papers constitute major tools of assessment which should ideally give feedback into the teaching and learning processes. They should therefore be regarded as a means for looking back, looking forward and guiding the course of action to be taken.

On the other hand, questions created by students themselves would be at the lower level of the Blooms taxonomy. An example of a question captured by Jimmy in the above quotation does not lead the learner in mastering their academic work. It is just a recall and of the lower level.

It is encouraging to note that the majority of the learners, 71%, said that they summarise and paraphrase their reading texts and take down short notes as their teacher teaches. However, when I examined their notebooks I could not see traces of self formulated notes. When I followed up with some of them to show me such notes, they claimed to have left some of their notebooks at home. Though it was difficult to verify this strategy like all the other strategies, this is one of the metacognitive strategy which one would use in selecting main ideas to grasp in the learning process and could lead to meaningful learning.

4.1.2 Strategies for help-seeking

Table 3 below is a summary of help-seeking strategies as captured from the LASQ. Help seeking is the ability of the learners to identify and find alternate sources of information when encountered with a problem. This is another metacognitive strategy where the learner identifies a problem and its source, pauses and seeks a solution to deal with the problem (Halter, 1996). Table 3 shows that some of the learners are able to acknowledge the availability of other facilities within their schools for obtaining additional information to enrich themselves. The common practice seen in table 3 is that all learners (100%) seek for extra assistance from their teachers and fellow students. In some cases (only 37%) students get some assistance from family members. Most of them reported that they got some assistance from their brothers or sisters who have also been to school. In rare cases, however, parents and guardians were mentioned to offer some assistance.

When reading textbooks, very few learners mentioned making use of certain features available in textbooks to simplify their work. For instance, only 37% referred to diagrams/tables, 11% and 10% referred to subheadings and topic objectives respectively. When asked to list down the features which they find helpful in biology textbooks and use them to simplify the material they read, students' responses included: use of diagrams and chapter summaries, drawings of body systems, reading objectives and introductions, and use of tables, graphs and charts. From responses like these, I deduced that some students realize the importance of diagrams, tables, graphs, chapter objectives, introductions, summaries and other features, although only few students mentioned them as can be seen from Table 3.

It can be seen from the Table 3 that some learners said that they use study aids like subheadings, chapter introduction & summaries, book indices and glossaries, diagrams, graphs & tables, italicized and bold written words as well as the list of objectives that is given in some books. These, they said, act like guidelines to help them find main ideas as they study.

The mass media were also identified as another source of information by very few learners, which perhaps could have depended on their availability. 24% of students specifically talked about using radios, 8% mentioned the television, and 10% mentioned using some newspapers/magazines to obtain further information for their academic work. Some students referred to columns about the environment and general science issues which appeared in newspapers. Thus, very few learners mentioned the use of media as an alternative resource in their studies. This observation implies that the use of a particular strategy or resource depends on the learning culture and resource availability.

Table 3: strategies for seeking help

Strategy	N = 120	% of learners
Consulting peers/individuals		
Consult teacher	120	100
Consult peers	120	100
Consult family members	45	37
Study aids strategies (textbooks)		
Use different textbooks	55	45
Refer to diagrams/tables in books	45	37
Refer to book summaries & introductions	28	23
Refer to subheadings	14	11
Refer to topic objectives	13	10
Refer to book indices & glossaries	11	9
Use italicized/bold lettered words	3	2
Media strategies		
Listen to academic radio programmes	29	24
Read academic newspaper articles	12	10
Watch/listen to academic TV prog.	10	8
Browse internet	1	1
Use computer documents	1	1

Learners are capable of undertaking certain tasks individually but they also need external guidance from other people for more demanding tasks. This is one of the concepts of social constructivism where learners are assisted through the Zone of Proximal Development (ZPD). Social learning through mediation is an important and normal way of mastering concepts. It is encouraged in constructivism.

While all learners said they make consultations among themselves and with their teachers, the majority of them do not seem to make use of other resources effectively. Strategic learners are able to use a variety of resources for additional information. For biology, this could also include the living environment around them. Unfortunately, many students seem to have little knowledge of how best to use textbooks and the media. From

the researcher's personal experience and observation, most of the learners, it appears they think the only learning resource is the textbook though also used ineffectively by many. Generally the scenario shows that many learners do not make use of or maximise all the available resources in their learning environment.

4.1.3 Strategies for time management

In this section I wanted to find out how well students set aside time for their academic activities to avoid procrastination and cramming for examinations. I also wanted to determine problems that they face in keeping up with time. Table 4 shows that all respondents (100% of the learners) had a study timetable. However, there were many factors especially at home that prevented them from maximizing their study time. Only 54% of the participants stated that they were able to study following their scheduled study timetable. This group said they had adequate time to study even at home. From the interview responses, those who had inadequate study time provided the following reasons:

- Lucy: "Sometimes there are many children and can make noise at home but I come study at school during weekend during the day."
- Mercy: "There is much work at home like cooking, there is many works. But I can only study well at night and in the morning but there is much work."
- Jane: "At home there is many things, many jobs like cooking, going to maize mill, drawing water, going to the farm. ... then they (parents) say if you want to read now without working then do not live in my house, don't stay here. So it is very difficult for you to refuse."

This is an indication that many learners experience a lot of challenges to keep up with their academic work. They have very limited study time especially at home despite the fact that they try to formulate a study timetable. Therefore they do not follow their study

schedules. This problem is common; and, learners know their situation. There could not, however, say whether or not they replan their studies by going to school to study. Many do not do it because they are given some house work by their parents and guardians as seen from responses above. Only one girl said sometimes she goes to school to study, especially during weekends, when she sees that she cannot read at home, re-planning is indeed a metacognitive strategy in trying to catch up with extra work.

