TEACHERS' VIEWS AND PRACTICES OF LEARNER-CENTRED TEACHING IN BIOLOGY TEACHING IN SECONDARY SCHOOLS IN KABWE DISTRICT

By

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A Dissertation Submitted to the University of Zambia in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Education in Science Education

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DECLARATION

I, Esther Gondwe, declare that this dissertation is my own work and that it has not been previously submitted by anyone at the University of Zambia or at any other University.

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APPROVAL

This dissertation of Esther Gondwe is approved as a fulfilment of the requirements for the award of the degree of Master of Education in Science Education of the University of Zambia.

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Examiner 3_____ Signature _____ Date _____

Chairperson Board of Examiners _____ Signature _____ Date _____

Supervisor _____ Signature _____ Date _____

DEDICATION

This dissertation is dedicated to my late mother, Mrs. Suzgo Mfune Gondwe. Beloved Mother, you encouraged me to upgrade my studies and your words of inspiration still live on in my life.

I also dedicate it to all researchers who wish to further their studies in the same study area that I undertook. The sky is the limit.

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ABSTRACT

This paper investigated the learner-centred teaching (LCT) approaches in the teaching of Biology in selected secondary schools of central province. The study used a descriptive research design following qualitative methods of data collection and analysis. The qualitative methods used interview schedules, document checklist, lesson observation schedules and questionnaires. The sample for the study consisted of twelve teachers of Biology and one hundred and twenty learners drawn from the six selected secondary schools. Qualitative data was analysed using the themes generated from the research questions.

The findings revealed that the twelve teachers held divergent views about LCT approaches; ten out of twelve respondents held onto views that LCT approaches could not be used without experiments or laboratories and that it focuses on the groups of learners. The other two respondents held on to views that were consistent with the approach that learner interactions was important in learner-centred lessons and also that the approach focuses on the varied abilities of learners. Hence, the study established the need for more training in LCT by Biology teachers. Despite the varied responses, the study established that Biology teachers mainly used group work, discussion and question and answer as LCT approaches which were considered during lesson planning and delivery. The approaches are ultimately reflected in the way learners learn in classroom activities.

The study further established that there was a strong linkage between the lesson planning, lesson delivery and learning as observed from the way aspects that focused on learner centred learning were ranked. Aspects that were lowly scored on the lesson plan, were also lowly scored in the lesson delivery and analysis of learning too and the opposite was true for aspects that scored highly at planning. The available curriculum teaching and learning materials supported teachers in the implementation of LCT as evidenced from the Biology curriculum which recommended the use of LCT approaches. The implementation of LCT approaches was not smooth. The study revealed challenges such as large class, Biology syllabus being too bulky, inadequate teaching and learning materials and learners' attitudes towards the approach. To overcome these challenges, Biology teachers made use of both Teacher-Centred Teaching (TCT) and LCT. These findings are likely to compromise the quality of education provision in that it may be difficult to realise the learner that is so much desired for by the Biology curriculum and nation at large.

Keywords: Learner-centred teaching, lesson planning, lesson delivery curriculum teaching and learning materials

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ACRONYMS

MOE	Ministry of Education
MOGE	Ministry of General Education
UNESCO	United Nations Education Support Co-operation
MESVTEE	Ministry of Education, Science, Vocational Training and Early Education
LCT	Learner-Centred Teaching
TCT	Teacher-Centred Teaching
INEE	International Network for Education in Emergencies
TIMSS	Trends in International Mathematics and Science Study
SMART	Science and Mathematics Advice and Regional Training
AIEMS	Action to Improve English, Mathematics and Science
BeSST	Better Secondary School trained Teachers
ESO	Education Standards Officer
SESO	Senior Education Standards Officer
VVOB	Flemish office for International Co-operational and Technical Assistance
CPD	Continuing Professional Development
COSETCO	Copperbelt Secondary Teachers' College
SMASTE	Strengthening Mathematics Science and Technology Education
STEPS	Strengthening Teachers' Performance and Skills
JICA	Japan International Co-operation Agency
TGM	Teacher Group Meeting
SPRINT	School Programme of In-service for the Term
TLM	Teaching and Learning Materials

TPG	Teacher Professional Growth
TCIG	Teachers Curriculum Implementation Guide
ZPD	Zone of Proximal Development

CHAPTER ONE: INTRODUCTION

This chapter describes the background and purpose for the study, the research objectives and research questions, the significance of the research and the theoretical framework underpinning the study. The last section outlines the organization of the chapters in the thesis.

1.1. Background

Quality education debates are taking centre stage among many countries, Zambia inclusive. The goal of the Zambian government has been to provide quality and relevant education for a long time now (MOE, 1996). The government hopes to achieve this goal through education provision that enhances acquisition of knowledge, skills, attitudes and lifelong learning to its learners (MOE, 1996). To achieve this, Zambia like most developing countries has focussed on improving the quality of science and mathematics education because these subjects are regarded as a basis for economic advancement. While there could be several factors that contribute to quality education such as pupil/teacher ratio, adequate teaching and learning materials, teacher qualifications, contact time, adequate laboratory facilities and many others; the part played by the teacher in adopting effective teaching approaches could be central in improving quality education in Zambia, (MOE, 2008; UNESCO, 2015).

Effective teaching approaches, according to Schweisfurth (2013), point to learner-centred teaching (LCT) that could give learners a high level of active control over the contents and processes of learning. LCT is an interactive teaching approach that would enhance learning (UNESCO, 2015). The learner is placed at the centre of the learning process and has the opportunity to participate in his or her own learning. This means that learners' responses, ideas, feedback are what the teacher uses to proceed with the flow of the lesson. This way, learners feel part of the lesson and assume responsibility for their own learning (Musonda, 2009).

LCT approaches could encourage learners learn to think for themselves and do most of the class activities either in groups or individually. Learning would likely occur

where learners are given opportunities to think through given tasks in pairs or as individuals. Therefore, as MESVTEE, (2014) puts it, “the job of the teacher is to stimulate thinking and encourage exploration of ideas in the learners”. This situation may help to provide an environment for meaningful learning to take place. This, therefore, demands departing from the traditional pedagogical teaching approaches that emphasize the role of the teacher as the holder of wisdom and knowledge to interactive teaching strategies where learners take charge of their own learning (MESVTEE, 2014).

It therefore, follows that, to employ LCT approaches, teachers are required to use a range of different approaches so that every learner is actively involved and catered for; also taking into account the available resources (MOGE, 2013). This is why teachers need to have knowledge of the various teaching methods that would engage and involve learners in the learning process (Nzewi et al., 2009). This kind of teaching would ultimately realise the desired learning outcomes that would also develop skills and talents in each learner (Nzewi et al., 2009).

Though LCT has not directly ranked very highly among other factors contributing to learner achievement and performance, the study by Chika (2012) revealed that the LCT pedagogy is a powerful approach for improving learner achievement in the acquisition of knowledge and skills, as it recognises the learners’ own active role in the learning process and views the teacher as a facilitator of the process. This implies that learners be given the dominant role in the lesson in terms of expressing their views freely. The use of LCT approaches provides freedom for learners to also add their voice in the lessons. This also means that the teacher should give a listening ear to the views of learners and make meaning of them in order to progress smoothly in the lesson.

Studies done for instance, in India, in rural schools highlighted three aspects that are cardinal about LCT approaches; questions and answer, teaching and learning materials and utilising learners’ working in small groups that these were positively correlated with test scores in standards two and four (UNESCO, 2012). This may suggest that learner achievement and performance could be linked to the type of teaching approaches and teaching and learning materials that teachers employ.

In support of LCT approaches, a long-standing educational goal in Zambia states that the 'teaching methods adopted in the school curriculum should help to awaken the individual's political consciousness and to provide educational experiences that will nurture skills to enable learners take charge of their own learning' (MOE, 1996, p.51). There is therefore, a pressing need for teachers to use interactive pedagogical approaches that engage learners so that learning becomes more meaningful (MOE, 1996; Vavrus, Thomas and Barlet, 2011). By this, as educators, we will be upholding the current demands of education delivery which is advocated for globally. This is also supported by Ware (1992) who argues that since the purpose for science education delivery is changing, therefore the expectations for learner achievements are equally rising to meet society demands. The world of tomorrow is very much determined by what goes on in the classroom today. Therefore, in order to improve learner achievement levels, it may be important for teachers to vary teaching approaches to meet learners' varying education needs. It must be borne in the mind of every teacher of Biology that learners come from different family cultures and social environments. This is why, the aspect of accommodating learners' differences in the teaching and learning processes and creating a variety of learning activities may therefore, help to bring out desired teaching and learning outcomes (Richards & Rodgers, 2001). It is also argued that in the LCT approaches, it becomes important for teachers to help learners make connections between their prior knowledge and new situations. This will help learners to become co- constructors of knowledge which they can apply in any given situation or subject area (Vavrus, et al., 2011).

The reliance of most teachers on approaches such as chalk and talk, commonly known as 'lecture method', as revealed by Haambokoma *et al.,* (2002) may not help learners to construct knowledge on their own or with their peers. In using lecture methods, learners may just recall or remember facts without necessarily understanding the concepts. It must also be noted here that teaching approaches that place learners in a passive situation should be avoided because they do not promote collaboration and participation amongst learners. To prevent learners from being passive recipients of knowledge, teachers are encouraged to provide learners with hands-on activities (MESVTEE, 2013). Hands-on activities in groups or pairs or individually may be the sole purpose of engaging learners to think and contribute

their ideas and views in the lesson. Group work, discussion and question and answer, debates may be considered participatory teaching approaches that may enhance interactions, collaboration and participation amongst pupils and their teacher. When learners are engaged in participatory or interactive classroom activities, they tend to take a prominent role in their own learning (Musonda, 2009), so taking responsibility for their own learning.

The efforts of educators world-wide have been to bring change into the classroom; where teachers change their way of teaching and also the way learners learn (Musonda, 2009). The dominance of TCT approaches do not seem to bring about the desired change. This is a concern to the Zambian government because learners are placed in a passive role and limits their skills, knowledge and values acquisition (MESVTEE, 2011). With the paradigm shift of education delivery, knowledge and skills are believed to be constructed by learners themselves whose minds are actively engaged in the lesson. Consequently, Biology teachers become the main players in understanding the use of LCT approaches in their teaching. There is, therefore, need to energize action to bring LCT into the classroom for improved learning and achievement.

1.2. Statement of the problem

LCT as interactive approaches may help to engage the minds of learners not only in knowledge construction, but also skills acquisition. In the Zambian context, little has been observed in terms of integrating LCT approaches into the teaching of Biology in secondary schools despite the government's focus to promote the use of LCT. Studies done by Haambokoma, et al., (2002), Baba and Nonaka (2010), MESVTEE (2012) on teaching and learning, indicated that teachers mainly used TCT in their lessons. The predominance of TCT over LCT may be due to perceptions that as long as Biology lessons comprise group work and hands-on activities combined with question and answer approaches, such as are learner-centred lessons (MOGE, 2016). The government's efforts on LCT approaches is also emphasised and recommended in the revised curriculum (MOGE, 2013), to which Biology teaching is not an exception. Biology, being a practical subject, teaching it using LCT approaches could help learners construct knowledge and acquire skills essential to assist them in their

career prospects that are Biology related. This study, therefore, sought to explore the teachers' views and practices of LCT approaches to establish how they could contribute to successful teaching of Biology in secondary schools.

1.3. Purpose of the study

In view of the concerns that teachers do not use the LCT approaches which may enhance teaching and learning of Biology, the study therefore aimed at investigating teachers' views and current practices of the recommended LCT approaches in the teaching of Biology at secondary school level in Kabwe district.

1.4. Research objectives

The objectives of the study were to:

1. Investigate the use of LCT approaches employed by teachers of Biology in their lessons;
2. Determine the views of teachers of Biology about LCT approaches in the teaching of Biology in secondary schools;
3. Determine the link between curriculum teaching and learning materials and the implementation of the LCT approach by teachers of Biology.

1.5. Research questions

This study will be guided by the following research questions:

1. How do teachers of Biology use the LCT approaches in their teaching?
2. What views do teachers of Biology hold on LCT approaches in the teaching of Biology in secondary schools?
3. How do the available curriculum teaching/learning materials support teachers in implementing the LCT approaches?

1.6. Significance of the study

The findings of the study will help to consolidate the idea of teaching and learning of Biology in schools through LCT approaches. The findings will also be relevant to the education stakeholders as the ministry strives to attain quality education provision that would benefit the learners and society at large. Further, the findings would also assist education stakeholders to put in place interventions to strengthen capacity

building programmes that would enhance teachers' understanding and practices of the LCT approaches in Biology teaching.

1.7. Delimitation and Limitations of the study

1.7.1. Delimitation

This study was conducted in Kabwe District of Central Province and targeted six secondary schools. There are eleven secondary schools in the district and six schools out of the eleven were used which stood above fifty percentage. The choice of six schools served a good representation and therefore, the findings from the study may be generalised.

1.7.2. Limitations of the study

During data collection in the field, a number of obstacles were encountered by the researcher. The data collection period was in the first term, a time which is characterised by rains which made some respondents to miss their Biology lessons because they could only report for work when the rains were over. This made it difficult for the research to be completed in the stipulated time. The most affected area was the lesson observation aspect because there was no replacement if the target respondent was not available. It also meant that the time scheduled for the interview could not proceed as planned since some members were not in school.

1.8. Theoretical Framework

The theory employed as a guide to this study is "constructivism". Constructivism has been understood in various ways by different scholars. However, according to Taber (2011), constructivism as an education theory explores learners' thinking in the teaching and learning processes. The study dwelt on learning theories of constructivism from cognitive and social perspectives.

1.8.1. Cognitive constructivism

Originated by Piaget, the learning theory of constructivism evolved from the extensive study of cognitive development. This describes how thinking and knowledge develops based on observation and experimentation (Chambliss, 1996). Piaget's study of cognition, further initiated mechanisms by which knowledge is internalised by learners and called these processes 'accommodation and assimilation.' His analysis concerning the two processes is that through accommodation,

individuals construct new knowledge from their experiences and in assimilation they incorporate the new experiences into an already existing framework without changing the framework (Jacobs, Gawe and Vakalisa, 2002). This, therefore, means that in any learning situation, learners understand new knowledge in the context of their own 'old' knowledge, right or wrong (MOE, 2009).

1.8.2. Social constructivism

With regard to Piaget's study, Vygotsky, (1978) in his study of children's interactions made his position clear on cognition where he stated that cognitive development is influenced by the interaction of an individual with society (MESVTEE, 2014). This originated the Vygotsky's theory of social constructivism which stresses the need for collaboration among learners because this plays a fundamental role in the development of cognition (Kearsley, 1994). In his study, Vygotsky, (1978) linked peer collaboration to the concept of Zone of Proximal Development (ZPD). Kearsley (1994) describes ZPD as the distance between the actual developmental level as determined by independent problem-solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers. Musonda (2009) summarises ZPD as a gap between what a learner can do unassisted and what the same learner can achieve with the help of a teacher or capable peer. Other scholars such as Duffy and Jonassen (1992) agree with this and emphasize that learners with different skills and backgrounds should collaborate in tasks and interview schedules to arrive at a shared understanding of the truth in a specific field or task.

Social constructivists therefore emphasize the importance of the learner being actively involved in the learning process. McMahon (1997) agrees with the social constructivists scholars such as Vygotysk, (1978), Duffy and Jonassen (1992) that learning is a social process that only takes place inside the minds when individuals are engaged in social activities. This way, knowledge construction through interactions with others is a sure way for learners to arrive at concepts or confirm their acquired skills in learning (MESVTEE, 2013).

1.8.3. What then is constructivism?

Although constructivism is not a specific pedagogy, Glasersfeld (1989) points out that constructivism is connected with pedagogical approaches that promote active learning. One such pedagogical approach is the use of LCT which requires that learners' thought processes take centre stage in the lesson (MESVTEE, 2014). In support of this paradigm, Kearsley (1994) stresses that learning becomes an active process if learners construct new ideas or concepts based on their current or past knowledge. Further, Kearsley (1994) argues that the teachers' job is to develop learners to learn on their own through their active participation as individuals or as groups. Therefore, the teacher becomes very critical in constructivism to be able to provide tools of problem-solving and inquiry-based learning activities which learners can interact with (Sutton, 2003). They frame and test their ideas, draw conclusions and share knowledge collaboratively amongst themselves as learners. In this way, constructivism transforms the learner from a passive recipient of information to an active participant in the learning process. Always guided by the teacher, learners are encouraged to actively engage their minds in the learning if they are to construct their knowledge based on their day to day experiences (Musonda, 2009).

1.8.4. Conceptual framework

The conceptual framework in Figure 1 summarizes sections 1.7.2 and 1.7.3. The framework explains the LCT classroom environment that teachers must create for learners. This is the basis of constructivism that learners as individuals or as peers can construct their knowledge when they are involved in the teaching and learning process (Vygosky, 1978; Glassersfeld, 1989; Musonda, 2009; MESVTEE, 2014).