Table 4 also reveals that the majority of the learners do not necessarily plan specific areas to concentrate on in a particular study session. Their study is just too general and broad minded. Only 12% said they plan to understand specific concepts in a particular chapter as they begin to read that topic. One boy from an interview simply said:

“that’s difficult. I do not really set any goals in particular, but I just go straight into the reading to revise or generally read and finish that section or the pages until I am tired, no specific areas.”

Table 4: strategies for time management (self-organization)

Strategy	N = 120	% of learners
Time management strategies		
Have study timetable	120	100
Have adequate study time	66	54
Set up study goals for study period	15	12

Self organization and reflection is one of the key components of effective learning because it involves planning and then measuring how successful the activity is done. Order and organization are motivating factors for any success and this too is metacognitive learning. No activity can properly be done by chance, without planning. In this case the learner needs to identify specific tasks to achieve and allocate time

accordingly. Time management is seen to be a big challenge for most of the learners since they are required to do a lot more household chores at home. The results show that many learners fail to stick to their planned study schedules because some parents and guardians do not seem supportive in encouraging their children to use all the available time for studies. Some parents do not create study time for their children deliberately. This was noted when one girl said that sometimes her guardians tell her that she may not stay in their house if she continues studying and reschedules the assigned work for a later time. The results of Jorgensen (1998) and Hallem (2000) cited in Nielsen (2004) also indicated that while learners used a wide range of strategies, they employed the planning and environment management strategies to a lesser extent. This implies that there is a general problem among learners in planning and controlling time for their academic activities. Dzama (2006) found that the lack of self-control and management of study time and environment also contributes to poor performance.

4.1.4 Strategies for self evaluation

Learners were requested to state all the things they do to check themselves if they have understood what they were studying. The common strategy as can be seen from Table 5 is asking and answering students' own formulated questions. This was reported by 83% of the participants. This is followed by answering textbook questions, reported by 58% of the participants and answering past paper questions by 50% of the participants. It appears many learners shun answering revision questions that are found in the textbooks and yet these questions could be very effective in revealing their topic comprehension since they are usually of different cognitive level.

Table 5: Strategies for self-testing (self-evaluation)

Strategy	Total learners	% of learners
Self-evaluation strategies		
(a) <i>use of textbooks</i>		
Answer end of topic questions	70	58
Answer past exam questions	60	50
(b) <i>personal</i>		
Ask & answer own questions	100	83
Redraw diagrams	57	47

Responses from the LASQ as recorded in Table 5 were supported by interviews responses which included:

- to check my understanding I ask myself questions then answer them.
- I may try to draw the diagrams and label it without seeing in the book.
- to check if I have understood I write questions then answer them later.
- I find questions from what I am reading from the past paper and try to answer them.
- to my side I read in the book and answer those questions in the chapter.
- after studying then I try to answer some of the questions in the topic to see if I can get them correct if I have understood the topic. Even to answer questions from the past papers tell me that I know what I have studied is understood well.”

These responses gave me the impression that some students check their level of comprehension by asking and answering their own questions, answer questions from past papers as well as from textbooks.

Self-evaluation or evaluation in general, is an important element in any activity if meaningful progress is to be achieved. Learners therefore need to have strategies that they can apply to determine level of comprehension of the material they are studying. It is an effective way of monitoring one’s strengths and weaknesses to determine progress.

Metacognition emphasizes on monitoring ones weaknesses and strengths with the aim of making progress. One has to determine the effectiveness of the strategy used then make the necessary changes when it is deemed fit to do so. There is a need that students should look back at their set learning goal then determine the extent at which that goal is achieved in-order to replan and make progress.

In concluding research question 1, the study has found that learners employ a number of learning strategies as they study to learn. They are those strategies that are classified as rehearsal by Weinstein et al. These strategies reinforce simple memory rather than critical thinking or mastery of concepts. This could mean that students would want to learn something, pass an examination and the knowledge ends there. This is evident that the learning strategies are geared towards passing final examinations because many learners employ evaluation strategies that are meant to gaining experience in answering questions. In seeking help all learners go to their teachers or peers for assistance to obtain solutions of the challenges they experience. This implies that the majority of these learners tend to believe that they are not quite capable on their own but that someone must always be around to provide solutions. The study has revealed that the reading effort to search for solutions from different textbooks is very low in most learners. Even for those who read textbooks, the use of book illustrations for clarity of texts is poor. There is great need to sensitize learners on how rich and useful textbooks would be if all features and illustrations were fully utilized.

4.2.0 Research question 2: Are there differences in the learning strategies between boys and girls?

4.2.1 Study strategies by gender

Table 6 shows that boys and girls mentioned the same study strategies for their learning process. The difference and general trend depicted in this table, however, is that for most of the strategies mentioned, the percentage of girls is lower than that for boys except for memorizing ideas, asking and answering own formulated questions and the type of the reading environment. All learners (100%), however, highlighted group discussion. This has been true in all the other sections concerning group work.

When participants were asked if they use any techniques in memorizing what they study, very few of them (8% boys and 2% girls) said they had. This was supported with interview responses as follows:

- Yohane: “ya, I have, what I do is may be I read the same topic concerning proteins, all I do is I take the first letters eg fats, I take FA, carbohydrates I take CA, proteins I take PRO, make something like FAPROCA. When am mixing words I know what am writing and I will remember this easily.”
- Maria: “I join words together to make one letter like ROYGIBV to remember the rainbow”.

From responses like these, I deduced that some students create and use mneumonics and acronyms but the majority does not. It is therefore, interesting to note from Table 6 that few boys and girls mentioned making use of mneumonics and acronyms. In order to enhance and facilitate memory of the concepts under study, the learner must be able to apply a wide variety of memory strategies. This includes the ability to create and use mneumonics. Mneumonics are mental devices which are used to enhance memory and

recall the stored information. The use and application of this strategy was noted to be very uncommon among the participants despite the fact that students have used the various forms of mnemonics like acronyms & acrostics, songs and rhymes in the primary school classes to facilitate memory and enhance understanding. Many of the secondary school learners do not seem to regard mnemonics as important any longer. Some of the students wrongly said that memory is not relevant in learning, particularly the learning of science subjects. This shows students' misconceptions and failure to distinguish between rote memory and meaningful memory which lead to rote learning and meaningful learning respectively. Learning involves remembering: putting knowledge in the memory and retrieve it when needed.

As it is noted from Table 6, the percentages of girls mentioning complex activities which seem to demand more time were lower than the percentages of boys. For example, only 16% of the girls responded that they answered end of chapter questions when studying while 44% of the boys responded that they attempted such questions. 81% boys and 40% girls also reported their effort to answer past examination questions. This is probably because more girls than boys said they had very little time at home for study. Girls are involved in more household chores than boys at home thus they have very limited study time to accommodate time demanding tasks. This is contrary to what Nielsen (2004) in Norway found that gender differences did not affect use of learning strategies. I believe this is due to cultural differences and expectations between Malawi and Norway. In Malawian context as has been noted, most of the household chores and upkeep are left to

females than males though there is some paradigm shift with sensitization on gender balance and equity.

Since girls have limited time to do complex activities, some of them seem to resort to be doing simple activities like asking & answering their own questions. Usually these would be simple recall type of questions. They also end up using simple memory strategies of recalling what they read. Thus 89% of the girls created and answered their own questions and 73% boys did the same. Goetz (1988) emphasized that there are a number of factors that operate to influence the learner to use a strategy or not. These included the amount of effort the learner has to put in, the competence of the learner and the subject matter being studied. In some cases Malawian girls underestimate their competences hence do not attempt tough activities. There is a need to create deliberate activities and strategies that should encourage and empower girls for more involvement in such situations so that they can compete successfully with the boys.

Table 6: Strategies for studying by gender

Strategy	% of learners mentioning strategy	
	Boys (N = 65)	Girls (N = 55)
Information processing strategies		
Discuss in groups	100	100
Read teacher's notes & textbooks	88	86
Read teacher's notes only	2	3
Study aids strategies		
<i>(a) use of textbooks & other question sources</i>		
Answer past paper questions	81	40
Answer end of topic questions	44	16
Refer to diagrams/tables/charts	36	32
<i>(b) personal</i>		
Ask & answer own questions	73	89
Selecting main ideas strategies		
Make own notes to summarize topics	77	53
Concentration strategies		
Memorize main ideas	76	84
Use quiet reading environment	64	78
Creating & using mneumonics & acronyms	8	2

4.2.2 Help-seeking strategies by gender

Help seeking strategies are an important way of learning because the learners usually meet challenges as they get involved in complex academic material. In such cases they must be able to reach out to other people for help or identify supplementary materials and other alternative sources of information within their learning environment. The learner must also be able to make use of all the available features in textbooks that simplify the reading content and enrich the text.

Table 7 shows that all boys and girls (100% of the participants) rely on their teachers and peers for extra help when they encounter problems in their studies. While social constructivism encourages peer learning where every learner should be actively engaged.

The teacher is expected to offer hints and guidelines to promote discovery learning. However, it appears that most of the participants were on the receiving end than contributing to knowledge construction. Most learners expected knowledge must be flowing from their teacher or their more knowledgeable peers to them. This was evident to me when one girl remarked as follows from an interview session:

- “Many times I ask my friend to teach me because he is very intelligent. He knows many things in biology he is very good to answer many questions. He explain what we do not understand many of us.”

What is also clear from Table 7 is that the use of textbooks for both, boys and girls, is poor and novice. The table shows that 60% of the boys and only 17% of the girls mentioned that they read different types of textbooks to get the information they need for better understanding of difficult tasks. Despite the fact that three of these schools have an adequate supply of textbooks, the patronage of books is still low. Probably this is why they depend on other people even for issues they would find solutions for by reading different textbooks. This is a dependence syndrome as students do not exert more effort on studies by reading widely. Furthermore, even for those who claimed to use different textbooks, few used the books effectively. For instance, only 14% of the boys and 2% of the girls said they refer to book indices and glossaries. Besides the many study aids in textbooks, glossaries define and explain many concepts to the learners so that they can discover and understand concepts on their own rather than asking other people.

Table 7: Help-seeking strategies by gender

Strategy	% of learners mentioning strategy	
	Boys (N = 65)	Girls (N = 55)
Help-seeking strategies		
Consult teacher	100	100
Consult peers	100	100
Consult family members	41	31
Study aids		
<i>(a)use of textbooks</i>		
Use different textbooks	60	17
Refer to diagrams/tables in books	49	19
Refer to book summaries & introductions	26	16
Refer to subheadings	16	2
Refer to book indices & glossaries	14	2
Refer to topic objectives	13	5
Refer to italicized/bold lettered words	4	0
Use of media strategies		
Read academic newspaper articles	13	6
Listen to academic radio programmes	13	34
Watch/listen to academic TV prog.	4	13
Use computer documents	0	3
Browse internet	1	0

On the use of media as study aids, the figures are low for both sexes. For example, 13% of the girls and 4% of the boys said they watch and listen to academic television programmes. The low figures could be because not all households have TV sets. This could be compared to the figures on radio programmes which are higher with 34% for girls and 13% for boys. Radios are more common in households than TV sets. The figures are higher for girls probably because girls are at home for most of the times than boys who usually do not spend much of their leisure time at home. Usually girls also like watching and listening while boys like doing things. Similarly, when it comes to reading newspapers, Table 7 6% of the girls and 13% of the boys mentioned it. However, this does not suggest that gender plays a role in determining use of a strategy as was concluded by Hallem (2000) and Jorgensen (1998) cited in Nielsen (2004). An expert and

metacognitive learner does not restrict herself to limited sources of information. Failure to use alternative sources of information like the available media is a big hindrance to successful learning.