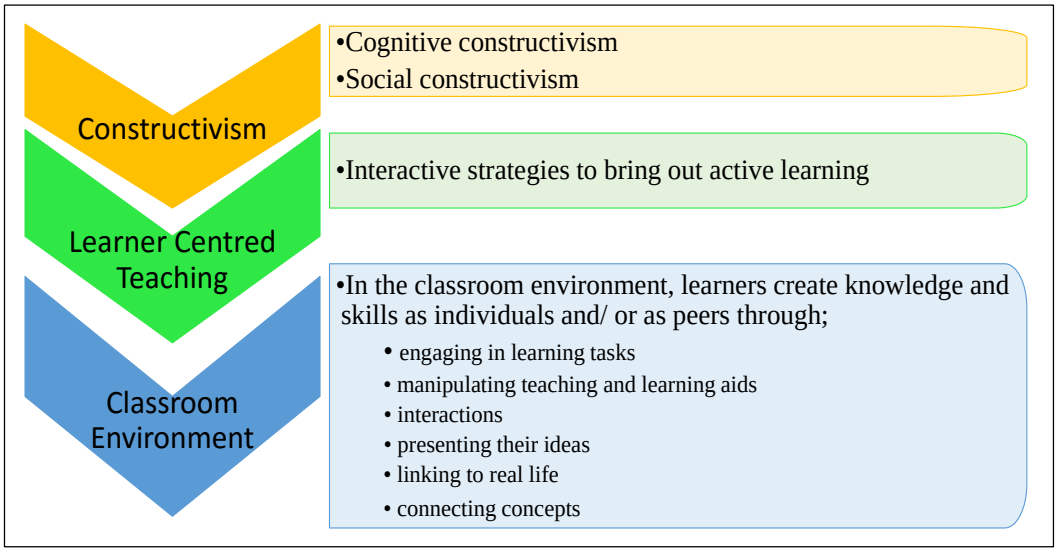

Figure 1.1: Classroom manifestation of LCT

1.9. Operational definitions of the terms

Constructivism: This is a view that stresses the active role of the learner in building their understanding, constructing their own knowledge and making sense of information.

Facilitator: A person who guides learners through a process in order to achieve a smooth and productive discussion.

Learner-centred teaching: An approach of teaching that allows for learners' maximum participation in the learning process as learners manipulate teaching and learning aids, engage in sharing ideas with each other and being in charge of their own learning.

Kyozai-Kenkyu: Deep study of curriculum teaching and learning materials to have adequate knowledge about the content or concept and the approaches of delivering the lesson.

Visible part of lesson: The stage when the lesson is being delivered to the learners.

Invisible part of lesson: Planning stage of a lesson by the teacher prior to delivery of the lesson in the classroom.

Classroom environment: A classroom where teaching and learning takes place.

Curriculum teaching and learning materials: Any materials that supports teaching and learning must be easily available (accessible) by the teachers. These could range from curriculum or syllabus, lesson plans, records of work, schemes of work, text book.

1.10. Organisation of the dissertation

This thesis consists of six chapters. Chapter One summarizes the background information to the study by focusing on the LCT approaches from both international and local perspectives, and their influence in the education delivery. It also highlights the purpose, research objectives and research questions and significance of the study. In addition, it also highlights both the theoretical and conceptual frameworks under pining the study. Chapter Two reviewed available literature on LCT; what actually it is in terms of classroom environments, its general benefits in knowledge and skill acquisition by learners, the methodology associated with LCT and curriculum teaching and learning materials supporting the approaches. This chapter also highlights the stand for Zambia in relation to LCT approaches. It also highlights the critics of LCT and why teachers and other stakeholders have different views about it. Chapter Three outlines the methodology used to address the research questions. It also describes the study area, respondents, data collection and analysis and ethical issues related to the study. The findings are presented in chapter Four while the discussions, conclusion and recommendations for further research are in chapter Five.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

The study was aimed at investigating the understanding and practices of teachers of Biology on the LCT approaches in selected secondary schools in Kabwe district. The chapter reviews available literature on LCT approaches and its practice in teaching and learning processes.

2.2. LCT and Constructivism

Many scholars (Chambliss 1996; Bush 2006; Musonda 2009) linked LCT approaches to constructivist view of learning. Constructivists believe that knowledge is constructed by the learner who then develops her/his own understanding through experience (Bush, 2006). Constructivism theory basically promotes the use of interactive teaching strategies which bring about active learning in a classroom situation. Teachers being in the driving seat of the teaching may be required to employ teaching methods that engage the learners in the acquisition of skills such as thinking, analysis and synthesis of their ideas (Baba, 2010). These are skills that may not be easily acquired in learners if traditional teaching approaches are used in their Biology lessons. Sunderman (2006) and Baba (2010) recommends the use of inquiry and problem-solving learning approaches where the teacher's role is facilitative, coaching and thought provoking. This kind of teaching prepares learners for life even after school (Stronkhorst, 2001) because they can apply skills in different life situations and make their living better.

2.3. Learning with LCT approaches

Learning may be looked at as change in behavior as a result of experience or practice. It is a complex cognitive process that requires constructing knowledge and skills. McMahon (1997) asserted that learning takes place inside learners' minds. However, the fact that learning is supported by teaching which is done by the teacher, there are indicators that may suggest that meaningful learning is taking place. Weimer (2013) stresses that the indicators may be generated from what the learners are doing, and how well they are doing it. This agrees with the constructivist view of learning that

construction of knowledge occurs when individual learners are actually involved and engaged in learning activities. Ezgi (2012) asserted that teaching that includes active involvement of learners in experiments or practical activities give the best education results because learners take responsibility for their own learning. Therefore, the teacher has a critical role to play; to make the learning an active process and to sustain it (Hein, 1991). To sustain the active atmosphere of the learning process, Nkoya (2009) points out that the teacher should ensure that, at every opportunity, the learners are involved by either asking questions or engaged in pair up or group work in discussing tasks. Such interactive activities will reduce passive acceptance of knowledge by learners which may not bring any meaningful learning (Rummel, 2008). Chikering and Gamson (1987) support this and argue that students do not learn much just by listening to teachers and memorising pre-packaged assignments. They must talk about what they are learning, write about it, relate it to past experiences, and apply it in their daily lives (Chikering and Gamson, 1987). Nations should therefore aspire to have learners that will not just complete school at whatever level and be idle but be able to apply knowledge and skills acquired while at school.

2.4. International community and LCT

LCT pedagogy has been endorsed by both international organizations and national policy makers that such methods would help learners develop the knowledge, skills, and attitudes and values which over time can transform society (Schweisfurth, 2013; UNESCO, 2015). The LCT approach has also been endorsed by the International Network for Education in Emergencies (INEE); a range of donors supporting education that:

> For people to learn effectively, participatory teaching and learning techniques, including learner-centred methodologies, are essential. Child-centred methods should address the needs of the whole person, teaching skills necessary for survival, individual development, social interaction, and academic study (INEE, 2004, p.54).

Further, an analysis of “Trends in International Mathematics and Science Study” (TIMSS) test results also showed that learners from some Asian countries like Japan and Singapore outperform those from western nations like the United States in

Mathematics and Science achievement tests. For instance, it was found that the types of questions and concerns present in United States classrooms are much more fact related and only involve very simple conceptual processes while classrooms in Japan seem to provide students with greater understanding of processes and applications of subject content. It was further found that the typical goal of most United States teachers was to teach students how to do something, while that of Japanese teachers was to help students learn how to do something and also understand mathematical and scientific concepts so that they can solve future problems. United States lessons typically focused on acquiring mathematical and scientific skills rather than conceptual understanding and were less coherently presented. Developing mathematical and scientific concepts – that is proving, deriving, or explaining in some detail was rare among United States teachers in comparison to Japanese teachers (US Dept. of Education, National Centre for Education Statistics [NCES], 1999).

In 1993, the Ministry of Education in Swaziland through a project called Science and Mathematics Advise and Regional Training (SMART) focussed on the use of LCT methodology (Stronkhorst, 2001). The findings from SMART project showed that teachers showed resistance to change from teacher-centred teaching (TCT) to LCT because learners were used to the approach and therefore, changing the approach to LCT would disturb the usual way of teaching. Further, the findings revealed that teachers did not adhere to LCT approaches because they lacked quality teaching /learning materials. Further, teachers believed that learners preferred to be spoon-fed through note giving and lecturing. The study also established that teachers felt the use of TCT satisfied parents whose concerns were mainly for their children to obtain good examination results (Stronkhorst, 2001). Therefore, whatever teaching approaches they used did not matter as long as learners passed examinations at the end of the day. Such findings may compromise the quality of education provision because learning will only be for the purpose of passing examinations and not for learners to acquire skills that they may require in their day to day experiences.

2.5. Zambian government efforts on LCT education

The aspiration of Zambia like any other developing country has been to realise LCT approaches and has combined efforts with co-operating partners in projects such as:

2.5.1. Action to Improve English, Mathematics and Science

The Action to Improve English, Mathematics and Science (AIEMS) project was started in 1994 in the Ministry of Education. The aim was to improve the quality of education through constructing and providing sustainable system of in-service teacher education by targeting Mathematics, Science and English subjects at school level. One of the successes scored by AIEMS project was that teachers used a variety of teaching and learning materials. In 2002, the study by Haambokoma et al., (2002) on the AIEMS project revealed that teachers did not use LCT approaches in their Biology lessons because teachers were not confident to use the approaches in the case of large class size. They also cited inadequate apparatus and chemicals as a hindrance to their non-practice of the approach.

Additionally, teachers have more compelling arguments on the dominance of TCT as shown by the study conducted by Lund University (Winckberg et al., 2009). This study revealed that teachers used TCT methods because the Zambian education system was examination-oriented. This prompts teachers to concentrate on completing the syllabus to meet examination demands (Winckberg et al., 2009). This is usually what teachers aimed at as they teach, to finish the syllabus. Does finishing the syllabus imply that learners have learnt? Learning is for learners and may require more time for them to learn, grasp concepts and develop deep understanding of principles.

2.5.2. Better Secondary School Trained Teachers (BeSST)

The Better Secondary School Trained Teachers (BeSST) was a college based Continuing Professional Development (CPD) initiative supported by the Flemish office for International Co-operation and Technical Assistance (VVOB) aimed at training lecturers of Mathematics and Science in the use of LCT approaches at

Nkrumah and Copperbelt Secondary Teachers' Colleges (COSETCO). The study by Musonda (2009) showed that lecturers in the two colleges were implementing LCT approaches in their teaching of Mathematics as was reflected in the activities which they engaged the students and themselves in. In the same vein, the study by Nkoya (2008) showed that despite large class size teachers were using LCT approaches in the teaching of Chemistry.

The studies by Nkoya (2008) and Musonda (2009) focussed on the teaching Chemistry and Mathematics and not on Biology. Therefore, it was also necessary to investigate the use of LCT approaches in biology teaching. The findings of both scholars were that teachers were using LCT in their chemistry and mathematics lessons. The two studies too highlighted the LCT approaches that teachers were using. However, their observations were mainly centred on classroom activities and there is no mention of curriculum materials that may support LCT application by teachers. The aspect of teacher preparation which is usually gauged mainly from lesson planning missed from the researches of both scholars. This is why this study also considered checking on the teaching and learning materials to assess the motivation that supports teachers to employ LCT in their teaching.

2.5.3. Strengthening Mathematics, Science and Technology Education

Strengthening Mathematics, Science & Technology Education (SMASTE) project was implemented using phased approach; phase one, two and three. It was a project for the Ministry of Education supported by Japan International Co-operation Agency (JICA) aimed at improving the teaching of mathematics and science through LCT. The findings on the project reported that LCT methods were not fully used to contribute to the improvement of various aspects of teaching and learning in classrooms because despite planning for lessons, teachers did not have the skill to use the approach (MOE, 2011). The findings here disagreed with the findings of Nkoya (2008) and Musonda (2009) whose findings were that LCT approaches were being used by teachers of chemistry and lecturers of mathematics.

The Zambian government's position on LCT approaches has been embedded in the following definitions;

i. The learner's thought process takes centre stage while the teacher provides support to the learner
ii. Learners have debate amongst themselves and express their own thoughts.

Therefore, to realise definitions (i) and (ii) in Section 2.5.3, interactive teaching approaches such as problem-solving, inquiry and discovery, discussion, question and answer, debates have been incorporated in the revised curriculum (MESTVEE, 2013). When teachers engage in the Kyozai-Kenkyu (KK) practice, they may have greater opportunities to use these interactive strategies for effective classroom teaching and learning (MESVTEE & JICA, 2014). With the above stated definitions, the Zambian government hopes to fulfil its goal which states that the "teaching methods adopted in the school curriculum should help to awaken the individual's political consciousness and to provide educational experiences that will nurture skills to enable learners take charge of their own learning" (MOE, 1996, p.51). This goal is what compels the Zambian government to strive for learner-centred education and hopes that the use of LCT approaches by teachers will develop students' understanding and appreciation of Biology in particular and science subjects in general.

2.6. Effectiveness of LCT practices in learning

Studies that have been conducted on the practice of LCT approach, by scholars such as Vavrus et al., (2011) and Weimer (2013) have reported that learner-centred education may bring about meaningful learning. When learning is meaningful, learners may have the capacity to develop higher-order thinking skills which are deemed necessary for success in a complex global society (Vavrus et al., 2011; Weimer, 2013). The study by Wells and Jones (2005) examined collaborative and mentoring style of teaching that it actually promoted learner performance with higher grades as compared to traditional lecture-based style. The two scholars also concluded that students learned important skills, such as the ability to work collaboratively and take responsibility for their learning (Wells and Jones, 2005). Collaboration is also supported by the framework guiding this study. When learners are free to consult each other, interactions are visible in a lesson and that may be a sure way that learners are constructing their own knowledge as peers and as

individuals. While scholars such as Vavrus et., al (2011), Chika, (2012) and Weimer, (2013) support interactive teaching strategies in enhancing learning, Leyendecker, Ottevanger and Van den Akker (2008) pointed out that teachers who use interactive learning strategies may not cover the syllabus in full. This may result in poor performance by learners in examinations and deny learners an opportunity for economic advancement (Leyendecker et al., 2008). It seemed that Leyendecker et al., (2008) viewed it that way possibly because, traditionally, teaching is basically for examinations and not for skill acquisition and deep understanding of concepts which one can value in life and, even after school. This view is common, also amongst parents (Stronkhorst, 2001) who felt that learning was meant for passing examinations only.

LCT also promotes democratic participation in the learning process, encourages critical thinking, meets student's communication needs and improves performance (Cummins, 2007). The positive impact of such methods has also been discussed by Chika (2012) who argues that interactive teaching methods not only develop in learners' investigative skills, but also provide them with opportunities for developing independent (individual) learning and team working. He stresses both independent and team learning because they are important in making learners accountable for their learning. More so, team working, learners share responsibilities on given tasks in their small groups (Chika, 2012). This will ultimately benefit learners in the acquisition of social and leadership skills, which are fundamental abilities in life.

Although, positive aspects have been discussed on the LCT approaches, generally, in Zambia, the struggle experienced has been to have learners talking, expressing their ideas and views in Biology lessons. As revealed by the study of Matsubara (2009) in science lessons, the only response that learners easily give is 'yes' and in answering to questions posed by teachers such as, "Do you understand, this is OK, right?" (Matsubara, 2009, p.2). Biology teachers are required to consider the nature of questions that will make their learners engage in critical thinking and reasoning to be able to express their views. For LCT approaches, the bottom line must be to get learners involved in the learning.

2.7. Classroom environments and LCT

To employ LCT in Biology teaching, the classroom environment plays a major role in the teaching and learning process. Musonda (2009) contends that teachers should create conducive learning environments where learners are encouraged to explore their ideas, concepts and problems in order to achieve meaningful learning. For Biology lessons, learning environments may not be restricted to classrooms and laboratories. School grounds or fields may be used also as learning environments where learners can interact with the environment, nature and engage in critical thinking. A simple illustration may be on the topic 'soil'. It would not make sense in discussing the concept 'soil' in abstract when learners could actually feel it and engage in observing the phenomena at hand. The ultimate goal in teaching and learning should be to appreciate how much the learners are involved in the thinking process to arrive at solutions or answers (MESTVEE, 2013) and clear misconceptions.

The classroom situation should provide opportunities for learners to develop and build their confidence. Teachers are critical in this area to value learners' ideas and ways of thinking. The situation in most of the Zambian schools is that learners talk less or no talking at all because of fear that their answers are wrong and do not make sense. With LCT, the interactive teaching strategies stresses a shift of power for the teacher to a shared teacher-learner relationship, thus creating mutual ownership of the teaching and learning process (Robertson, 2005). To sustain the mutual teacher-learner relationship, teachers may be required to be part and parcel in the learning journey, supporting and intuitively recognising what learners need at every moment in the lesson (Ramsey and Fitzgibbons, 2005).

The interactions with, and amongst peers is another important aspect of LCT where learners have the freedom to ask questions and engage in critical thinking as they interact with peers (Van et al., 2005). This may be achieved if teachers of Biology could be designing activities which will allow learners to interact freely with each other and with the teacher. Through such interactions, learners can understand their learning strengths and weaknesses in any given task (Weimer, 2002). Co-operation is another very important aspect in LCT. The opposite of cooperation may be competition. Through cooperation, learners have the opportunity to compare their

ideas with their peers and their teachers. In doing so, they learn from each other in the process contributing to the development of their academics in a meaningful manner.

2.8. Teacher-Centred versus LCT approaches

Teacher-centred approaches tend to be pre-dominant over learner-centred approaches as reported by Haambokoma et al., (2002); Baba and Nonaka (2010); MESVTEE (2012). This may be due to the perceptions held by some teachers in most schools that as long as Biology lessons comprise group work and hands-on-activities, question and answer techniques, they translate to learner-centred lessons (MOGE, 2016). The presence of group work and availability of hands-on-activities in the lesson may not necessarily mean that LCT approaches are being practiced. As long as learners are not involved, are not showing any signs of thinking and not interacting or sharing their views with other learners, it may be difficult to experience learner-centred teaching approach.