4.2.3 Strategies for time management by gender

The accomplishment of any activity, among other factors, depends on how well one maximizes the time set aside for that activity. Table 8 shows that all students (100% boys and girls) reported that they schedule their study time by creating study timetables. However, results in Table 8 reveal that not all students are able to fully follow their set study timetables. It is even worse for the girls only 29% while 71% of the boys reported of being able to utilize their time by following their schedules. Most of the girls complained that they are involved in a lot more activities at home like cooking, milling and general welfare of the home. It is not surprising therefore that most girls do not maximize their study times.

Table 8: Time management strategies by gender.

Strategy	% of learners mentioning strategy	
	Boys (N = 65)	Girls (N = 55)
Time management strategies		
Own a study timetable	100	100
Have adequate study time at home	71	29
Set up study goals for study period	16	4

It is again evident from Table 8 that a large majority of our learners do not specify or identify what to concentrate on and achieve at the end of their study period. They do not

highlight the areas of attention so that they can, at the end of their study, determine whether they have achieved what they planned to do or not. Table 8 shows that only 4% of the girls and 16% of the boys set goals for their studies. One may not make much progress where she does not specify areas that she requires understand. A metacognitive learner is identified by the way she plans her work then monitors her performance. Setting goals and planning what to do and how to do are some of the concepts in metacognition. It would not be surprising that little progress is made as learners learn without planning and setting goals hence they have no standards to measure their achievements. Gender seems to play no role as noted by these findings since girls and boys are represented for each strategy though the percentages for girls are lower than for boys in many strategies.

4.2.4 Strategies for self evaluation by gender

Table 9 shows the same trend; fewer girls than boys reported the use of more demanding strategies. Only 27% of the girls and 62% of the boys evaluated themselves by attempting to answer past examinations questions which are more demanding than student formulated questions where there are more girls (97%) but fewer boys (75%). This is also confirmed by the results that 79% of the girls and 60% of the boys check their level of understanding simply by reciting to recall material they were studying. Mere reciting the content is usually associated with rote learning rather than learning with understanding.

Table 9: Self evaluation strategies by gender.

Strategy	% of learners mentioning strategy	
	Boys (N = 65)	Girls (N = 55)
Self-evaluation strategies		
(a) <i>Use of textbooks</i>		
Answer end of topic questions	67	38
Answer past exam questions	62	27
(a) <i>personal</i>		
Ask & answer own questions	75	97
Recite to recall read content	60	79
Redraw diagrams	47	30

To make any meaningful advancement, an individual must find effective ways of evaluating oneself. Students too need to be able to identify and use strategies to assess one's efficiency and effectiveness. A metacognitive learner employs mechanisms of self evaluation to determine one's strengths and weaknesses. This, in a way, determines the effectiveness of the strategy used. By so doing she would be able to reorganize her strategies so that she uses those that are effective.

To conclude on research question 2, the study has found out that there are no genders related strategies in that there is some representation of both sexes in each mentioned strategy. However, because of the cultural backgrounds, girls have a backlog of household chores which impinge negatively on their study time. As a result, most of them tend to use strategies that are less time consuming. Such being the case, more girls than boys fail to be described as metacognitive and constructivist learners.

4.3.0 Research question 3: What differences are there in the learning strategies between the rural and urban secondary school students?

4.3.1 Study strategies by school setting

Findings recorded in Tables 10 show that there are some similarities and differences in the types of learning strategies mentioned by rural and urban students. Rural students mentioned using the same strategies as those used by the students in the urban schools except for reference to topic objectives and use of mnemonics. These were not mentioned by rural students. The other major difference is the percentage of students who mentioned a particular strategy. The extent of using a strategy differed according to school setting. For instance, the use of local languages to understand some concepts was higher in rural setting (67%) than urban setting (24%). Probably this is because learners in the rural schools are more homogeneous in terms of language and culture than the learners are in urban schools. Where learners are more homogeneous and have been brought up from the same locality they, in most cases, discuss issues in their local language other than English. In such situations then they are more likely to think and do most of their learning activities in view of their local practices including language. Such a practice would not be common in the urban schools where learners are heterogeneous and probably better exposed to English language. Cubukcu (2007) and Zhu et al. (2007) observed that students' culture and background played a role in students' choice and use of certain strategies. However, the major difference between the findings of the current study and the above cited is that the current study is dealing with learners of the same nationality while the other studies compared strategies of learners of different nationalities.

Table 10: Study strategies by school setting

Strategy	Percentage of learners mentioning the strategy (%)	
	Rural setting (N =40)	Urban setting (N = 80)
Information processing strategies		
Discuss in groups	100	100
Read teacher's notes & textbooks	85	93
Read teacher's notes only	3	3
Study aids strategies		
(a) <i>use of textbooks</i>		
Answer past paper questions	65	72
Refer to diagrams/tables/charts	32	41
Answer end of topic questions	22	42
Refer to topic objectives	0	9
(a) <i>personal</i>		
Ask & answer own questions	95	70
Concentration strategies		
Memorize main ideas	90	77
Use quiet reading environment	85	63
Translate terms to local language	67	24
Create & use mneumonics & acronyms	0	8
Selecting main ideas strategies		
Make own notes to summarize topics	56	72

While students claimed that translating to local language enhances understanding, in some cases this has been noted to be the cause of problems in science. There are many terms in science that do not have the corresponding vocabulary in the local language as such misrepresentations or misunderstanding and comprehension deficiencies may arise. Kazima (2009) argued that local languages in Malawi are inadequate vehicles for conveying scientific information and concepts because science has its own highly specialised terminology. However, the practice of using local languages by some learners

shows a carry-over effect from the lower classes of primary schooling where local languages are used for instruction.

The use of mnemonics was mentioned by students from one urban school setting. One example of an acronym (ROYGBIV) for remembering the colours of the rainbow was mentioned by 8% of the participants but from the urban school. This gave me an impression that their teacher might have mentioned this to them. There was no evidence to show that the students formed their own mnemonics. This shows students' lack of creativity and personal initiative to formulate their own way of tackling issues to facilitate their learning. The students expect teacher to give them everything and they contribute nothing. Meaningful learning would involve using the teacher's examples or school knowledge as guidelines to help students formulate their own constructs and apply them to their everyday experiences as stressed in constructivism. Learners from the same school also mentioned the use of topic objectives as they study. This was 9% of the participants while no rural students mentioned this strategy. This could be an indication that some teachers guide their learners on how to study and what to use in their studies. Probably they also make available the teaching/learning syllabi to their students so that the students should know which areas to concentrate on. Table 10 also shows that there are more learners from the urban school setting who use textbooks and illustrations in the books as study aids. For example 41% of urban learners and 32% of rural learners said they refer to diagrams and charts in textbooks while 42% urban and 22% rural learners said they answered end of topic questions as study aids. The reason for this difference could be the availability of adequate textbooks for them to use. Both of the urban schools had a good supply of textbooks while one rural school had adequate books but the other

had an acute shortage of textbooks. Thus this imbalance of resources between schools has a negative impact on students' learning. The students therefore resort to just memorizing concepts, hence 90% and 77% in the rural and urban schools respectively, reported applying simple memory to remember things.

4.3.2 Strategies for help-seeking by school setting

Table 11 shows that all learners (100%) in both settings got assistance from their teachers and peers. However, only 60% and 31% of the urban and rural participants respectively mentioned getting assistance from family members. The family members were elder brothers, sister or cousins who had been to school before them. Very few of these participants, particularly from rural schools talked about getting academic help from family members. This was emphasized by participants during interview sessions as follows:

- Jean (rural student), “my parents are ignorant so I can only ask my teachers or my friends to help me when I do not understand that topic.”
- Joel (rural student), “I stay with my mother but she is a primary level so when I have any problem I just go to the teacher or sometimes my cousin can also teach me at home.”

To such situations McKeachie (1988) remarked that children do not get much help on their studies from their homes/parents or schools. In such cases learners have no alternative ways of approaching learning situations.

On the other hand, there were some learners from the urban schools who said they got some help from their fathers or mothers. In towns usually such parents are the working class who have been to school themselves and some follow-up the progress of their

children in school. A family is usually regarded as a primary agent of socialization and learning. Table 11 shows that very little learning takes place in the families of these learners. There are large disparities in the literacy rates between the rural and urban populations. Literacy rates are very low in the rural as compared to the urban rates. This therefore does contribute to the differences seen in Table 11.

Table 11: Help-seeking strategies by school settings:

Strategy	Percentage of learners mentioning the strategy (%)	
	Rural setting (N = 40)	Urban setting (N= 80)
Help-seeking strategies		
Consult teacher	100	100
Consult peers	100	100
Consult family members	31	60
Study aids strategies)		
(a) <i>use of textbooks</i>		
Use different textbooks	35	47
Refer to diagrams/tables in books	30	41
Refer to book summaries & introductions	15	25
Refer to subheadings	8	15
Refer to book indices & glossaries	7	14
Refer to topic objectives	0	9
Use italicized/bold lettered words	0	4
Media use strategies		
Listen to academic radio programmes	20	26
Read academic newspaper articles	5	16
Watch/listen to academic TV prog.	5	10
Use computer documents	2	0
Browse internet	0	1

The other general difference depicted from Table 11 is the use of media as another source of academic material to supplement learning. Percentages are low in both settings but comparatively more learners from the urban schools use the media than the rural learners.

The availability of a resource is a factor that does contribute to the use of a learning strategy. Newspapers and television sets are more common in the urban than in the rural settings. Learners can easily access these items in the urban schools than the rural learners can. Thus while constructivism and metacognition describe learners in the way these frameworks have done, there are some limitations to which these can apply. There is a need to consider factors that do interfere with the learners' way of learning and these include the availability and adequacy of the learning resources.

4.3.3 Strategies for time management by school setting

Table 12 shows that although all students in the rural and urban schools develop their study timetable. However, only around 50% of them follow their study timetables and said that they had adequate time to study at home. Reasons for failure to use study timetables were the same as those mentioned in the previous sections, that is:

- “There is much work at home like cooking, gardening, children make noise during the day. I can read better at night only”
- “Parents tell me to do something when I want to read.”
- “Sometimes when I get home I am tired because of walking so I just sleep.”

Table 12: Self organization strategies by school settings:

Strategy	Percentage of learners mentioning the strategy (%)	
	Rural setting (N= 40)	Urban setting (N = 80)
Self organization strategies		
Has study timetable	100	100
Have adequate study time at home	50	56
Set up study goals for study period	5	16

Therefore both groups of students face big challenges for the management of their study time for instance walking/bicycle riding over long distances. However, urban students are better off because some households in urban settings employ nannies and home care-takers who assist in household chores.

4.3.4 Strategies for self- evaluation by school setting

As already stated, evaluation is a means of monitoring one's level of comprehension and achievement with the aim of improving performance. Table 13 shows students do evaluate themselves either by using textbook illustrations or employing personally formulated techniques. The table shows that more learners in the urban schools use textbook related aids than the rural learners, eg 63% urban and 45% rural students said they attempted end of chapter questions to check their understanding of the chapter they were reading.