On the other hand, teacher-centred teaching approach (TCT) is in tandem with traditional teacher dominated practices similar to the 'banking' concept of education by Freire (1999) who classify tradition practises as forms of oppression to the learners. Freire (1999) further argues that the 'banking' concept of education considered students as passive receptors of information. Secondly, teachers filled learners with content that was detached from reality and from their day-to-day experiences. Weimer (2013) supports 'the banking concept' by Freire (1999) that teachers find it easy to switch to teacher-centred instructional methods because of cultural beliefs that consider them to be custodians of knowledge who should show learners what they know. However, Smith (2002) argues that in a situation where the teacher is considered the main source of knowledge and wisdom, some learners withdraw their active participation in the learning process. This may confine learning to a few individuals and consequently breed competition among learners (Smith, 2002). This is why Nzewi et al., (2002) argued that the use of TCT approach may not give learners an opportunity to develop manipulative skills because the longer the teacher talked to learners, the less the students retained the information presented to them.

Even though it may be a known fact that teachers are comfortable with TCT approaches, scholars such as McDowell (2001) and Adeyemi (2008) observed that such methods did not stimulate students' innovation, inquiry and scientific thinking but rather encourages them to cram facts, which are easily forgotten. The implication of such a method may be that knowledge acquired through memorization was short term and may not be used to solve problems in new situations (McDowell, 2001).

2.9. Critiques of LCT practices

LCT approaches, despite their popularity, may not be without critics. The most common threat to LCT approach as stressed by Bredo (1999) and Simon (1999) seemed to be independent learning. The two scholars stated the importance of the team learning and the value of interaction with peers as emphasized in the socio-cultural view of learning. Therefore, the concept of an independent learner may likely breed competition because the social aspect of learning may be completely absent. The view point of this researcher tends to disagree with the two scholars (Bredo, 1999; Simon, 1999). LCT must begin with independent learning by an individual learner because team learning depends on the individual learners' understanding and their contributions on a particular concept. It is true in this sense that one can only share what they know and understand better. The theory of constructivism focusses on individuals constructing their own knowledge; thereafter the knowledge can be shared in a group with peers.

The argument that Simon (1999) raised is based on the fact that each learner was considered unique and required specific attention. Therefore, he urged teachers to provide specific pedagogy for each child as unique beings. This aspect may only work in small sized classrooms with few learners. However, in large classrooms, as the situation stood for Zambia, teachers may have difficulties to use it. So for large class size, the issue teachers of Biology need to think about would be, how to arrive at an all-embracing pedagogy of teaching to meet the learning needs of the whole class. Perhaps the only way to go would be to encourage peer collaboration for learners to share different learning experiences (Musonda, 2009).

MOE (1996) cites limited teaching and learning materials such as text books, charts, large class size and inadequate laboratory facilities as the major hindrances to the implementation of LCT approaches. The study by Schweisfurth (2011) shared the same view that most developing countries with over populated classes, teachers have difficulties to use LCT approaches in their lessons. In trying to think 'outside the box' one would consider that large class size would serve as a platform for LCT approaches because of the concept of 'many learners' being equivalent to 'many brains'. The questions posed would be, 'Are learners thinking?', 'Are they engaged?', 'Are they collaborating or communicating', and 'are they constructing new knowledge?' If all these aspects are present in the lesson, then the aspect of LCT that it fails to work with large class size may not hold at all.

Schweisfurth (2011) shared the same view with MOE (1996) and adds that the challenges hindering LCT implementation were related to lack of supportive environment at teacher training and preparation. Teacher preparation at college or university levels ought to be grounded in LCT approaches so that the practice continued and flowed smoothly even in the schools.

The education system in Zambia through the School Programme of In-service for the Term (SPRINT) framework endeavoured to take care of teachers' professional gaps in the schools by allowing teachers of the same grade or same learning area meeting in their Teacher Groups (TGs).

In Uganda, primary school teachers changed classroom layouts in response to promotion of LCT pedagogy, but most of them found it difficult to place students in groups in overcrowded classrooms or to carry out meaningful pair or group activities (Altinyelken, 2010). For LCT pedagogy to work effectively in developing countries, the policy on learner-centred education ought to be very clear so that teachers find it easy to understand and interpret it in their teaching. Schweisfurth (2011) observed that there is usually a gap between policy formulation and policy intention which if bridged may help improve classroom practice. This was one of the barriers to effective implementation of LCT approaches where policy and practice were at variance.

2.10. Misconceptions of LCT approaches

The understanding and practice of LCT may vary from teacher to teacher because of the misconceptions that teachers may hold. It seemed a common belief that LCT could not be conducted without science equipment and apparatus. Though practical work and experiments were appreciated in science lessons, Watts and Bentley (1995) stressed that if the role of learners was just to follow step-by-step instructions or fill in the blanks on a worksheet, the learners would have little involvement in either the process or the results (product). Often times LCT had been associated with group work. Group work being a good teaching strategy may be difficult to be qualified as LCT if teachers of Biology did not critically think about it and planned for its effectiveness to work as such. Further, the strategy of question and answer often times have been perceived as LCT approaches. On one hand, it might be so, however, it largely depends on whether teachers critically think about the questions and the motive of the questions. Secondly, questions that promote thinking may be of value to learners' thought processes.

2.11. LCT versus curriculum teaching and learning materials

The paradigm shift from TCT to LCT should therefore correspond with educational curriculum materials that will serve as a guide to the teachers and other educators in the provision of education. In this context, educational curriculum materials such as syllabus, lesson plan and teaching and learning aids are critical in the teaching and learning processes. The utilization of curriculum materials may not go independent of teaching and learning strategies. Therefore, this requires that teachers carefully engage in the lesson planning process. Each of these education curriculum materials is explained further in the subsequent sections.

2.11.1. Syllabus

The syllabus guides the flow of the teaching process at classroom level. The syllabus means more than just topics and subtopics of particular grade levels. It is a requirement for teachers of Biology to be well acquainted with general outcomes of the syllabus and what kind of teaching and learning is being advocated for. This also goes with the methodologies that must be used for effective learning to take place.

The revised curriculum for 2013 incorporated knowledge, skills and values aspects unlike the old curriculum which just had knowledge level. In addition, this curriculum is spiral in nature where topics build up from lower levels to higher levels in terms of depth of coverage on each particular topic. This arrangement provides the background of each topic that learners cover at each grade level coupled with specific outcomes, knowledge, skills and values for different topics (MESTVEE, 2013). The inclusion of skills and values in the syllabus served the more reason for the emphasis by the ministry of education on the use LCT in biology teaching.

The appropriate use of the syllabus may help teachers of Biology to know the condition of the learners in terms of what topics they learnt before the topic at hand and its relevance to the lesson at hand. According to MESTVEE (2014), such connection of concepts should not miss out in the use of LCT approaches. The Ministry of Education hopes that when teachers engage in the approach, it may result in maximum participation of learners both in and outside classroom (MESVTEE, 2013).

2.11.2. Schemes of Work

Schemes of Work (SOW) are derived from the syllabus; the scheme of work served as guideline that defined the structure and content of a particular topic. It mapped out clearly how resources such as books, apparatus, teaching methodologies, class activities, time and assessment strategies would be used to ensure that the learning outcomes of the syllabus were effectively met. The design and structure of the SOW vary from school to school mainly in terms of content coverage and also availability of teaching resources in a particular school or cluster.

2.11.3. Teaching and Learning Materials (TLM)

Teaching and learning materials (TLM) such as models, charts, laboratory apparatus, including textbooks were important in the teaching and learning process because they carry in them the concepts/ content that learners would learn in a particular lesson. LCT approaches demanded the use of TLM in day-to-day lessons not only for the understanding of scientific concepts in a particular lesson but also helped teacher in

bridging gaps within or among concepts. The availability of these resources in lessons were meant to bring motivation, increase interest, maintain concentration and make learning more meaningful (MESVTEE, 2014). The situation in most secondary schools was that educational facilities and resources were inadequate for effective teaching and learning hence teaching was done theoretically, even for practical lessons (MESVTEE, 2013).

2.11.4. Lesson plan

A lesson plan serves as a guide to the teacher in the delivering of a lesson. It is very easy to deduce from the lesson plan if the lesson to be conducted will be learner-centred. MOE (2009) contends that the tasks on the lesson plan will tell the direction and flow of the lesson. Lesson planning in Zambia is policy and therefore, a must for teachers. MOE (1996) stresses that careful preparation of lesson plans by teachers is one of the most important pedagogical routines that should not be missed. As a guide to the teacher, it is important that Biology teachers take it upon themselves to adequately plan for their lessons in terms of content, activities for the learners, teaching strategies and appropriate TLM to provide learning experiences to the learners for life in and outside school (MESVTEE, 2013).

The skilful and creativity of Biology teachers is very cardinal not only in lesson planning, but also in both lesson delivery and evaluation. The serious reflections teachers make on their lessons in terms of planning, delivery and evaluation eventually yielded improved classroom practices (Stuart, 1999). In the same vein, Jacobs, Gawe and Vakalisa (2002) stressed that although lesson evaluation depends on the achievement of objectives in a particular lesson, this may not be the case often times. The three scholars argue that learning is unpredictable and unobservable because many times learning occurs only in the mind. This may therefore imply that when teachers plan, their lesson outcome or objective may not necessarily be attained in one lesson. It may take several lessons to have objectives achieved because in employing LCT approaches, learners' learning becomes a factor as to whether the teacher proceeds or slows down. This then, required patience on the part of Biology teachers in playing their roles as facilitators and also intensive study of TLM that could assist in raising learners' ability to apply concepts in new situations.

In Swaziland, the study by Stronkhorst (2001) reported that although lesson planning was a must to get through a lesson, teachers wrote them as required by administrators but mostly only after the lesson had been taught. More purposefully and thoughtfully lesson planning was not done. He further stated that teachers were more engaged in content delivery than attaining learning objectives. The situation may not be different in Zambian schools as emphasized by MESVTEE, (2012) that in planning for LCT, the critical element was for teachers to consider learners as they plan for their lessons. This implied that in the 'invisible' part of the lesson (at planning stage), the learners must be 'visible' in the mind of the teacher (MESVTEE, 2014).

2.12. Teaching Strategies associated with LCT approaches

Chaka (1997) reported that although the practices of LCT approaches vary regarding its implementation, teachers matched their perceptions of the LCT approaches mainly to group and pair activities. Supporting the study by Chika (1997), Froyd (2007) stressed that LCT approaches ought to emphasise activity, discovery and independent learning through strategies such as question and answer, inquiry-based learning, experiential learning, collaborative learning, problem-based learning and project-based learning. Although these teaching strategies seem to stand out, teachers of Biology may be encouraged to mix them during lesson delivery to be able to cater for the learning needs of the majority of the learners. The mixing of the LCT strategies largely depends on the "difficulty of contents, level and interest of learners and availability of learning materials" (MOE, 2009, p. 15). The effectiveness of these LCT approaches, therefore, depended on how Biology teachers utilised them in their lesson delivery.

2.12.1. Group Work or Team Learning

This is also referred to as co-operative learning. The common trend about group work was that it was equal to LCT. While this assertion is appreciated that in groups, learners have the freedom to discuss their conceptions and ideas with fellow learners. They can also agree, disagree and resolve learning concepts in their groups. According to Nkoya (2009), the approach of group work encouraged development of

skills like problem solving and critical thinking in learners. In their interactions in group work, learners developed communication skills (Jacobs, Gawe and Vakalisa, 2002). However, if not all learners are participating, then the whole purpose of group work activity is defeated. MOGE (2016) supported this assertion that learners required tasks that were challenging and provoking if group work was to be effective. The assigned tasks ought to warrant group work so that learners have the motivation to be engaged and also appreciate the views of others. Jacobs, Gawe and Vakalisa (2002) seemed to suggest that learners who were taught individually rather than co-operatively failed to develop social and communication skills which were required in working with others in and outside school.

2.12.2. Problem-Based Learning

A problem-solving approach enabled learners to learn more effectively. This method was based on the premise that by applying the knowledge they gained early on during the course of their learning (thus not merely at examination time), leaners were more exposed to situations they would normally face outside of the classroom and could thus become more adaptable. Problem-solving was a very real part of the learning process. Greeno, (2006) argued that this approach assumed a very crucial role for learners in that it presupposed that learners took on some of the responsibility for their own learning. He further stressed that the approach may help learners to take personal action to solve problems, resolved conflicts, discussed alternatives, and focused on thinking as a vital element of the learning process. It therefore provided learners with opportunities to use their newly acquired knowledge in meaningful, real-life activities and assisted them in working at higher levels of thinking.

2.12.3. Discussion or Question and answer approaches

This is a planned and systematic teaching- learning conversation between the teacher and the learners and among learners. This approach was important because it provided opportunities for learners to contribute their own ideas in the lesson. Discussion and Question and answer methods have been classified as LCT approaches because they encouraged active learning. The baseline survey report by MOGE (2016) revealed that questions used for discussions or question and answer

teaching approaches were those that did not solicit demonstration of reasoning from the learners and that were simply demanding ‘yes’ and ‘no’ answer. Further, the survey report seemed to suggest that questions that solicited for ‘yes’ or ‘no’ did not enhance thinking in learners. In the same vein, questions asking for definitions encouraged a lot of memorization by learners because the real understanding of particular concepts was not being achieved. Questions asked in biology lessons ought to have a purpose and focus. They should drive the lesson forward while galvanising the learners’ thoughts and discussions to the core of the lesson. The high number of questions in a lesson may be an indicative of dominance of teacher-centred approaches being applied by teachers (MOGE, 2016).

2.12.4. Experimentation

Biology teaching required the use of experimenting by learners as a way of confirming their conceptions and at the same time disproving their misconceptions. Experiments needed to involve hands-on-activities where learners interacted with apparatus, models, and chemicals as well as nature. It was crucial for teachers of biology to plan and manage their lesson time very well while learners were engaged in an experiment. The baseline survey report (2016) revealed that teachers spent very little time in supporting learners’ experiments or activities. The only support given was usually during lesson evaluation on the lesson plan that the lesson and the experiment were successfully delivered. Such support was not very beneficial to the learners.

The study by Mudenda (2008) mentioned of a number of reasons why experiments were avoided in biology lessons. Teachers shunned conducting experiments mainly because they lacked adequate knowledge to handle practical activities. Secondly, conducting experiments was hampered due to large class sizes against limited materials (apparatus and chemicals). Such situations caused learners to crowd over very few available material resources making the acquisition of science process skills very difficult to attain (Mudenda, 2008). The loss of interest to perform experiments may not just be for teachers, but also for learners as well.

2.13. Teacher Professional Growth (TPG)

The realisation of LCT and appropriate curriculum support is not achievable without a strong focus on teacher learning and professional development (Annette, et al, 2002). The Zambian Policy on Continuing Professional Development (CPD) advocates for lifelong learning of teachers (MOE, 1996). The policy acknowledges that teaching is a learned and a learning profession, therefore, a mandate for every teacher to continue learning from one another with regard to their classroom practice in terms of content and pedagogy (MOE, 1996). As already alluded to, SPRINT as an existing framework for TPG in Zambia, is coordinated and implemented at school level through TGM (MOE, 2007). In the absence of TGM, LCT may be viewed as difficult to attain. Teachers should come to a realization that participation in CPD is a personal responsibility undertaken solely for improvement of one's professional knowledge and skills (MOE 1996; Haambokoma et al., 2002; MOE 2010).

Trowel and Bamber (2005) further stresses that if teachers were engaged in CPD activities, it would be easier for them to adapt teaching approaches that may achieve the desired learner-centred approaches. The ultimate goal for teachers' involvement in CPD is to improve classroom practice (Gibbs et al., 2004; MOE, 2010).

2.14. Conclusion

This chapter discussed, by examining available literature, the meaning of LCT and its possible consequences on learner performance and achievement. By highlighting the various ways in which LCT impacts on learner participation, engagement and eventually achievement, opportunities for integrating LCT in classrooms have been explored. In Zambia, one of the crucial aims for conducting CPD is to promote learner-centred lessons in the classroom. Among the implementers in the education sector, it was considered that, firstly, teachers needed to understand the fundamental principles and practices of learner-centred education, although the ultimate aim was to ensure that learners were developed holistically. Learner-centred education is defined in Zambia by MESTVEE (2014, p. 11) with some key features like "The learner's thought process takes centre stage", "The teacher provides support as well as challenges to the learner", "Learners express their own thoughts", and "learners have dialogue and debates".

This research therefore sought to find out how teachers of Biology understand and practice LCT approaches in their Biology teaching. The result of the study would inform the researcher on the necessary interventions to suggest for inclusion in CPD activities at school level. It was hoped that when teachers' understanding and practices of LCT were enhanced, their teaching skills would improve, and translated in effective learner-centred lessons. Effective learner-centred lessons promoted quality learning and rendered improved learner achievement.

CHAPTER THREE: METHODOLOGY AND RESEARCH PROCEDURES

3.1. Introduction

This chapter discusses the research methods which were employed in this study. It describes the research design, study area, study population, study sample, sampling techniques, data collection, data collection procedure and timeline, data analysis and ethical considerations.

3.2. Research Design

This study employed descriptive research design. The study adopted qualitative methods because they are typically more flexible and allow greater spontaneity and adaptation of the interaction between the researcher and the study participant (Bernard, 1995). The strength of qualitative research lies in its ability to provide complex textual descriptions of how people experience a given research issue. In general terms, qualitative research is a type of scientific research which comprised an investigation that:

i. Sought answers to a question.
ii. Systematically used a predefined set of procedures to answer the question.
iii. Collected evidence.
iv. Produced findings that were not determined in advance.
v. Produced findings that were applicable beyond the immediate boundaries of the study.