Table 13: Self evaluation strategies by school settings:

Strategy	Percentage of learners mentioning the strategy (%)	
	Rural setting (N = 40)	Urban setting (N = 80)
Self evaluation strategies		
(a) <i>use of textbooks</i>		
Answer end of topic questions	45	63
Answer past exam questions	45	52
(b) <i>personal</i>		
Ask & answer own questions	92	78
Recall read material	75	63
Redraw diagrams	37	47

In all the sections, knowledge application was not mentioned as a means of understanding concepts. Constructivism emphasizes that knowledge is useful when it can be put to

practical use. There was no mention of application of the acquired knowledge to life situations. The practice by students seems to be responsive to the traditional way of learning in Malawi. Students learn with the sole reason of passing final examinations for certification and/or selection to the next level of learning rather than acquisition of knowledge for practical application. The motivation to learn is certification and selection.

In conclusion of research question 3, the study has found out that there are no learning strategies which are dependent on the location of the school but that the availability and adequacy of resources affected the use of certain strategies. Learners in both school settings depend on their teachers and peers for assistance for most of their learning challenges. Very few learners take the challenge to read different types of textbooks for better understanding of the issues, hence most of them apply minimum reading effort. The study has also revealed that perhaps due to low literacy rates far less than half of the participants sought help from their family members (in particular parents) in the rural schools while more than half of them were able to seek academic help from their parents in the urban schools. Literacy rates are higher in the urban settings. The study again suggests that the prevailing use of textbooks in both school settings by learners is poor. The textbook illustrations are not adequately utilized to complement their understanding of content. Furthermore, the study has shown that in rural schools, female learners have more problems with time management strategies because they have more household chores than their counterparts in the urban schools.

4.4 Chapter summary

This chapter has outlined the study findings. The common issues are that students employ rehearsal strategies as a way of regurgitating the material they learn. This is because the main motivation of learning is to pass final examinations for certification or selection to higher learning institutions. Learners show very limited knowledge of effective use of learning textbooks hence depend on other people for most of the challenges they face. There seems to be no critical differences in the learning strategies between boys & girls and rural/urban school settings. The next chapter is a summary, conclusion and recommendations of this study.

Chapter 5: summary, conclusion and recommendations

5.0 Chapter overview

In this chapter I reemphasize the main issues from all the chapters. In particular the major findings of the study are restated so as to make a conclusion. I finally state some implications/recommendations of this study.

5.1 Study summary

The purpose of this study was to explore the learners' learning strategies as they engage in various learning endeavours to achieve their learning goals. In this study learning strategies have been defined as activities and thoughts done by the learner to enhance mastery of knowledge and skills to improve academic performance. Three research questions were formulated to achieve the study purpose. The questions sought to explore and determine the actual strategies which learners employed to learn biology, establish whether learning strategies were gender related and whether there were differences in the learning strategies between urban and rural school students.

The study was guided by constructivism as a theory of learning and metacognition as frameworks in conjunction with concepts of learning highlighted in LASSI as a conceptual framework. The learner is expected to be the centre and an active member in the learning process. The emphasis is that learning occurs in a social context. The learner

must be a self starter and planner of her way of learning by identifying the strategies which work best for her. Self-reflection of the process of learning is fundamental for successful learning to occur. Literature identifies five categories of learning strategies so that each one helps the learner achieve a particular learning goal. On the other hand, LASSI pulls together various skills of the learning process because learning itself is a skill that can be developed by the use of appropriate strategies. These skills include information processing, selection of main ideas, time management, self testing, and use of study aids among others. Studies have shown that the majority of learners are novice and therefore non-metacognitive learners. They do not examine the quality of their work nor do they stop to reflect on the learning process. They do not examine a problem in depth nor see the relevance of the material in their lives.

The study generated data by conducting 14 interviews with student participants. A questionnaire (LASQ), which was an adaptation of LASSI was completed by 120 students. Students' notebooks were also examined. Triangulation was done to complement the findings so as to increase the validity and credibility of the results. This study was conducted in selected rural and urban DDSS in the NED. Interviews were transcribed; categories and subcategories of the learning strategies were generated and compiled. The frequency of a particular learning strategy mentioned in the LASQ was determined then its percentage was calculated. Various tables of learning strategies were developed to summarize these results.

The study findings reveal that the participants mentioned the rehearsal strategies which basically enhance and facilitate memory. These include discussing, reading, note-taking, consulting with other people and peers, drawing diagrams, reciting concepts to put to their memory.

All students emphasized that they study and learn in groups to help each other. They also indicated that they depend on their teacher for any challenge that they experienced in their learning process. There are serious deficiencies by students in the use of the available learning resources. Even where the schools had an adequate provision of textbooks and other resources, there were still some students who depended on the teachers' notes only for their studies. However, even those students who said they read the available textbooks, it seems they do not fully maximise the use of the books. Most students do not seem to appreciate the significance and role of different illustrations in the textbooks. This is an indication that the majority of our students get out of their schools with very little and poor study skills. The implication is that schools have not done much in making learners learn how to learn.

The general picture is that learners do not seem to have particular strategies for specific learning situations. They have a routine way of learning and studying. They can not evaluate the effectiveness of a strategy and determine whether it has enabled them to complete a task successfully or not.

The findings indicate that girls (particularly in rural schools) are more disadvantaged than their counterpart boys. It was noted that the percentages of girls mentioning complex

activities which seemed to demand more time were lower than the percentages of boys. The main challenge faced by girls was limited study time available to them due to numerous household chores culturally assigned to them at home. The implication is the dwindling performance of most of the girls in these schools. Worse still is the high drop-out rate of girls especially in the rural schools as was noted in Chapter 3. The volume of household chores in the rural school set-up is even higher than in the urban school-setting. There is more that needs to be done to support the girl-child education by way of parental involvement and community sensitization. .