Additionally, qualitative research approach helped to generally examine target teachers' words and actions in narrative or descriptive ways more closely, and represented the situation experienced by participants in their natural settings **(**Johnson & Christensen, 2004).

Further, it also seeks to understand a given research problem or topic from the perspectives of the local population it involves.

Therefore, qualitative methods of data collection and analysis were employed in the study.

3.3. Study area or site

The study took place in Kabwe district in six secondary schools. These were Kabwe, Highridge, Kalonga, Mukobeko, Chindwin and Bwacha. The study used secondary schools only because of the adequate infrastructure that these schools have such as laboratory rooms which were absent in most combined schools. At the time of the study, Kabwe district had eleven secondary schools and the choice of six secondary schools out of the eleven in the study served a good representation of the population. The schools selected in the study were better off in terms of: infra-structure, teacher supply and availability of teaching and learning materials.

3.4. Study population

The study was conducted in the six secondary schools of Kabwe district targeting twelve teachers of Biology teaching grade ten and eleven and one hundred and twenty pupils; twenty pupils per school. The researcher targeted the teachers in these schools because of their knowledge and skills acquired from the SMASTE training whose focus among many factors, was to promote LCT practices among teachers of mathematics, science and technology subjects. The learners used in the study were those doing grade ten and eleven at the time of the research. Twenty learners per school were used; ten from grade ten and eleven respectively.

3.5. Study sample

The study sample comprised twelve teachers of Biology and one hundred and twenty learners. The distribution per class of both grade ten and eleven was ten learners as explained in section 3.3.

3.6. Sampling techniques

The purposeful sampling was used to collect data from all the targeted respondents. Teachers of Biology were purposively selected in the study because of the knowledge and skills they possessed from learner-centred training under SMASTE project whose focus was teachers planning and delivering learner-centred lessons in mathematics and science. In addition, the same teachers were oriented during the launch of the revised curriculum where learner-centred approaches were highly recommended to be used in their Biology teaching. The study targeted teachers who taught Biology at grade ten and eleven. There were twenty learners selected per school; ten from grade ten and ten from grade eleven. The ten learners per grade level were purposively drawn from the classes of the target Biology teachers used in the study. The attendance registers were used to select the twenty pupils per target class of grade ten and eleven. Learners who were in the target classes for more than one term participated in answering the questionnaire. The choice of learners in this way was on basis that they had more interactions with their Biology teachers' way of teaching and therefore meaningful data would be gathered from them.

3.7. Data collection

The researcher developed instruments that were used for data collection. The instruments or data collection tools answered the research questions and comprised questionnaires and lesson observation tools, document analysis guide and interview schedules. Use of a variety of data collection tools was advantageous and supported by Crown (2010) who stressed that if several different sources of data are used, it increased the probability that the findings presented an accurate picture (Crown, 2010).

The documents that were checked were the syllabus, schemes of work and lesson plans. For lesson plans, the purpose was to have the knowledge of what lesson

planning teachers of Biology and whether it was in line with learner-centred teaching that was recommended in the revised curriculum. Document checklist also gave an insight of how Biology teachers planned their lessons.

Questionnaire

Questionnaires consisting of open and closed questions were used for data collection. These were answered in written form by respondents. The questionnaire consisted of four parts with Likert-type, ranking type, and free-response type questions.

Lesson observation schedule

The tool was meant to capture the information on the lesson plan and link it to what took place in the lesson. For the lesson plan, the purpose was to capture aspects that focussed on LCT approach and how these were actualised by learners in the lesson. Also how learners interacted with concepts and tasks or activities in the lesson. Furthermore, the tool also focussed on the general LCT classroom environment as described by the constructivist's theory. In addition, concentration was also given to the teaching approach planned for, teaching and learning materials whether improvised or not and the introduction, development and summarisation of the lesson. The twelve teachers of Biology taught three lessons each. Their lesson plans, lessons and learning were all analysed to generate qualitative data.

Interview schedule

The interview initiates a dialogue between interviewer and interviewee aiming at obtaining the individual views on the issue (Flick, 2011).

The study used semi-structured interviews to collect data. Interviews were used to explore the views, experiences, beliefs and motivations of individual respondents. In this study, the interviews allowed the researcher and the respondents to elaborate more on issues that may not have fully been covered or explained in the questionnaire. Issues such as teachers' thoughts, feelings, intentions, viewpoints and experiences which would reflect their views and practices on LCT in their Biology teaching were of importance in this research.

Document checklist

Curriculum teaching and learning materials were analysed in the study with a view to establish their availability with the respondents and also if they were written in a manner to support teachers use of LCT approaches in their Biology teaching. Teaching and learning materials such as Biology syllabi, lesson plans, schemes of work and records of work were studied. The purpose for document checklist was to find out if the teaching documents supported Biology teachers in using LCT approaches. If it was there in the curriculum, did the teachers reflect it on their lesson planning? These documents are key for Biology teachers to implement LCT approaches and therefore the information in them must correspond.

Prior to the actual data collection process, the instruments were tried out in one school. The purpose of piloting the instruments was to ensure their validity in terms of clarity of questions or statements. Questions and statements that were not clear were later on rephrased. The questions that were redundant were abandoned. Pre-testing also gave the researcher an insight of how long it would take to complete the research in each school.

3.8. Data collection procedure and time line

The procedure for data collection involved informing head teachers of the target schools about the exercise well in advance. The actual exercise for data collection was conducted when schools were in session. Prior arrangements were made with the target school head teachers so that teachers of Biology teaching the target grades were aware of what was expected of them and also to ensure that teaching and learning was not disrupted. The study also involved actual lesson observations where a target teacher of Biology was observed for three lessons. The researcher hoped that, observing three lessons by one teacher at different times may bring out the actual tendency or practices prevailed among teachers of Biology as opposed to observing one lesson. This meant six lessons were observed from two teachers per one particular school making a total of thirty-six lessons observed from twelve teachers as the target for the study. For the purpose of grouping the data, averages for the three lessons per teacher were calculated and generated as lesson 1, lesson 2 and lesson 3.

3.9. Data analysis

Since data could only make meaning to the researcher and other stakeholders after it had been analysed, the data collected from the study was analysed qualitatively according to research themes generated from research questions and other key sub themes from the questionnaires. In this research, the quantification of some responses to closed-ended questions was an important aspect of understanding teachers' views, needs and challenges on the use of LCT in Biology teaching.

Qualitative methods, therefore, contributed to this study by helping to find out the feelings, thoughts, and ideas of teachers on the use of LCT in Biology teaching. The use of open-ended questions and interviews in the study facilitated the identification

of the above ideas, feelings and views from teachers as they answered the questionnaire and participated in the interview.

3.10. Ethical considerations

The researcher considered ethical concerns of respondents. As observed by Michael (2002) the issues of consent and confidentiality were very important in any research and must not be ignored by the researcher. Firstly, it is a known fact that respondents have rights to either participate or not. In view of this concern, prior arrangements were done with permission sought to conduct the activity. This was accompanied by clearly explained objectives of the research to avoid misunderstandings between the researcher and the participants. Secondly, the identities of the respondents involved in the research were protected and treated with respect (Hopkins, 2002).

3.11. Conclusion

The research was conducted using qualitative methods of collecting and analysing data to explore views of Biology teachers on the use of LCT approaches in their teaching. The target sample for both Biology teachers and learners were taken from six secondary schools of Kabwe district. The tools used for capturing data comprised both closed and open-ended type questions that aimed at answering the three research questions, 'How do teachers of Biology use the LCT approaches in their teaching?'; 'What views or perceptions do teachers of Biology hold on LCT approaches in the teaching of Biology in secondary schools?'; 'How do the available curriculum teaching/learning materials support teachers in implementing the LCT approaches?' Participants were protected by ensuring that ethical issues of anonymity were adhered to.

CHAPTER FOUR: PRESENTATION OF RESEARCH RESULTS & FINDINGS

4.1. Introduction

This chapter presents the findings of the research aimed at investigating Teachers' Practices of LCT approaches in the teaching of Biology in secondary schools of Kabwe district. The objectives of the study were to: investigate the use of LCT approach by teachers of Biology in their lessons; explore the views of teachers of Biology about LCT approach in the teaching of Biology in secondary schools and establish the link between curriculum teaching/learning materials and the implementation of the LCT approaches by teachers of Biology.

The findings are presented according to the emerging themes generated from research questions from both teachers and learners. The headings are sub divided into broad areas as follows: characteristics of respondents for both teachers and pupils, the perceptions teachers of Biology have on the meaning of LCT approaches, how teachers of Biology use the LCT approaches in their teaching and how the available teaching and learning materials support teachers in implementing the LCT approaches.

The respondents in the study were classified into two: teachers and learners. When it came to the interview schedule, teachers of Biology were coded using letters. This was for the purpose of tallying the codes with the specific responses that they gave as individuals. Since the sample involved twelve teachers of Biology, codes were generated from the letters; 'Tr' standing for 'Teacher' followed by the first letter or letters of their schools such as; TrH1, TrH2, TrKb3, TrKb4. TrC5, TrC6, TrM7, TrM8, TrK9, TrK10, TrB11 and TrB12. The codes were used also for selected quotes or excerpts to show their own words during the interview schedule.
(H: Highridge, Kb: Kabwe, C: Chindwin, M: Mukobeko, K: Kalonga, B: Bwacha, Tr: Teacher)

For the learners, the codes were not used because the questionnaire for them had closed questions and demanded only one response.

4.2. Characteristics of Respondents

There were 12 teachers who participated in the study and these were drawn from six schools, two per school. The study also had one hundred and twenty learners; twenty per school. These participated in the study in terms of answering questionnaires. Biology lessons were also observed; three lessons per teacher. The sampled teachers also participated in the interview schedule.

Of the 12 Biology teachers, 7 were male while 5 were female as shown in Table 4.1.

Table 4.1: Gender of respondents

Gender	**Frequency**
Female	5
Male	7
Total	**12**

The under-representation of females in degree qualifications could be a result of the few females that choose to take up science programmes in higher learning institutions, which some researchers have linked to lack of interest or phobia for science (Hatchel & Aveling, 2008).

The age distribution of the teachers ranged from 25 to 45 and categorized as shown in Table 4.2.

Table 4.2: Age of respondents (Biology teachers)

Age	**Female**	**Male**
21 -25	0	1
26 – 30	1	0
31 – 40	2	3
41 -45	2	2
Total	5	7

The grade taught by the respondents were shown in Table 4.3.

Table 4.3: Grades taught by gender

Grade taught	**Female**	**Male**
	Frequency	Frequency
10	2	3
11	2	3
Both 10 and 11	1	1
Total	**5**	**7**

The information about the highest qualifications possessed by the respondents is shown in Table 4.4.

Table 4.4: Highest qualifications of respondents

Highest Qualification	**Male**	**Female**
	Frequency	Frequency
Diploma	2	3
Advanced Diploma	0	0
Bachelors' Degree	4	2
Masters' Degree	1	0
Total	**7**	**5**

Most teachers teaching Biology are degree holders which is the rightful qualification for teaching Biology at senior secondary schools.

4.3. Use of LCT approaches by teachers of Biology in their teaching

The findings on how teachers of Biology use the LCT approaches in their teaching were generated from three sources; questionnaire (Appendix A, Section C), interview schedule (Appendix C), lesson observation tool (Appendix D) and pupil questionnaire (Appendix E). For lesson observations, the tool looked at lesson planning, delivery of lessons and learning. Thirty-six lessons were observed. Each teacher taught three Biology lessons and all the three were observed.

4.3.1. Lesson planning

The aspect of lesson planning was studied from both the lesson observation and the lesson plan analysis as part of curriculum documents for teaching. The planning focussed on the few selected elements that could be considered as evidence for LCT. The elements that were of interest in this study were the introduction, development and the summary of the lesson. Further the focus was on lesson objectives, subject matter knowledge (based on the curriculum), activities for learners, abilities of learners (condition of learners and also availability of teaching and learning materials in the lesson.

The lesson plan was used also to assess whether lessons were planned based on both sufficient subject matter knowledge and pedagogical knowledge. The required subject matter knowledge and pedagogical knowledge was compared with what was stated in the Biology syllabus for the particular grade level (document analysis). The lesson plan was also for the purpose of checking on activities that were planned for learners, the ability of learners and teaching materials /aids prepared that were planned for the lesson. The teachers that were observed for Biology lessons had their lesson plans in the teaching file. The only variation was that in one school, teachers used hard cover exercise books for their lesson planning. In the other five schools, teachers are given already made templates for lesson planning where they just filled in necessary information under each component. In these schools, teachers of Biology complained of lack of adequate space on the lesson plan templates.

TrKb3 had this to say on the lesson plan template *"we leave out a lot of important details when writing lesson plans because there is no enough space, you just try to squeeze what you make sense of".*

Although teachers complained of inadequate space on the lesson plans templates, the key components such as; introduction, development, teaching and learning aids, rationale, reference books, conclusion, evaluation and general information were available. Within the rationale, teachers stated one or two LCT approaches that they intended to use in their Biology lessons. It was learnt from TrKb3 that the teaching and learning aids stated on the lesson plan whether worked in the lesson or not was dependent on its availability in the school. Due to the unavailability of teaching aids, TrH1 went on to say that, "*This makes us change the teaching methodologies to TCT*

at the eleventh hour". The implication is that the lesson planning is done without consideration of teaching and learning materials available in the school.

Further, it was a common view by the respondents that marking of lesson plans by the head of department or deputy head teacher was done usually before implementing lessons. This implies that even if teachers of Biology did not adhere to the lesson plans, it was nobody's business to counter check whether the teaching and learning was in line with the syllabus and lesson plan itself or not.

Figure 4.1 represents the outcome of the analysis of the lesson planning of the three lessons.

Key:

A: Were the introduction, development, and summarization parts in the lesson plan?

B: Was the lesson flow planned to achieve lesson objectives?

C: *Was the lesson planned based on sufficient subject matter knowledge?*

D: *Was the lesson planned based on sufficient pedagogical knowledge?*

E: *Were the activities or tasks of learners planned?*

F: *Did the teacher consider the ability of learners?*

G: *Were teaching and learning materials/aids prepared to enhance learning?*

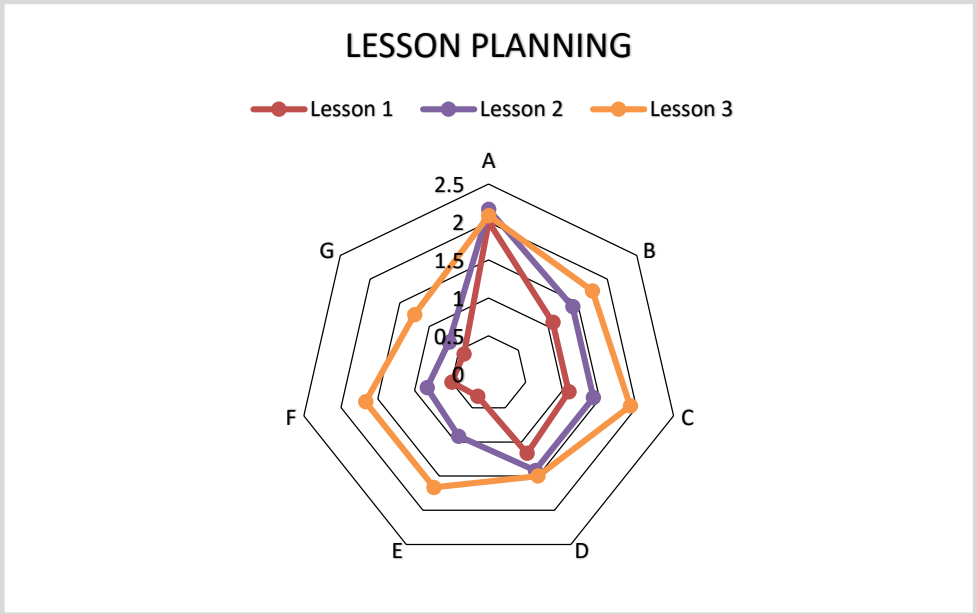

Figure 4.1: Analysis of Lesson planning

For lesson (one) 1, as shown by the inner line, three elements are lowly scored and close to zero. These are 'considering learners ability', 'activities or tasks planned for learners', teaching materials /learning prepared to enhance learning of learners.

Considering lesson two, as indicated by the middle line, the lowly scored element was that of 'teaching materials to enhance learning'. The same element was lowly scored also for lesson three. For lesson three most of the elements moved towards the outer line indicating remarkable improvement in most of the elements. In all the three lessons, the part for lesson introduction scored higher than any other aspect. This is an indication that teachers of Biology consider the introduction part an important element in lesson planning.

4.3.2. Lesson delivery

A rubric was created also for lesson delivery as was the case with lesson planning. The elements considered were 'introduction', 'development' and 'summarisation'. Other aspects considered vital in lesson delivery were availability of teaching and learning materials for learners to use and the issue of improvisation. The findings from lesson delivery is shown in the Figure 4.2 with the key explaining what the letters stand for.

Key:

H: Was the introduction conducted as planned?

I: Was the development conducted as planned?

J: Was the summarisation conducted as planned?

K: Did the teacher intend to confirm a particular concept or values in the process of teaching?

L: Was there time for evaluating the lesson to confirm whether the learners had learned?

M: Did the introductory part of the lesson motivate pupils?

N: Were the learners given time to think?

O: did the teacher's questions motivate learners' thoughts during the lesson?

P: Did the teacher use any kind of teaching materials?

Q: Did the teacher use improvised or locally available teaching material?

P: Were the teaching materials used in the lesson enhance learners' understanding?

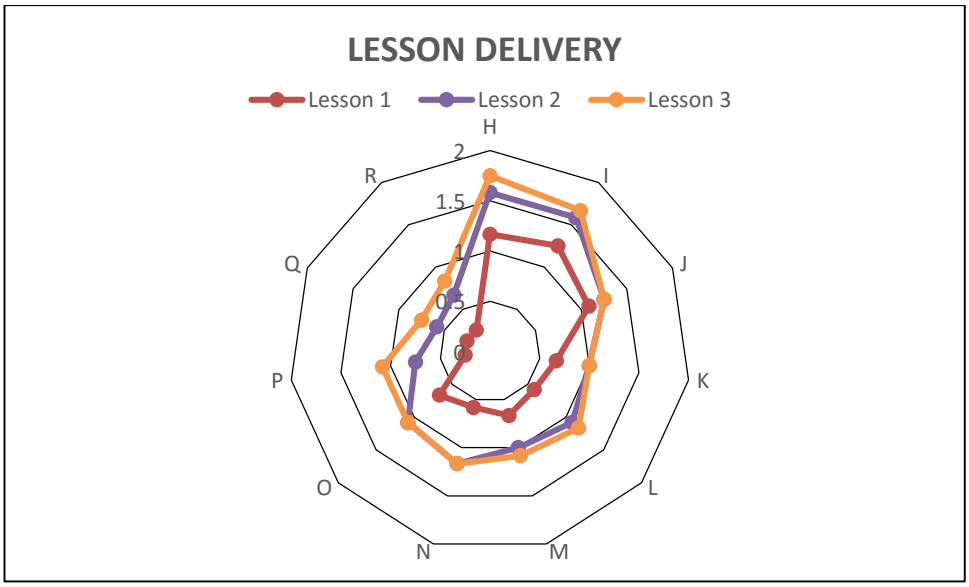

Figure 4.2: Analysis of lesson delivery

The lowly scored elements observed from lesson one, two and three were 'use any kind of teaching materials', 'use improvised or locally available teaching material' and 'teaching materials used in the lesson enhance learners' understanding. Of the three lessons, lesson one and two recorded the lowest score generally on all the elements. Lesson three showed a little improvement in elements to do with 'learners given time to think', use of teaching materials', teacher questions and many others as shown in Figure 4.2. It should be noted that the three items that were lowly scored in lesson one applied to lesson two and also lesson three, however, with a little bit of improvements in lesson three by all the participants.

4.3.3. Analysis of Learning

Analysis of learning was purely linked to the lesson planning and lesson delivery. The focus was purely on how the learners were learning in the lesson. The key below showing what the letters stand for on Figure 4.3

Key:

S: Were the learners able to find core contents or concepts on their own?

T: Were the learners able to conclude what they learned?

U: Were the learners' interests motivated in the lesson?

V: Were the learners thinking deeply to answer the given questions/task?

W: Did the learners participate in the lesson, was there a presentation by learners in the lesson?

Y: Was there a discussion among learners to find answers or better solutions?

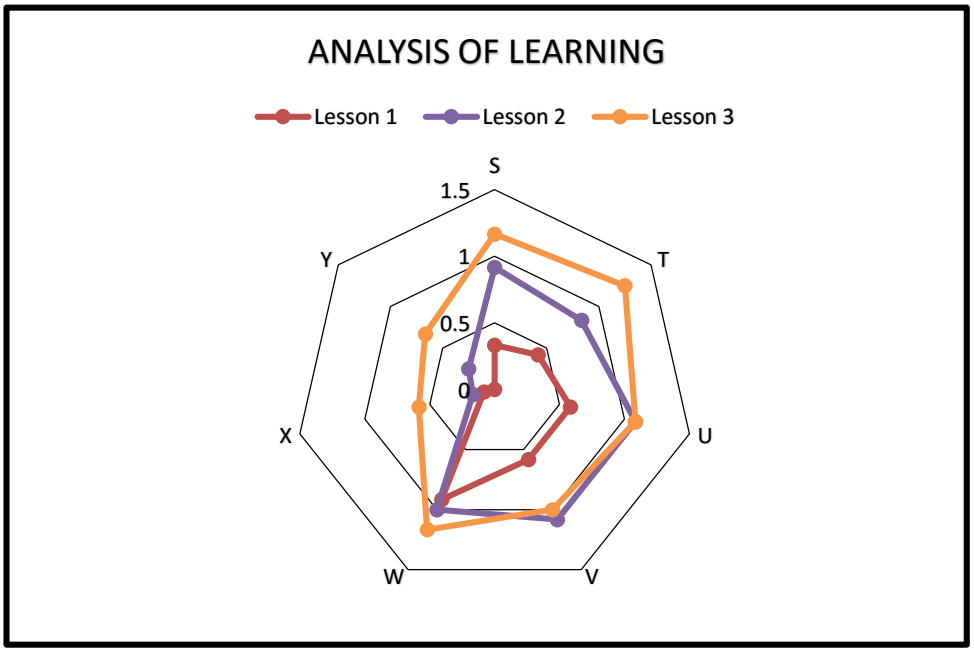

Figure 4.3: Analysis of Learning

Lesson one had lowest scores in elements namely; 'was there a presentation by learners in the lesson'? Was there a discussion among learners to find answers or better solutions to the given tasks'? Were the learners able to conclude what they learned in the lesson'? And were the learners able to find core contents or concepts on their own'? These aspects were scored lowly from lesson one. The critical part of learner-centred lesson is that learners must manipulate the teaching and learning materials, draw their own conclusions and then present their findings. If the TLM are absent, learners may just be forced to be engaged in activities without them seriously thinking about what they are learning. In lesson two, these aspects shifted a little bit outwards to show slight improvement. In lesson three, the same aspects showed much improvement. Generally, most elements scored moderately in both lesson two and three. These improvements occurred after observing these lessons. So what if there is no one to sit in class and observe the lessons? Would there still be improvements on the aspects?

4.4. Biology Teachers' views on LCT approaches in Biology lessons

With regards to Biology teachers' views on the implementation of LCT approaches in their lessons, the following verbatim records were obtained from the respondents.

a) Views of TrKb3

"My understanding about the LCT approaches is that most of the learning activities are done by the learners while the teacher serves as a facilitator of the learning. It also implies that learners should not stay idle, they must be kept busy as they are expected to participate fully in the lesson".

b) Views of TrK9

"In my lesson, most of the work is left to the pupils to do on their own in groups. It is only in groups when they are given the opportunity to manipulate variables or specimens where they observe, interpret and compute their finding"

Although the approach of group work was singled out by TrK9, most of the respondents mentioned that group work, discussions, question and answer were the main LCT approaches they used in Biology lessons. To justify their response, the respondents argued that it was through these approaches that learners were able to bring out their views.

4.4.1. Group work, discussions and question and answer as LCT approaches

One of the commonest LCT approach used in Biology lessons is group work. TrK9 explained how she uses group work; *"learners are presented with problems of which they have to devise ways of solving them".*

She further explained that in some classes, groups were permanent and learners knew which group they belonged to. Sometimes the formation of groups was dependent on the nature of tasks to be discussed. Group work involved discussions. Her observation about group formation was that when girls were on their own in a group, there discussions were fruitful, but when they were mixed with boys, they tended to be shy and kept quiet.

In teaching Biology using discussion approaches, TrB10 said that, "*we split the pupils into groups and give them topics to discuss*". His observation was that sometimes, in groups, some learners talked too much and gave others no chance to submit their point of view.

He said, this was so because discussions were not timed, learners ended up going outside the topic at hand. This situation requires the support and proper guidance from the teacher to ensure all learners contributed their views within the stipulated time.

While in groups, TrB11 said that learners shared roles amongst themselves for the purposes of maintaining order in their discussions. The view was supported by TrK10 that the shared roles were only for a specific activity and could only change depending on the subject and the requirements of the teacher at a particular time.

In his narrative, TrK10 mentioned that learners shared roles such as those of chairpersons and secretaries. The chairperson was to read out the task, ask for contributions from the members while the secretary of the group took note of the proceedings and also presented the work done by the group to the rest of the class. The roles of 'chairpersonship' and 'secretary' were mostly played by the same learners, and not all benefited in terms of communication and leadership skills. After presentations by all groups, it was the role of the Biology teachers to consolidate learning points.

In employing the question and answer approach, TrKb4 observed that the teaching approach, although qualifies to be LCT, has some challenges if not taken care of by the Biology teacher. The same respondent stated that effective questioning in classroom required prior preparation by the teacher at planning stage. Besides, she also alluded to the limited teaching and learning materials in her school that incapacitated teachers' ability in the use of question and answer approach.

This was an insightful reflection by TrKb4. The fact that most schools didn't have the Biology curriculum in hard copies served as a challenge for lesson preparations. With respect to the Biology curriculum, TrKb3 mentioned that teachers seemed not to know the extent of topic coverage where high order thinking questions could be extracted from. The same teacher revealed that it was due to the absence of the Biology curriculum that the 'yes' and 'no' questions and questions that demanded for

definitions were inevitable in Biology lessons. Further, she said, after all, most learners like to be asked to state the definitions of terms like 'Photosynthesis', 'Digestion', 'Respiration' and so forth.

Although learners may seem to be active in stating definitions, such questions are closed and may not promote a fruitful and lengthy discussion among the learners.

With regards to questions. TrH2 reported that while open questions allow for divergent views, they were few learners who were able to engage fully and express themselves. '*This then makes the class discussion to be limited to the teacher and few learners', (TrH2).*

In some instances where there is completely no feedback from the learners on a particular question, TrH1 explained that, when found in that situation, he resorted to pair work to try and involve even those learners who had closed their minds.

It was also noted that the usual practice during Biology lessons was that, questions were mainly raised by the teachers. It was very rare for learners to also ask questions to the teachers. This also may be an indication that learners take the back seat of always being the recipient of information. Raising questions to teachers may seem like challenging the knowledge of teachers.

4.4.2. Debates

For instance, during debates, it was noted from the respondents that they would give pupils topics in advance to research on and later to debate on it. TrM8 mentioned that she used this strategy with topics that she considered interesting and easier to be handled by learners. 'My role would just be to add on certain vital information that the learners would have missed in their research. On this, TrK9 said, "*Although this served on time on the part of the teacher, it only worked for topics that were more informative and not practical".* Therefore, this statement implies that it was rare for teachers of Biology to involve their learners in debate, a strategy deemed to also promote communication skills and respect for views of others.

4.4.3. Experimentation

Experiments or practical work enables learners to have hands-on experience and acquire science process skills. However, experiments were in most cases avoided because of limited resources in schools. In view of this, TrC5 mentioned that, *"carrying out experiments is dependent on the availability of the right apparatus and chemicals and in most times, experiments are done in groups and not by individual learners*". The idea of using group work during experimentation was to serve on the chemicals. However, this strategy disadvantaged some learners as observed by TrC6, TrH2 and TrB10 that learning was usually for the particular learners who actually manipulated the apparatus or specimens. For the learners who just 'sit and observe', they did not have much to achieve. This was a common trend when doing experiments in the schools under study. Most schools also availed materials for Biology experiments in the third term and only for grade twelve learners to prepare them for final practical examinations (5090 Biology Paper 3). For most schools under study, the trend was that topics requiring practical activities were pushed forward so that learners cover them in grade twelve as a way of reserving chemicals and apparatus for final examinations.

4.4.4. Teachers' frequent use of LCT approaches

The findings on how often the teachers use the LCT approaches in their teaching of Biology, the respondents said that at least one or two of LCT approaches were used in every lesson. This, they do to ensure that they cater for learning needs of most of the learners. However, they stated that the frequency of LCT use dependent on a number of factors. These were elaborated as follows:

Biology being a very broad subject contained topics that are quite descriptive. On this, TrC6 commented that, '*using LCT depends on the nature of topics'.* The same respondent further cited that the LCT approaches used in teaching 'Nutrition in plants' may not work well in a topic under 'excretion'.

Further, the availability of teaching and learning materials was also a critical factor. As alluded to by TrK9, '*in my department, I can only access chemicals and apparatus when am teaching an examination class'*. She further cited that the school management procures chemicals and other apparatus when national examinations were about to take place. This, in a way, contributed to high failure rate in science

related subjects because learners do not develop skills to handle apparatus or use chemicals and interpret their observations. Seemingly, teachers of Biology displayed a strong belief that LCT approaches could only be effective when learners do experiments.

It was established from respondents that time allocation was another hindrance to LCT. Biology only had 4 periods per week from grade ten to twelve unlike other subjects with six to seven periods per week. Some days Biology has single periods where the application of LCT approaches become impossible to use. In such cases, as mentioned by one TrKb4, "W*e teach using TCT method to beat the allocated time and to finish the syllabus".* Biology teachers further explained that each grade level has specific topics to be covered and so carrying over topics to other higher-grade levels usually brings panic to them.

4.4.5. Characteristics of learners

There were 120 learners that participated in the study. These were drawn from 6 schools; 20 per school, these were grades 10 and 11 learners only. The purpose of involving learners was to also get their views concerning the use of LCT approaches by their teachers of Biology. The details are shown in the Table 4.9.

Table 4.5: Learners grade levels by gender

Gender	**Grade 10**		**Grade 11**		**Total**	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Female	23	36	26	46	49	41
Male	41	64	30	54	71	59
Total	**64**	**100**	**56**	**100**	**120**	**100**

Of the 120 learners, 71 (59%) were male while 49 (41%) were female. With regards to the grade levels, 64 (53%) were drawn from grade ten and 56 (47 %) from grade eleven.

4.4.6. Learners views on use of LCT approaches by their teachers of Biology

In the study, learners' views on how their Biology teachers used LCT approaches in their lessons were collected using Appendix E. Their responses as shown in Table 4.6.

Table 4.6: Learners' views on the use of LCT approaches by their Biology teachers

ITEM	YES	%	NO	%	NOT SURE	%
My Biology teacher asks us to make presentation after group activity	82	68	36	30	2	1.6
My Biology teacher uses teaching /learning aids in Biology lessons	31	25.8	87	72.5	2	1.6
My Biology teacher wants everyone to participate in group activities	49	40.8	62	51.6	9	7.5
My Biology teacher presents situations and problems which provoke thinking in me during Biology lessons.	27	22.5	91	75.8	2	1.6
My Biology teacher tells us to memorize facts and scientific concepts so that we learn	63	52.5	56	46.6	1	0.8
My Biology teacher wants me to think for myself in Biology lessons	43	35.8	67	55.8	10	8.3
My Biology teacher thinks that as pupils we are responsible for our own learning	46	38	70	58	4	3.3
My Biology teacher is more interested in finishing the syllabus than helping us to learn Biology	92	76.6	27	22.5	1	0.8
My Biology teacher lets us work in groups so that we can discover things together	84	70	34	28	2	1.6
My Biology teacher gives us time to say what we have learnt at the end of the lesson	19	15.8	93	77.5	8	6.6

In this study, it was also important to get views of learners about the LCT approaches their Biology teachers used in the lessons. Regarding the item of whether learners made presentations after group activity, 68% said yes, 30% said no and 1.6% were not sure. On whether Biology teachers used teaching and learning aids in Biology lessons, 25.8% learners said yes, 72.5% said no and 1.6% were not sure. Concerning whether Biology teachers made every learner participate in group activities, 40.8% learners said yes, 51.6% said no and 7.5% were not sure. With regards to whether Biology teachers presented problems which provoked their thinking, 22.5% agreed while 75.8% learners said no and 1.6% were not sure. Regarding the fact that Biology teachers encourage them to memorise facts and scientific concepts so that they learnt, 52.5% agreed, 46.6% learners said no and 0.8% were not sure. Concerning the element that their Biology teachers wanted them to think for themselves as learners, 35.8% said that 55.8% said no to the statement and 8.3% were not sure. The aspect of Biology teachers encouraging them that it was learners' responsibility for learning, 38% said yes while 58% said no and 3.3% were not sure. Finding out as to whether Biology teachers were interested in finishing the syllabus, 76.6% said yes, 22.5% said no and 0.8% were not sure. The findings also revealed that 70% said that their Biology teachers allowed them to work in groups to discover things together, 28% said no and 1.6% were not sure. Finally, 15.8% said that their Biology teachers gave them time to say what they had learnt at the end of the lesson, 77.5% said they were not given any chance and 6.6% were not sure.

4.5. Summary

The findings on the use of LCT approaches in teaching Biology revealed that respondents planned and implemented their Biology lessons using LCT approaches. The scenario resulted in a very close linkage between planning and lesson delivery which ultimately brought out effective learning in the learners. However, what was observed was that out of the three lessons, the most improved lesson was lesson three and the trend at lesson planning, lesson delivery and learners learning was such that lesson two was better than lesson one and lesson three much better than lesson two. This inconsistence of three lessons explains a lot about the need to supervise teachers in the way they teach their Biology lessons. This could be professional support from their supervisors at various levels. An interesting observation was also made that

factors that were lowly scored at planning also stood lowly at lesson delivery as well as at learners learning. These included; considering learners ability, activities or tasks planned for learners, teaching and learning aids prepared to enhance learners understanding, use of any teaching materials, use of improvised or locally available materials and discussion among learners to find answers or solutions to given tasks. The elements which scored lowly at planning followed suit during lesson delivery as well as during learning.

It was also interesting to note that the improvements on the three lessons were progressive. This may be an indication that Biology teachers may improve their LCT with frequent monitoring visits by standard officers or any other education stakeholders.

The teachers also cited group work, discussion and question and answer as the main LCT approaches that were commonly used by almost all the teachers because they said these were easy to use during teaching. Other LCT approaches such as role play, field trips, and inquiry-based learning and experimenting were not frequently used because some of them were involving for the Biology teachers and had cost implications.