Finally the study indicates that students in the rural and urban setting use similar strategies. However, more students in the urban schools where students have access to a variety of resources and facilities mentioned more strategies than students in rural schools. Such rural schools have limited resources and facilities. Therefore use of some strategies depends on the availability of certain resources which can enable the learner to employ a strategy or not. Where the learning facilities are available more learners mentioned the strategy than where such facilities were not available. It also appeared that in one school teachers could direct learners to use acronyms as memory strategies some learners maximised such instructions. This is a sign that use of some strategies is dependent on the availability of relevant learning resources and the guidance of the teachers. Teachers also must offer the appropriate guidance and expose their learner to a wide range of learning techniques and resources.

5.2 Conclusion and implications

The primary research objective was to explore the learning strategies used by students in learning biology in rural and urban district day secondary schools in Malawi. Learning strategies are seen to be an effective tool in aiding learning. To explore and determine learning strategies as activities for learning, the study used constructivism, metacognition and the LASSI. These frameworks originate from cognitive psychology for the improvement of the learning process. The findings basically show that most of the strategies mentioned by the participants are the simply rehearsal type to enhance memory rather than for application to life situations in solving problems.

The findings, however, show that most girls, especially in the rural schools, employ strategies that are not complex but those that demand less time. The major challenge with the girls is that they are involved in a lot more household chores than boys hence for most of them their study time at home is very limited. The implication for this is the extreme poor performance for most of the girls. As a result there would be little motivation for such girls to learn. The consequences are the high drop-out rates of girls as was noted in the two research schools of the rural settings. Furthermore, the findings suggest that most of the participants are heavily dependent on other people, especially their teachers. This overdependence on the teacher and then the teacher directly providing all what students ask for in turn seem not to make learners to be resourceful. Probably teachers only need to direct their students to the relevant reference material so that the learners can see that information is always available in their textbooks and media (print and electronic when available) and not created by their teacher. The implication is to teach learners to learn how to learn by reading and searching widely. Students are not able to maximise the

available resources as the first steps in the learning process. However, learners can only employ certain strategies when resources allow them to do so.

Since textbooks are treated as the main teaching and learning resources, they need to be available to students. However, even when they are available, they are not effectively used by the majority of the learners. The implication and significance of these study findings is the need to train learners by teachers of the appropriate use of textbooks. Many students do not seem to realise and acknowledge that information is available from different sources. The consequence is that students remain very limited in searching for information.

5.3 Recommendations

In view of the findings from this study, I make the following recommendation whose aim is to try to improve students' practices in the learning process to improve their performance.

1. Learners should be guided to learn how to learn for specific learning goals as they learn the subject content.
2. Learners should be guided and encouraged on the effective use of the textbook as a major teaching and learning resource so that they can maximise on the availability of the many illustrations in them.
3. Schools should deliberately make available supplementary T/L resources for effective learning to occur by using them as alternative resources. These could include newspapers, magazines, science models among others.

4. Since teachers have great potential in developing learners' learning strategies, perhaps the inclusion of learning strategies in teacher training could play a bigger role in helping learners to learn how to learn.
5. Parents and guardians could also do a great deal in helping their children and wards to learn at home by creating free time and monitoring their children study practices.

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APPENDIX 1: THE LEARNING AND STUDY QUESTIONNAIRE (LASQ)

INSTRUCTIONS:

1. The purpose of this study is to find out the actual or exact things that students do and/or think about when they learn and study biology.
2. In these questions you are required to simply state or describe or to choose (by ticking) the things or activities that you do as you learn or study biology.
3. This is not a test, therefore, where you do not understand a question ask me to explain and clarify what the question is saying.
4. There are no right or wrong answers to these questions, just say what you do in learning and/or studying biology.
5. The responses that you give to these questions may help in the improvement of the learning/studying of biology by all students.
6. Your responses are private and confidential. No direct link will be shown between the final report of this study and your individual responses.
7. Any student participating to complete this questionnaire will do so on voluntary basis. You may choose to participate or not. No one will accuse you or punish you if you do not want to complete this questionnaire.

LASQ OFFICIAL ID: 1. HAB or 2. LAB or 3. HAG or 4. LAG

Name of school: _____

Location of school: Urban [☐] Rural [☐]

Student's particulars: Name; _____

Sex male [☐] female [☐] **Age** [] years

Parents' highest level of education (any one or both parents):

PSLCE [☐] JCE [☐] MSCE [☐] Diploma [☐]

Degree & above [☐] none [☐]

Now answer the following questions:

1. Do you have a biology textbook of your own (personal)? yes [☐] no [☐]

2. Does the school have enough biology textbooks for students? yes [☐] no [☐]

Choose 3(A) or 3(B)

3. (A) I study biology using class notes only [☐]

3. (B) I study biology using class notes as well as reading from biology textbooks [☐]

4. **To be answered by only those who have a personal textbook:** state all the things that you do as you read from your personal biology textbook to make sure that you understand the ideas in the topic better.

5. **To be answered by all those who use any other biology textbooks and notes:** what actual or exact things do you do as you read or study from school or personal biology books to make sure that you thoroughly understand the ideas? (List all the things).

6. Apart from the written descriptions and explanations I am able to use other features and representations available in biology textbooks to help me better understand and grasp the ideas and the topic that I am reading.

yes [] no []

7. If your answer to question 6 is yes, name all the features and representations in biology textbooks that help you to understand the topics better.

Choose 8(A) or 8(B)

8(A) I use one type of biology textbook only yes []
8(A) why do you use only one type of biology textbooks?

8(B) I use more than one type of biology textbooks yes []
8(B) why do you use more than one type of biology textbooks?

9. How do you check yourself to determine whether you have understood what you have read or not? (Mention everything that you do to check yourself).

10. What do you do when you discover that you have not understood much of what you were reading?

11. List all the things that you do in class to learn as the teacher teaches biology.

12. I get help from parents or brothers or sisters or other relatives at home when I study as I learn biology. yes [] no []

13. (A) I have a study timetable for my school activities yes [] no []

If your answer is YES do 13 (B) or 13 (C) as well, if your answer is NO go to 14

13(B). I am able to study biology and follow my study timetable at home with minimum disturbances, yes [].

13(C). I am not able to study biology well at home and I fail to follow my study timetable because there are more disturbances, yes [].

14. List all the things that you do to fully prepare for biology tests so that you can do well in the test.

15. What do you do after getting your biology test paper and you discover that you performed

(a) badly?

(b) well?

16. I find my peers (eg classmates, schoolmates) quite helpful as I learn biology. Yes [] no []

17. **Choose 17(A) or 17(B)**

17(A). Most biology textbooks are difficult hence I find them difficult to summarize and get main points when reading them yes []

17(B). Most biology textbooks are relatively simple, I am able to summarize and get main ideas from them. Yes []

18(A). I memorize certain ideas in biology to master some points/ideas yes [] no []

If your answer is YES answer questions 18(B) and 18(C), and continue with 20, if your answer is no answer question 19 and continue with 20.

18(B). Do you use any techniques in memorizing ideas in biology? Yes [] no []

18(C). If your answer is YES, what techniques do you use to memorize biological ideas?

19. Give reasons for not memorizing some biological ideas as you learn biology.

20. Apart from biology textbooks, class notes, teachers, peers, relatives and parents, from what other sources do you get extra biology information to enable you learn more?

THANK YOU VERY MUCH FOR COMPLETING THIS QUESTIONNAIRE.

APPENDIX 2 : INTERVIEW GUIDE TO EXPLORE STUDENTS' LEARNING

STRATEGIES

1. What do you do to learn and understand biology
 - (a) during class as the teacher teaches,
 - (b) after class within the school,

- (c) at home away from school?
2. Do you set any goals or aims to achieve in the process of learning and studying before you start studying a given topic in biology? What goals do you set, if any, if not why don't you set any goals in studying/learning?
 3. What actual or exact things do you do to make sure that you understand what you read/study when you are reading a topic in your biology textbook?
 4. How do you check whether or not you have understood the topic you are reading/studying?
 5. What do you do when you don't seem to understand a biology topic because it appears to be difficult to you?
 6. Do you memorise any ideas in biology? Do you have and use any techniques to enable you memorise certain ideas or concepts that you learn in biology? If any, what are those techniques? If you don't memorise why don't you?
 7. Do the biology textbooks have any features or representations that help you to understand the ideas better? Can you name these features if any?
 8. How do you prepare for biology tests so that you do better than before? What do you do with a biology test that you have performed very (a) poorly? (b) well?
 9. What other resources, apart from prescribed textbooks, notes, teachers and peers do you use to learn biology more meaningfully and effectively? (If any mention all of them).
 10. Do you use a study timetable? If yes, how does having a study timetable help you to learn biology? If not why not have it?
 11. Do you have anybody who helps you to learn biology at home?
 12. Do you have adequate time to study biology at home?

Examination of students' notebooks

To establish and describe evidence of individual and group practice (written) exercises.

To establish and describe the evidence of students' formulation of own notes.

To describe evidence of students' note-taking during class teaching time.

APPENDIX 3: LETTER OF INTRODUCTION

UNIVERSITY OF MALAWI



Principal
Emmanuel Fabiano B.Ed., M.Sc., PhD

Our Ref.:
Your Ref.:

CHANCELLOR COLLEGE
P.O. Box 280, Zomba, Malawi
Telephone: (265) 524 222
Telex: 44742 CHANCOL MI
Fax: (265) 1 524 046

FACULTY OF EDUCATION

4th May, 2009

The Divisional Manager
Northern Education Division
P.O. Box 133
Mzuzu.

Dear Madam/Sir,

LETTER OF INTRODUCTION: MR NAMESON NGWIRA

The bearer of this letter is Mr Nameson Ngwira (Reg. No. MED/SCE/03/07) who is a Master of Education student here at Chancellor College, one of the constituent colleges of the University of Malawi. He is registered with the Department of Curriculum and Teaching Studies in the Faculty of Education and is specializing in science education. He is in the final year of his studies and will be conducting his fieldwork in the Northern Education Division from May to July this year.

I would like to request that Mr. Ngwira be given permission to conduct his research study in several districts in the division. The actual names of the districts and schools will be provided by Mr Ngwira himself. I will very much appreciate the assistance that you may render to him.

Yours sincerely,

Dorothy C. Nampota (PhD)
Head of Curriculum and Teaching Studies Department



Names of schools overleaf

APPENDIX 4 : PERMISSION TO CONDUCT RESEARCH STUDY

Ref. No. 9/3

12th May, 2009

FROM : THE EDUCATION DIVISION MANAGER (N) BOX 133, MZUZU
TO : THE HEADTEACHER, KATOTO SECONDARY SCHOOL.
: THE HEADTEACHER, LUWINGA SECONDARY SCHOOL.
: THE HEADTEACHER, MZENGA SECONDARY SCHOOL.
: THE HEAD TEACHER, BOLERO SECONDARY SCHOOL.
: THE HEADTEACHER, MAGHEMO SECONDARY SCHOOL.

**PERMISSION TO CONDUCT A RESEARCH STUDY IN SECONDARY
SCHOOLS - MR NAMESON NGWIRA REG. NO. MED/SCE/03/07**

The subject above refers.

I write to request your office to consider allowing Mr. Ngwira conduct a very pertinent Educational Research study within your institutions.

Mr. Ngwira is a student at the University of Malawi, Chancellor College, Department of curriculum and Teaching studies, Faculty of Education and is pursuing a Master's Degree Programme in Science Education.

I should, therefore, appreciate any assistance you may have to offer to facilitate towards the success of his Research work.



EDUCATION DIVISION
MANAGER
2009-05-13
P.O. BOX 133, MZUZU

L.A.D Kamisa

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