The views obtained from the learners were in agreement with the perceptions of teachers on LCT approaches. For instance, most learners said ‘yes’ to statements such as; My Biology teacher is interested in finishing the syllabus; my Biology tells us to memorize facts and scientific concepts so that we learn; and most of the learners further said ‘no’ to statements such as; my Biology teacher presents situations that provoke my thinking; my teacher uses teaching and learning materials in Biology lessons. Most learners said ‘no’ to the aspect of whether their Biology teachers used teaching and learning aids. Inadequacy of teaching and learning materials in the target schools was also mentioned by the teachers of Biology. It was also learnt from the learners that the strategy teachers of Biology used was group work.

4.6. Views teachers of Biology hold on LCT approaches

The study sought to find out the views or perceptions teachers of Biology had on the meaning of LCT approaches. On the tool, ten statements were given. Of the ten,

seven statements were contradicting with LCT while three statements were in agreement with LCT approaches. The findings revealed that the respondents had divergent views about the meaning of LCT approaches in that eight out of twelve respondents strong agreed with the statements that contradicted with the approach. Table 4.7 outlines Biology teachers' responses in line with the statements given.

Table 4.7: Biology teachers' views of LCT approaches

Statement	**SA**	**A**	**D**	**SD**	**NS**
It is generally easier for teachers to organize learner-centered lesson as compared to organizing teacher-centred lesson.	5	3	1	2	1
If a lesson has an experiment or activity by learners, it is a learner-centred lesson.	3	7	1	1	0
In a learner-centred lesson, teacher should put more attention to groups of learners than individuals	3	7	0	0	2
Learner-centred lessons focus on the thinking process of learners	3	5	1	2	1
Achievement of lesson objectives is not very important in a learner-centred lesson	4	8	0	0	0
Interactions among learners is one of the important factors in a learner-centred lesson	2	5	4	1	0
Teachers have less work in conducting learner-centred lessons during the lesson, because students can work on their own	8	4	0	0	0
Learner-centred lessons put more focus on the development of varied abilities of learners than memorizing knowledge	3	5	1	2	1
Learner-centred lessons cannot be conducted without equipment/apparatus	4	0	5	3	0
When preparing a lesson for Grade 10 or 11, teachers don't need to refer to the syllabus for lower grade levels	2	0	4	6	0

Biology teachers' divergent views about the LCT approaches also reflected in Figure 4.4.

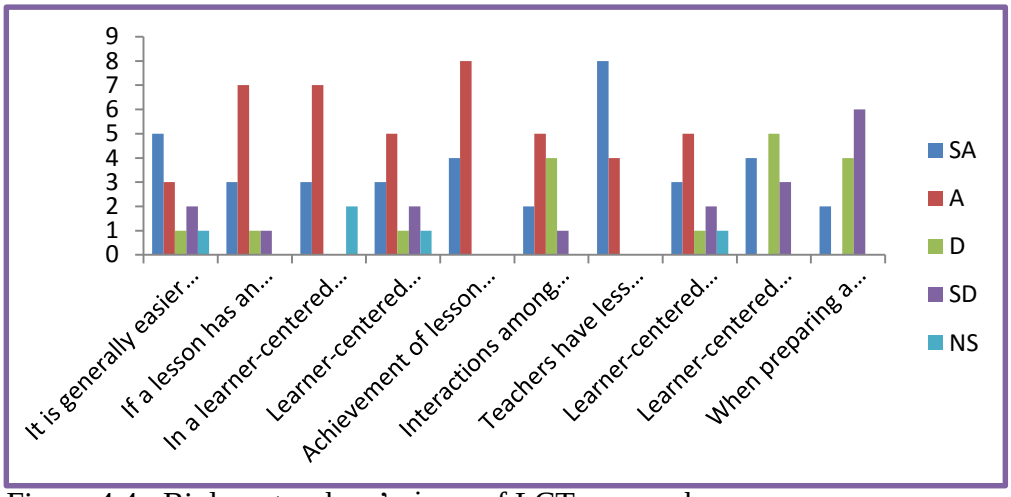

Figure 4.4: Biology teachers' views of LCT approaches

The study sought to find out whether it was generally easier for teachers to organise learner-centred lessons as compared to organising teacher-centred lessons, of the 12 respondents; 5 strongly agreed, 3 agreed, 1 disagreed, 1 strongly disagreed and 2 were not sure. In terms of whether a lesson that experiment or activity qualifies to be a learner-centred, of the 12 respondents; 3 strongly agreed and 7 agreed while 1 disagreed and 1 strongly disagreed. The findings also revealed that 3 strongly agreed and 7 agreed that in a learner-centred lessons the teacher should put more attention to groups of learners than individuals. Only 2 respondents were not sure to comment on this aspect. Regarding the aspect that learner-centred lessons focus on the thinking process of learners; of the 12 respondents; 3 strongly agreed and 5 agreed while 1 disagreed and 2 strongly disagreed. Only 1 was not sure to make any comment. In terms of lesson objectives that their achievement is not very important in a learner-centred lesson; 4 respondents strongly agreed and 8 agreed.

The study also revealed that 2 of the respondents strongly agreed and 5 agreed to the aspect that interactions among learners is one of the most important factors in a learner-centred lesson. However, 4 of the respondents disagreed while 1 strongly disagreed. The findings also showed that all the respondents; 8 strongly agreed and 4 agreed were in support to the fact that teachers have less work in conducting learner-centred lessons during the lesson because students can work on their own.

Concerning the aspect that learner-centred lessons put more focus on the development of varied abilities of learners than memorising knowledge, 3 of the respondents strongly agreed and 5 agreed. However, 1 disagreed, 2 strongly disagreed with 1 respondent not being sure.

The item on whether learner-centred lessons could not be conducted without equipment or apparatus, the study revealed that 4 respondents strongly agreed. However, 5 respondents disagreed and 3 strongly disagreed with the statement.

As to whether, when preparing a lesson for Grade 10 or 11, teachers need to refer to Grade 8 or 9 school syllabus for that topic at hand 2 respondents strongly agreed while 4 disagreed and 6 strongly disagreed to the statement.

4.6.1. Teachers perceptions over learners' performance with LCT approaches

On classifying the performance of learners, respondents revealed that learner performance improved when they used LCT approaches in their teaching of Biology. They rated learners' performance as follows; 4 respondents classified learners' performance as very good, 5 classified the learners' performance as good, 2 as average and 1 respondent classified it as poor as shown in Figure 4.5.

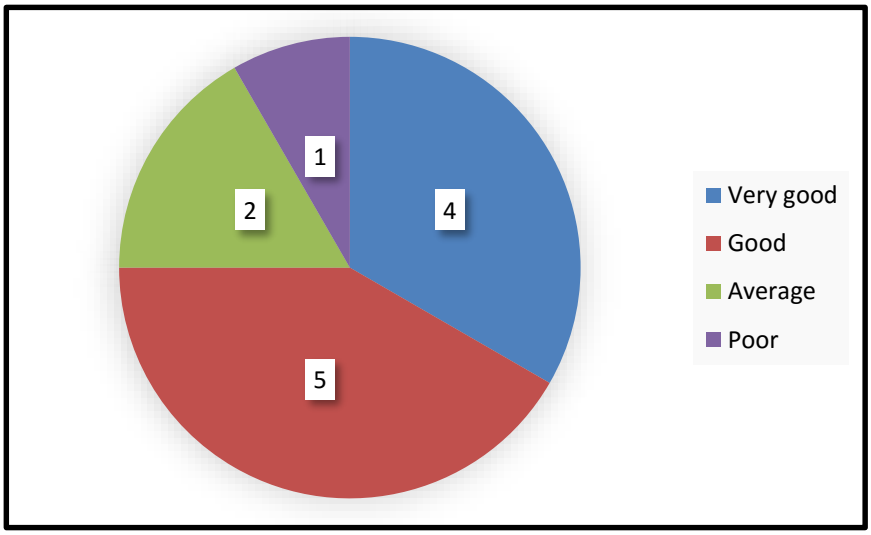

Figure 4.5: Biology teachers' views on learners' performance with LCT approaches

4.6.2. Learners performance without LCT approaches

Additionally, the Biology teachers were asked how they classified the learners' performance when they did not use the LCT in their teaching of Biology, the teachers rated the learners' performance in this manner; 1 out of 12 rated learners' performance as good, 3 out of 12 as average, 3 out of 12 and 5 out of 12 rated the performance as poor and very poor respectively. The data is shown in the Figure 4.6.

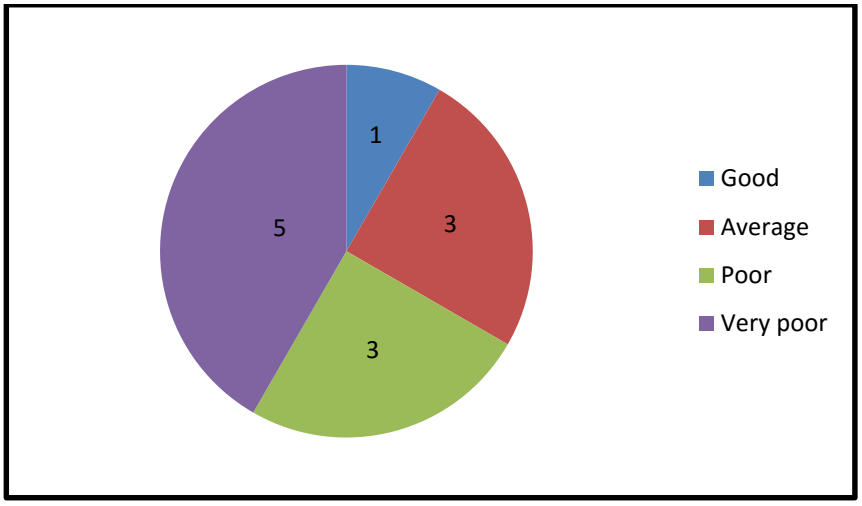

Figure 4.6: Biology Teachers' views on learners' performance without LCT approaches

4.6.3. Training in the LCT approaches

On whether the teachers received any training in the LCT approaches, 8 teachers said that they had received training in the LCT approach while 4 teachers said that they had not received any training. The findings are shown in Table 4.8.

Table 4.8: Respondents trained and not trained in the LCT approaches

Opinion	**Frequency**
Yes	8
No	4
Total	**12**

4.6.4. Adequacy of LCT approaches training to Biology teachers

With regards to the Biology teachers' opinion on whether the training was adequate to enable them use the LCT approach, the information is presented in Table 4.9.

Table 4.9: Rating of LCT training by Biology teachers

Opinion	**Frequency**
Yes	6
No	2
Non-response	4
Total	**12**

Of the twelve respondents; 4 teachers gave no response as to whether LCT training was adequate or not. The non-response could mean the 4 teachers were comfortable with whatever approaches they were using in their Biology lessons. 6 teachers were of the view that LCT training was adequate while 2 teachers said it was not adequate.

4.6.5. The need for more training in the LCT approach

On whether the teachers needed more training in the LCT approach, 5 of the respondents agreed while 2 disagreed. Those that did not respond were 5. The picture obtained from those requiring more LCT training is equal to those who did not give any response at all. The number (2) obtained from those who did not require LCT training is quite low. This implies that more LCT training is needed by 50% of Biology teachers in the study.

4.7. Summary

The findings revealed that the respondents' perceptions on LCT approaches were very much divergent, with the majority of the respondents leaning on aspects that had nothing much to do with LCT approaches. For instance, seven respondents supported the item on 'interactions among learners' that it was one of the most important factors in a learner-centred lesson, ten respondents supported that a lesson that had experiment or activity qualified to be a learner-centred and that learner-centred lessons teachers should put more attention to groups of learners than individuals. All

the twelve responded that teachers had less work in conducting learner-centred lessons during the lesson because learners could work on their own. Four respondents supported that learner-centred lessons could not be conducted without equipment or apparatus and that when preparing a lesson for Grade 10 or 11 while two respondents said they did not need to refer to Grade 8 or 9 school syllabus for that topic at hand. Eight respondents were in support that learner-centred lessons focussed on the thinking process of learners and also put more focus on developing varied abilities of learners rather than encouraging them to memorize.

Despite the varied views about LCT approach, the respondents mentioned that learners' achievement was positive when teachers used LCT approaches. However, they said they still needed more training on approaches.

4.8. Curriculum teaching-learning materials support to LCT approaches

In order to find out if the available curriculum education materials supported teachers in implementing the LCT approaches, the data tools Appendix B (document analysis) and Appendix C (interview schedule) were used.

Teaching and learning materials played a major role in supporting teachers to use LCT approaches in the teaching of Biology. TrKb3 commented that, "*teaching materials have a bearing to a large extent and their availability make us use the LCT approaches*." On the TLM, the common ones teachers of Biology cited were; Biology syllabus, Biology text books, models, charts and laboratory apparatus. Besides, they also mentioned that the use of the syllabus by teachers assisted in the identification of scientific skills that could not easily be gotten from the Biology textbooks. With respect to the inability to conduct hands-on-activities, TrKb4 said, '*If available, these materials would be helping us plan for hands-on-activities in our lessons to engage learners'*. The same respondent mentioned the use of the syllabus by Biology teachers assisted in the identification of scientific skills that were to be acquired by learners in different topics. The syllabus clearly outlined the skills such as observation, recording, manipulating variables, making inferences and so forth. However, not all Biology teachers have access to the Biology syllabus. Of the twelve teachers, only 2 respondents had hard copies of the Biology syllabus. On this aspect, teachers of Biology lamented that it was such a big draw back in teaching Biology. Additionally, teachers of Biology mentioned that the textbooks were not giving the

extent or depth of content coverage. The guide on topic coverage was only assessed and followed effectively from the syllabus.

4.8.1. Syllabus

The Biology syllabus grade ten (10) to twelve (12) was found in all the six secondary schools that were targeted in the study. Most teachers did not have access to it because there was only one copy that was kept in the office of the head of department. For those with laptops, they had the syllabus in soft copies making it very difficult to use it during lesson planning. All the six secondary schools did not have syllabus copies for lower grade levels (one to seven and eight to nine). Teachers felt that there was no need to have syllabi for lower grade levels because the teaching of Biology starts at grade ten. In line with the use of LCT as stipulated in the curriculum, teachers were of the suggestion that Biology topics be reduced. This came about from the fact that the revised curriculum had incorporated knowledge, skills and values and so to plan and achieve the three was not an easy task. Before the curriculum revision, the teaching was only focussed on learners acquiring knowledge, this was a bit easier than what was prevailing in the revised curriculum where learners were expected to acquire knowledge, skills and values.

Furthermore, teachers pointed out that due to inadequacies of Biology syllabi in some schools, some teachers just depended on Biology textbooks for teaching Biology because they had neither hard nor soft copies of the syllabus. The text books mostly used for Biology were Biology book ten, Biology book eleven, Complete Biology, Jones and Jones, and Basics of Biology. Two schools in the study experienced this scenario.

4.8.2. Schemes of work

The schemes of work are prepared by the head of section who works hand in hand with the head of department and approved by the school administrators. The Biology teachers who were involved in the study had schemes of work on their teaching files which showed topics and subtopics which were to be covered per term. The schemes of work also stipulated clearly the use of LCT methodologies. Teachers admitted that

the use of LCT was a requirement by the Biology curriculum and very much emphasised by school administrators and Senior Education Standard Officers (SESOs). SESOs are in charge of quality assurance and so in schools, they ensure adherence to interactive teaching strategies. The head of departments use the schemes of work also for counter checking how many topics have been covered, which methodology was used and what topics still remain to be taught. This information is meant for verifying the records of work which teachers submit fortnightly to head of departments, deputy head teachers and finally to head teachers.

4.8.3. Teaching and learning aids

The truth of the matter as expressed by Biology teachers was that Biology lessons needed to be interesting for learners to develop interest and perform better. Schools may not manage to provide each and every teaching material that teachers may require. Therefore, teachers pointed out that it was very important for Biology teachers to develop a habit of improvising materials for their lessons. They too suggested that, while teachers of Biology are improvising teaching and learning aids, their school administrations should also do their part by procuring conventional materials, apparatus, chemicals and textbooks so that teachers teach effectively without giving excuses. Teachers further went on to suggest that as stakeholders, head teachers should be sensitised on how to value the teaching of sciences. The discussions also revealed that schools usually procured apparatus, chemicals and other teaching materials in the third term in readiness for final examinations, a situation that seemingly contribute to learners' poor performance in Biology practical examinations (Mudenda, 2008).

4.9. Teacher professional growth meetings and LCT

One teacher of Biology lamented that it was very unfair for the use of LCT to be emphasised in schools. In his comment, TrB11, "*LCT approaches should start from as low as Early Childhood Education (ECE) all the way to tertiary levels so that pupils are grounded from there onwards and also trainee teachers to graduate with the concept*." Furthermore, he suggested that CPD trainings in LCT should be conducted at all levels; schools, colleges and universities. This was a common view

by the respondents. They also pointed out that schools had SPRINT while it was not clear what system of in-service the colleges of education were using for their students to prepare them for schools. If teachers engaged in such meetings, they would be using teaching strategies that enhance learning. The teachers also accepted responsibility of contributing to high student failure rates in higher learning institutions because in secondary schools these learners were used to be given information as opposed to encouraging them to think in order for them to develop research skills.

4.10. Challenges of LCT approaches in Biology teaching

The implementation of LCT in Biology lessons was not without challenges for teachers as well as for learners. The following were mentioned as some of the challenges experienced by Biology teachers targeted in the study.

4.10.1. Availability of curriculum teaching and learning materials

Of the twelve respondents, seven teachers of Biology (TrC6, TrH2, TrK10, TrC5, TrK9, TrKb3 and TrKb4) said the available teaching and learning materials present in the schools were not tallying with pupil enrolments, even though they supported the LCT approaches. They cited examples of Biology syllabi, Biology text books, apparatus, chemicals, models and already drawn charts. On the models, they said mostly each school had one or two models; for instance, that of the eye and the heart. TrC6 added that, *"we have five classes of Biology and following the same schemes of work, what will make me wait for another teacher so that I use the same model".* He further explained that this, did not work well with the utilisation of LCT especially with experiments where each pupil needed to manipulate and interact with the materials on his or her own. When doing experiments, TrC5 commented that, "*for me I don't even do experiments, I don't see the need because learners are crowded over few apparatus wanting to see and touching them and, in the process, they don't observe anything and end up stepping on each other*". He further pointed out that sometimes, to go round the challenge; learners are grouped in bigger groups of about ten members or more. However, the discussions in such grouping were limited and shallow because very few learners expressed their views.

4.10.2. Learners attitudes

The respondents mentioned that the learners' attitude toward teachers who use LCT approaches was not good. This made it very difficult to achieve learning objectives. Further they said learners opposed LCT approaches because they were used to being given information which did not make them think. They went on to say that this was due to the learners' background, they were used to be spoon fed, and therefore, it became very difficult to get them involved in the learner-centred lessons. TrK1 said that, *"the level of pupils' understanding or grasping of concepts was a challenge in that some pupils even went to the extent of considering us as not knowing how to deliver or teach".* In one school in the study, it was reported that the parents actually summoned the teachers for using LCT because to them, the teacher did not know how to teach the subject.

4.10.3. Biology syllabus

Other challenges that were mentioned were; the content covered was too much, therefore, it was against time, especially for examination classes, the teachers said that they had to consider all the topics for teaching because examinations demanded that they complete the syllabus within the specified time. The respondents cited the Biology syllabus to be bulky; therefore, it could not be completed on time. In view of this challenge, the teachers said that LCT was not ideal. One respondent lamented that, "*this time coupled with national examinations coming twice per year, some of us are markers as well so to complete the syllabus we just teach".* Examination Council of Zambia has designed two sets of examinations per year; GCE taking place in June for external candidates and also the one for internal candidates in October. Both are marked by the same teachers. Participation of teachers in both examinations leaves them with very little time for teaching effectively.

4.10.4. Large class size

During the interview schedule, teachers stated that the use LCT would work well with small class size. On this, TrH2 commented that*, "in a situation of a large class*

size, it is difficult to involve all the pupils especially when conducting hands-on-activities and at the same time is time consuming." The respondent further gave an example of his class, that the class size is seventy (70) to seventy-five (75) with pupils of varying abilities. This makes the utilization of LCT very difficult, especially where the learners' abilities have to be considered.

Teachers described large class as a hindrance to the practice of LCT approaches. For instance, the schools under study had total enrolments ranging from sixty to seventy learners per class. The application of LCT in such cases may not be effectively done. *"What we want is to finish the syllabus and remain with a good number of weeks to do revision"* TrH2 commented.

The teachers of Biology strongly felt that, combining both TCT and LCT approaches in Biology lessons made learning much easier in certain topics.

4.11. Summary

Seven teachers mentioned that the available teaching and learning materials supported LCT approaches. However, the seven respondents revealed that schools did not have adequate teaching and learning materials. Teachers did not have access to the hard copies of the Biology syllabus. Only a few with laptops had them in soft copies. This posed challenges to the schools under study. In the absence of the syllabus, teachers used Biology text books and extracted learning outcomes from there. This has resulted in Biology teachers dwelling on delivering lessons on knowledge level without skills and values. They also did not have the integrated science syllabus copies to trace prerequisite knowledge for learners in some topics. The teachers of Biology, however, acknowledged the importance of employing LCT approaches in Biology teaching and this was reflected in their lesson planning as well as schemes of work. They also endeavoured to use the approach in every lesson though with some limitations. Some of the challenges cited included shortage of teaching and learning materials, learners' negative attitudes or background, bulky content and the large classroom size.

4.12. Overall summary

In conclusion, the twelve respondents expressed divergent views regarding the understanding and implementation of LCT approaches in teaching Biology. Although the teachers of Biology were able to classify LCT approaches, the researcher still felt that there was a lot that teachers of Biology needed to understand in order to fully grasp LCT approaches and use them in their Biology lessons. For instance TrKb3 and TrKI9 have very good explanations and theories about LCT approaches in saying that much of the work is done by learners, however, the practical aspect of it in their Biology lessons required much more understanding of the practice. Of the twelve, eight (8) respondents indicated that they had received training in LCT approaches and considered the training to be adequate. However, four (4) Biology teachers demanded for more training in LCT approaches while five teachers expressed that they required more LCT training. This may be an indication that Biology teachers could be in support of LCT approaches and they could implement the pedagogy if given the necessary information and education on it.

The Biology lessons observed showed a progressive trend from lesson one to lesson three as was observed from Figure 4.1, Figure 4.2 and Figure 4.3. The reason for this trend may be that Biology teachers were attempting to use LCT approaches in their lessons.

The pupils' opinions on how teachers made use of LCT methodologies were varied. However, some of the issues that were established from the Biology teachers were the same ones that learners cited. For instance, both Biology teachers and learner cited teaching and learning materials as a challenge in their lessons. In addition, both teams mentioned group work as the main LCT approach used in Biology lessons. The aspect of teaching to finish the syllabus was mentioned by both the teachers of Biology and the learners. The revelations from respondents from the study may be issues often taken for granted in as far as LCT approaches are concerned.

The available curriculum teaching and learning materials such as the Biology syllabus, schemes of work, lesson plans and Biology text books supported teachers in implementing the LCT approaches. The teaching documents such as schemes of work, records of work and lesson plans were available with every teacher targeted in the study. The syllabus was mostly found with head of department in most schools.

Some teachers with laptops just had soft copies, while others did not have it at all. The majority of Biology teachers just depended on text books for planning and teaching Biology because they had no access to the syllabus. The text books mostly used for Biology lessons were Biology book ten, Biology book eleven, Complete Biology, Jones and Jones, and Basics of Biology.

CHAPTER FIVE: DISCUSSION OF RESEARCH FINDINGS

5.1. Introduction

This chapter discusses the findings of the study whose aim was to investigate Biology teachers' practices of learner-centred approaches in the teaching of Biology in secondary schools in Kabwe district. In this chapter, not all findings were presented and discussed. Only those findings that were pertinent to the study were deemed reasonable for discussion as done below:

5.2. Views Biology teachers hold on LCT approaches

This data reveals a set of generally positive views towards the use of LCT approaches in teaching of Biology among the secondary school teachers. The teachers mentioned too that LCT approaches in Biology teaching are vital in the curriculum and thus play an important role in the future of the learners. The respondents reported that learners' performance was positive when teachers used LCT approaches in their Biology teaching as opposed to lecture methods. Learners' performance was observed especially through group activities where learners were free to discuss, argue and resolve their opinions. Learner performance was also observed from the tasks that they did as individuals and as groups. Through discussions, learners not only developed communication skills but also the ability to work with peers, and also to recognise that amongst themselves they could select leaders (chairpersons and secretaries) to guide the deliberations. In this way LCT approaches bring about effective collaboration among the learners which is supported by Vavrus et al., (2011), Weimer (2013) and Wells and Jones (2005) that the use of LCT by teachers did not only bring about meaningful learning but also developed useful skills of collaboration amongst learners.

Seven respondents pointed out that interactions among learners was very important in LCT promoting dialogue and debate among learners. This agreed with the study of Musonda (2009) that when learners were engaged in participatory or interactive classroom activities, they tended to take a prominent role in their own learning. Van et al., (2005) also justified the aspect of communication among learners that through interactions, learners develop the freedom to ask questions and engage in critical thinking.

Additionally, all the twelve respondents observed that the achievement of lesson objectives was not very important in learner-centred lesson. This suggested that the critical aspect in learning was not merely achieving the laid down objectives on the lesson plan, but rather the understanding of concepts by learners. The findings here are in line with the research done by Jacobs, Gawe and Vakalisa (2002) who asserted that while objectives instilled a sense of purpose in teachers, what teachers required to know more was that learning was unpredictable and unobservable because some of the most learning occurred only in the mind.

The study also revealed that ten respondents perceived lessons that had experiments or activities as learner-centred. This may not be completely true for LCT because it depended on the way the experiments had been set up and how engaging the materials were to the learners. One very important factor in experimentation is the engagement of learners in hands-on-activities to create their knowledge and acquire skills. Acquisition of skills was not achieved merely through following step-by-step instructions or filling in the blanks on worksheets (Watts and Bentley 1995), but learners getting fully engaged in the practical process (Mudenda 2008; MESTVEE, 2014). Through experiments, misconceptions about science phenomena are rejected or confirmed in the learners and process skills developed. This way, learners will not only learn science but also appreciate nature and appreciate science in general. The study by Mudenda (2008) is in line with this that learners gave their experimental results mainly from what was stated in the text books and not from their observations. Although it was vital to conduct experiments in biology lessons, TrC5 had this for a comment, "*for me I don't even do experiments, I don't see the need because learners are crowded over few apparatus wanting to see and touch and in the process, they don't observe anything and end up stepping on each other*". This teacher seemed to have lost interest in conducting experiments because of large class size. To him, there was no learning because learners hardly observed anything. The issue already highlighted in literature that few learners benefit from experiments or practical activities because of over-crowding over limited apparatus and chemicals (Mudenda, 2008). The respondents (eight out twelve) pointed out that there was no need to refer to the syllabi for lower grade levels when teaching grade ten or eleven Biology. It is important to know what learners were taught prior to the current topic. This builds a strong foundation to the new concepts because it bridges the gap between the old and

the new concepts to be learnt. Learners need this kind of connection to be able to progress smoothly in the learning journey. This is why MOE (1996) and MESTVEE (2014) stress on careful preparations of lesson plans by teachers as the most important pedagogical routine. There is little that can be achieved in LCT if this important step by teachers of Biology is missed or taken lightly. Learning can only make meaning and valuable to learners when they are able to make connections between or among concepts, be it in one topic, subject or across subjects. The situation in the target schools of not being in possession of syllabi copies for Biology and integrated science imposed a great concern to the schools, district, province and nation at large.

Of the twelve, eight respondents stated that learner-centred lessons emphasise the development of varied abilities of learners and not just memorising the knowledge. This is in line with demands of the revised curriculum for Biology (MOE, 2013) that the acquisition of knowledge should be coupled with skills and values; this kind of education would ultimately empower learners to participate effectively in the various needs of society. Education that focuses on the development of varied abilities of learners is completely supported by the principle of constructivism enshrined in the Ministry of Education (MESVTEE, 2014:11) stipulating that:

i. *Learners' thought processes to take centre stage in the lesson*
ii. *Teachers to provide both support and challenges to pupils.*
iii. *Teachers to provide opportunities for learners to make meaning of new concepts and processes through interaction with others, concrete objects and the pupils' own inner reflections.*
iv. *The learners are given and make use of multiple opportunities to express their own thoughts as a way of enhancing understanding and exchanging their ideas with others.*
v. *Learners feel safe providing multiple responses to the problems posed to them. The correctness of the answers supplied by the learners is ascertained through a process of dialogue and debate and not through the sole authority of teacher and the text.*

5.3. Use of LCT approaches by teachers of Biology

Generally, the study revealed that teachers of Biology had positive understanding on LCT approaches and used it in their teaching. This was confirmed from their lesson plans where one or two LCT approaches were stated. However, it was noted from the interviews held that teachers did not adhere to the lesson plan religiously when delivering Biology lessons. The reason the teachers gave for this was that some teaching resources stated on the lesson plan were based on assumptions that they were available in the schools and yet they were not. TrKb4 alluded to this and said, '*this makes us change the teaching methodologies to TCT at the eleventh hour".* This statement seems to imply that teachers of Biology planned lessons without serious reflections of what was available to use and what was not there. It also suggests the dependence syndrome on schools by Biology teachers to provide teaching resources and not being creative themselves. In other words, lesson planning was a matter of fulfilling routine. The case established here, is that planning for lessons was not thoughtfully done. This is in line with the study by Stronkhorst (2001) who reported that although lesson planning was a must to get through a lesson, teachers wrote them as required by administrators and more purposefully planning was not done.

Despite the dictates of policy on embracing LCT in education delivery, the practice was not considered as mandatory because teachers chose what teaching approaches were appropriate to be used. This is why they stated that the use of LCT depended on the nature of topics to be presented and the kind of teaching materials available in the school. In some topics it was felt by teachers that combining LCT and TCT approaches made their work very easy because this helped them to cater for all learners. The teachers' choice of teaching approaches also depended on the time remaining for examinations. This was mainly the experience of those handling grade eleven classes as alluded to by one respondent "*we teach using TCT method to beat the allocated time and to finish the syllabus so that our learners pass examinations".* This is in agreement with findings of Winckberg et al., (2009) that teachers maintained their stand on using teacher-centred methods because the Zambian education system was examination-oriented. The Zambian education system is such that examinations are held at grade seven, nine and twelve. This is for the purpose of progression of learners to the next grade or level. This prompts teachers to concentrate on completing the syllabus at the expense of learners. Biology teachers held strong beliefs that failure to complete the syllabus would ultimately contribute to

high failure rates by learners and this would attract blame from school administrators and parents (Stronkhorst, 2001).

5.4. Use of LCT in the observed Biology lessons

The study findings revealed a common trend among the three Biology lessons observed in terms of planning, delivery and learning. The scores for the first lesson were generally low, the second lesson moderate and high scores were noted in the third lesson. These aspects under consideration were; 'considering learners ability', 'activities or tasks planned for learners' and teaching materials /aids prepared to enhance learning of learners. In all these aspects, lesson three was better than lesson two and lesson two better than lesson one. This trend could be that teachers in the first lesson planned and taught the usual way. In the second lesson, teachers of biology were aware of the observation and so naturally they had to make it better than the first lesson. Finally, comparatively, the third lesson came out with a little bit of high scores possibly because they kept making improvements. The trend could have broad implications; one could easily attribute this to the aspect of supervision that possibly frequent observation of lessons is likely to motivate Biology teachers to improve their teaching pedagogy from the so called 'talk and chalk' to LCT approaches. Additionally, close supervision of lessons may inculcate the spirit of reflection in Biology teachers. Possibly, the improvement of the third lesson had more to do with teachers reflecting on their earlier planned and taught lessons as alluded to by Stuart, (1999) that reflecting in practice leads to improvement.

Further, there could also be an element of 'teaching to impress', a tendency that usually prevails when Education Standard Officers (ESOs) go to monitor and observe lessons. For this study, teachers of Biology had to be informed well in advance to make them aware of what was expected.

5.5. LCT approaches commonly used in Biology lessons

In answering the research question "How do teachers of Biology use LCT approaches in their teaching", it was established that most of the teachers commonly used three LCT approaches in their Biology lessons namely; Group work, Discussion and Question and answer. These methods were often used because teachers found them

easy to use and had no cost implications on the school. Additionally, LCT approaches require that teachers listen to the learners speaking as they express their views. For this purpose, teachers of Biology opted to be using three approaches in their lessons.

5.5.1. Group work as LCT approach

Learners working in groups seem to be the most popular teaching strategy used in Biology lessons. In the Zambian situation, our classes are usually overpopulated and so to cater for all learners, the strategy of group work is considered the best option by Biology teachers. In their groups, TrK9 reported that, "*learners are presented with problems of which they have to devise ways of solving them"*. This explains the way Biology teachers use the strategy of Group work. In trying to find solutions to the tasks, the learners chose among themselves leaders to guide the discussions. Through this, learners acquire skills such as communication and leadership. They also develop respect for each other's views. This agrees with Chika (2012) who alluded to the fact that, when learners work in groups, a number of skills are developed that could be very beneficial to the learners. These skills include investigative, critical thinking, communication and leadership skills. Achievement of the stated skills is made possible because as a team, learners learn to explore their ideas, build confidence and appreciate each other's weaknesses and strengthens (Musonda, 2009). Relating the discussions from the Biology lesson observation; Figure 4.3 on the element as to whether there was a discussion among learners, the score was quite low in lesson one and two and slightly improved in lesson three. This could be viewed from diverse angles by different scholars. One possibility could be that the tasks were too simple or too difficult and it could also mean that learners did not see the motivation to discuss tasks. Furthermore, it could imply that there was no support from Biology teachers. As already highlighted in the literature, tasks for group work need to be provoking so that learners employ their critical thinking (Nkoya 2009; MOGE 2016). Tasks for learners should be balanced to accommodate the learning needs of all. When learners experience success, it reinforces their learning, builds their confidence and encourages them to accept further learning challenges (Ministry of Education, Zambia Education Curriculum Framework, 2013). If teachers of Biology considered this, group work as LCT approach could be effective and appreciated by learners.

Teachers in LCT approaches serve as facilitators of the learning process. Therefore, this role must be executed even when learners are assigned group tasks because the presence of the teacher is required more during this process in supporting and guiding the learners. One respondent stated that "*most of the work is left to the pupils to do on their own in groups as they are given the opportunity to manipulate variables or specimens where they observe, interpret and compute*". This response seemed to suggest that teachers' view about LCT is that learners are required to do more on their own without the involvement of the teacher. Secondly it may also mean that when teachers had little to do during group work, learners took it as a weakness and most times, this resulted in learners making unconstructive noise and diverting from the task given. This is why, in Appendix A, element number 7; all the twelve (12) respondents agreed with the statement that "Teachers have less work in conducting learner-centred lessons during the lesson, because students can work on their own". The study by Hein (1991) actually emphasises that in using LCT approaches, teachers are not passive but rather have a critical role to play in their lessons; making learning an active process. One critical role for the teachers is to enlist learners' ideas which can be used to make learning very interesting and meaningful to the learners (MOESVTEE, 2014). This therefore, means that in the journey of learning, the teacher is required to stay active.

5.5.2. Understanding LCT approaches

The advocacy of LCT approaches is in line with Outcomes-Based Education (OBE) which is moving away from Behavioural Approach (BA). The approach seeks to link education to real life experiences. In line with this view, one of the most important aspect of LCT approaches is to give learners skills to access, analyse and practically apply knowledge (MESVTEE, 2013). The involvement of learners is very critical because they must express their views, whether wrong or right in biology lessons. It was established from the study that during discussions, learners were divided into groups to discuss the given topics of the lesson. Although the strategy used for allocating learners in groups was not mentioned, the Biology teachers' observations were that some members dominated the discussions and gave no chance for others' input. The role of the teacher as a facilitator becomes very important in such situations. Musonda, (2009) stresses the need for support of the teacher in the

learning to ensure all learners contributed their views. This may also benefit learners who may have lost track of the learning content to easily pick up when the teacher is giving support.

5.5.3. Question and Answer as LCT approach

One of Zambia's definitions of LCT approaches takes into account "learners' thought processes to take centre stage in the lesson" (MESVTEE, 2014, p.11). This sounds to imply that whatever activities, questions and tasks that biology teachers plan for their lessons, they should focus on the thought processes of the learners. The study established similar findings from the Biology teachers and the learners. The aspect on whether 'Biology teachers phrased questions that motivate learners' in biology lessons was lowly scored as reflected from Figure 4.2 on lesson delivery. The response from the learners on the similar item also recorded 75% of the learners attesting to the fact that their Biology teachers did not present them with problems that provoked their thinking. It may be, therefore, not easy to qualify 'question and answer' as LCT approach because the full understanding of it is yet to be accomplished. Teachers mentioned that it was easy to ask learners questions demanding for yes and no and stating definitions. These findings agree with the Baseline study for IPeCK project (MOGE, 2016). The questions asked in a lesson must be those that have a purpose and clear goal. The idea here should be for teachers of Biology to design questions that give direction to the flow of the lesson and those that will encourage discussions and critical thinking among the learners. This also means that the questions must not be one way; teacher to learners, but also learner to teacher and learner to learner (MESVTEE, 2013).

There seemed to be a very strong link between or among the three LCT approaches; group work, discussion and question and answer. The bottom line among the three is that, in one way or the other, learners are involved in discussions.

5.6. Learners view on their Biology teachers' use of LCT approaches

Learners expressed varied responses about the utilisation of LCT approaches by their teachers of Biology. A few aspects were noted from the respondents and some of these were; on the issue of the use of teaching and learning aids in Biology teaching,

the findings were that out of 120 learners, 87 (72.5%) stated that their teachers did not use them. Apparently, this result is similar to the findings from analysis of learning in Figure 4.3, which lowly scored. The aspect of T/L aids may be viewed from a lot of angles. It may be one thing to have T/L aids in Biology lesson and it may also be another thing to use them effectively in the lesson. T/L aids that are well planned for may enhance learning and raise a lot of interests in learners in a particular concept.

5.7. Developing useful and resourceful learners

There is a growing need to provide curricula that meets the changing needs of learners in our schools. The revised curriculum (MOE, 2013) for teaching Biology attempts to provide education that answers the demands of the new educational contexts, the move from teacher-centred curricula to learner-centred curricula as a must. To develop the learner that is useful to himself or herself and to the community, and resourceful, is the very core of education provision. Therefore, the critical issue that teachers of Biology labour with is how to raise learners to a level to be able to demonstrate their ability to comprehend concepts and to apply concepts in different settings. As was established from TrK1 who stated that, "*the level of pupils' understanding or grasping of concepts was a challenge in that some pupils even went to the extent of considering us teachers as not knowing how to deliver or teach".* This statement may also mean that the learners have no understanding of the new education dimensions that demand their sole responsibility in learning. However, if Biology teachers collaborated in using LCT approaches, they are likely to bring the learners on board. It may not be achieved in short space of time, but with concerted efforts and slowly, the country's education system may get on the right track.

5.8. Understanding Curriculum demands for lesson planning

In the olden days, teachers were perceived to be the ones with knowledge as a 'bank of knowledge' to "fill" or transfer to the learners (Freire, 1999). To date, this stance seems to disadvantage a lot of teachers from learning and aligning themselves to

latest innovations demanded by education ministries. Teachers with this notion do not see the need to deepen their own understanding through studying and analysing the learning content from the syllabus, textbooks and other teaching and learning materials (MESVTEE, 2014). While deepening their own understanding, the study of teaching and learning materials may help teachers in structuring the learning content and also harmonising the teaching strategies that may make learning more beneficial to the learners. What determines learning may be the way the information is presented to the learners, how learners receive it and use it in different life situations. The study revealed that most Biology teachers had no access to the curriculum of the grade level they were handling. The worst scenario also was that Biology teachers did not have the curriculum for lower grade levels; grade one to seven and grade eight to nine integrated science as though Biology was a stand-alone subject. Tracking topics from lower grade levels may be an important aspect for teachers of Biology as they endeavour to implement LCT lessons. This may also be a good deal to trace the significance of the content or concept of a particular Biology lesson. Mostly, it has been mentioned that learners make sense of the content if it is taught from what is familiar to them and to the unknown content. LCT thrives in using prior knowledge of learners which is meaningful and relevant to the topic at hand.

Although textbooks seem to be the most important and available tools for content reference by Biology teachers, they may not be adequate in guiding the teachers on the accuracy of content alone in the absence of the syllabus. The study established that Biology teachers mostly used Biology text books for teaching, possibly, because they are the only available guide they can use. In the absence of the syllabus, it may be difficult for Biology teachers to know what exactly LCT approaches are recommended for use in the teaching and what consequences may be on the learners for not adhering to them. Furthermore, they may also not be aware of the implications on the quality of lessons and ultimately the economic activities of the country.

5.9. Capacity building teachers of Biology in LCT

The success of LCT approaches require the flexibility and creativity on the part of Biology teachers. Flexibility in the way they deliver lessons and also creativity in the manner they plan their teaching and learning materials necessary for biology lessons.

The study revealed the need for training in LCT approaches among teachers of Biology. The SPRINT programme already established in the schools, as alluded to in the literature review may help the biology teachers address the need.

5.10. Learner performance with LCT approaches

The responses from the participants suggested that LCT approaches played an important role in the delivery of quality education in that there is freedom of expression; rapport between the teacher and the learners and amongst the learners themselves. From the research findings, it was clear that teachers of Biology considered the use of LCT approaches during lesson planning and lesson delivery. The LCT approaches used during lesson delivery brought out much learning on the learners because of engaging them in learning activities. This suggested that there is a very strong link between lesson planning and lesson delivery.

The respondents pointed out also that learners' performance was better in the Biology lessons when teachers used LCT approaches than when they used tradition approaches. The Biology teachers attributed positive learner performance from interactions as a result of learners' engagement in group work and discussions. The findings are in line with Ezgi (2012) that teaching that included active involvement of learners gave the best education results. This is also confirmed in the conceptual framework in Figure 1.1 as believed by both cognitive and social constructivits view that knowledge is acquired through an interactive and dialogical engagement with what is to be learnt.

5.11. Influence of limited resources and facilities on LCT implementation

Although teachers of biology used LCT approaches to some extent, their use was limited due to a number of hindrances that existed in their schools to enable them use LCT effectively. The issues already highlighted in the literature review such as limited teaching and learning materials, large class size and inadequate laboratory facilities (MOE 1996; Schweisfurth 2011) were also cited by the respondents that these affect the smooth implementation of LCT.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter presents the conclusion of the study in line with the discussions of the findings followed by the recommendations and the areas of future research.

6.2. Conclusion

The views gathered from the teachers of Biology revealed that their understanding of LCT were varied. Some (seven participants) understood LCT as an approach where learners are provided with experiments or hands-on-activities and must take place in a laboratory while others (five participants) viewed it as one that focusses on learners' thinking processes. The divergent views on LCT from the Biology teachers could mean that the learner-centred training they received was not adequate and hence there could be need for Biology teachers to be trained in the approach.

Biology teachers, to some extent utilised the LCT approaches in their lessons, however, through group work, question and answer and discussions. The stated LCT approaches are considered by the Biology teachers at lesson planning and during lesson delivery. The study established that the use of LCT approaches brought about positive learner performance in the way learners participated in the lessons, in their interactions with each other and also with their teachers.

The study also established that the effectiveness of LCT approaches depended on the support from the curriculum teaching and learning materials such as the Biology curriculum or syllabus, schemes of work and lesson plans.

The learners' opinions on how teachers made use of LCT approaches were varied which was similar to Biology teachers. Both cited inadequate teaching and learning materials as a challenge in their lessons. The same aspect was prominent also at lesson planning, delivery and learning analysis as it was lowly scored in all the three categories.

Although Biology teachers expressed strong desires to teach learner-centred lessons, they are hampered by numerous challenges such as inadequate teaching and learning materials, chemicals and apparatus coupled with large class sizes and also coupled with their mixed understanding of the approach.

6.3. Implications of the study findings

The divergent views displayed by the teachers of Biology over LCT approaches may imply unclear understanding about the approach resulting in the use of both TCT and LCT in Biology lessons. To a large extent, it also suggests that the smooth implementation of LCT approaches cannot be done without equipping schools with appropriate teaching and learning materials. Therefore, this suggests the need for effective provision of adequate teaching and learning materials, curriculum materials, charts, models and equipment as well as LCT training for Biology teachers. Further, the Biology teachers may also require support and guidance by schools administrators to seriously engage in continuing teacher professional development at school level with more hands-on and practical experiences.

These findings are likely to compromise the quality of Biology teaching if not adequately addressed in that Biology teachers may dominate the use of TCT in the absence of supportive facilities like adequate teaching and learning materials. This practice may also result in the education delivery that may not realize the kind of learner that is so much desired for by the revised curriculum and nation at large.

Finally, failure to understand and implement LCT approaches would make our country Zambia lag behind in terms of economic growth. The learners for today are the leaders for tomorrow. Teaching them creativity, innovative and knowledge construction coupled with skill acquisition, can be a sure way of having a better tomorrow for Zambia as reflected in the bible's famous quote, 'teach the child in the manner he should go, when he grows up he will not depart from it'.

6.4. Recommendations

Based on the findings from the study, the following recommendations are made:

i. The need for training in LCT approaches using the SPRINT framework of In-service-training so that teachers can deepen their skills and knowledge on the approaches
ii. There is need to make available comprehensive syllabi copies, from Early Childhood Education (ECE) to secondary school level, to Biology teachers despite the grade level they are handling. Other than tracing the content coverage across grade levels, it will enhance their abilities to bridge the gaps and build up on content and concepts flow
iii. School administrators and other education stakeholders to encourage improvisation of teaching and learning materials among teachers of biology.
iv. Schools to work closely with the Directorate of National Science Centre (DNSC) to enhance Biology teachers' creativity and innovation, and promoting their delivery skills of LCT lessons

6.5. Areas of future research

The findings in this study suggest the need for further research into the teachers' practices of learner-centred approaches in the teaching of Biology in secondary schools such as:

i. Conducting the same research in the same schools to find out whether the teachers of Biology are still adhering to the same practices, the LCT pedagogies after some interventions have been put in place to address some challenges.
ii. Conducting similar research in the colleges of education on the lecturers of Biology to ascertain whether their teaching approaches are similar to what teachers of biology use in secondary schools.
iii. Conducting the same research in other provinces that embraced the STEPS programme after Central Province had piloted the project. This should include

large survey, interviews and lesson observations to make the results more conclusive and generalisable.

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LIST OF APPENDICES

APPENDIX A: QUESTIONNAIRE FOR TEACHERS OF BIOLOGY

Dear respondent,

The purpose of this questionnaire is to gather information on general understanding of learner-centred lesson from you. The information gathered will be for academic purposes only and therefore will be treated with anonymity and confidentiality. There is no need for you to write your name on it

SECTION A

SEX: M [ ] F [ ]

Grade(s) Taught:…….

School:……....

Highest Qualification…….

Years of teaching ……..

SECTION B

Instructions: by ticking (√) write your answer based on the key below against each given statement

KEY: SA = Strongly Agree; A = Agree, NS = not sure, SD = Strongly disagree; D = Disagree

S/N	Statement	SA	A	NS	SD	D
1	It is generally easier for teachers to organize learner-centred lesson than teacher-centred lesson.					
2	If a lesson has an experiment or activity by learners, it is a learner-centred lesson.					
3	In a learner-centred lesson, teacher should put more attention to groups of learners than individuals.					
4	Learner-centred lessons focus on the thinking process of learners.					
5	Achievement of lesson objectives is not very important in a learner-centred lesson.					
6	Interactions among learners is one of the important factors in a learner-centred lesson.					
7	Teachers have less work in conducting learner-centred lessons during the lesson, because students can work on their own.					
8	Learner-centred lessons put more focus on the development of varied abilities of learners than memorizing knowledge.					
9	Learner-centred lessons cannot be conducted without equipment/apparatus.					
10	When preparing a lesson for Grade 10 or 11, teachers need to refer the syllabus of lower grade levels (grade 8 and 9)					

SECTION C

Instructions: Please respond to the questions by putting a tick (√) in the brackets provided against your answer or write down your answer (s) where spaces are provided

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RESEARCH QUESTION 2: How do teachers of Biology use the Learner-centred Teaching approach in their teaching?

1. How would you classify the performance of your learners when you use the LCT approach in your Biology teaching?

i. Very good [ ]

ii. Good [ ]

iii. Average [ ]

iv. Poor [ ]

v. Very poor [ ]

2. How would you classify your learners' performance when you do not use the LCT in your Biology teaching?

i. Very good [ ]

ii. Good [ ]

iii. Average [ ]

iv. Poor [ ]

v. Very poor [ ]

3. Did you receive any training in the LCT approach?

i. Yes [ ] ii. No [ ]

If your answer to question 3 is yes, then go to question 4

4. In your opinion, was the training adequate to enable you use the LCT approach?

i. Yes [ ] ii. No [ ]

If your answer to question 4 is No, then proceed to question 5

5. Would you need more training in the LCT approach?

i. Yes [ ] ii. No [ ]

APPENDIX B: DOCUMENT CHECKLIST

SECTION A

Province:_____**District:**_____

School:_____

Grade(s)**Taught**:_____

Sex:_____

Highest qualification:_____

Years of teaching: _____

Position held: _____

SECTION B

S/N	Name of Document	Available with teacher	Available with administrator	Not available	Evidence of support to LCT	Comment
1	Grade 10-12 Syllabus					
2	Grade 8-9 Syllabus					
3	Grade 1-7 syllabus					

Any other comment:

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SECTION C

S/N 1	Name of Document	Available	Not available	Who prepares	Who checks	Evidence of support to LCT	Comment
1	Schemes of work						
2	Lesson plan						
3	Records of work						

Any other comments:

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APPENDIX C: INTERVIEW SCHEDULE FOR TEACHERS OF BIOLOGY

a) What is LCT?

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b) Which teaching approaches would you classify as LCT?

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c) How often do you use the LCT approaches in your teaching of Biology? (with reference to those stated in (b)

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d) What challenges do you face in using LCT approaches?

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a) How do you make use of LCT approaches in the teaching of Biology?

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a) Do you think teaching materials have a bearing on the use of LCT approaches in the teaching of Biology?

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b) If answer to (b) is Yes, how?

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c) If answer to (b) is No, why not?

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d) What do you think should be done to promote the use of LCT in Biology teaching?

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e) Is there anything else you would want to add on the topics we have covered?

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APPENDIX D: LESSON OBSERVATION TOOL

Province:……

District:……..

School:……

Sex:……

Grade (s) Taught:……

Highest qualification:……

Years of Teaching:…….

Part A: Planning of a lesson

Key: 0 = Unsatisfactory 1 = Satisfactory 2 = Good 3= Very good

	Criteria	0	1	2	3
Planning	Were there introduction, development and summarization parts in the lesson plan?				
	Was the lesson flow planned to achieve lesson objectives?				
	Was the lesson planned based on sufficient subject matter knowledge?				
	Was the lesson planned based on sufficient pedagogical knowledge?				
	Were the activities or tasks of learners planned?				
	Did the teacher consider the ability of learners?				
	Were the teaching materials /aids prepared to enhance learning of learners?				
		0	1	2	3
Delivering lessons	Was the introduction conducted as planned?				
	Was the development conducted as planned?				
	Was the summarization conducted as planned?				
	Did the teacher intend to confirm a particular concept or values in the process of teaching?				
	Was there a time for evaluating the lesson to confirm whether the learners had learned?				
	Did the introductory part of the lesson motivate pupils?				
	Were the learners given time to think?				
	Did the teacher's questions motivate learners' thoughts during the lesson?				
	Did the teacher use any kind of teaching materials apart from blackboard and chalk?				
	Did the teacher use improvised or locally available teaching materials in the lesson?				

	Criteria	0	1	2	3
	Were the teaching materials used in the lesson enhance learners' understandings?				
		0	1	2	3
Learning of learners	Were the learners able to find core contents or concepts on their own?				
	Were the learners able to conclude what they learned in the lesson?				
	Were the learners' interests motivated in the lesson?				
	Were the learners thinking deeply to answer the given questions/tasks?				
	Did the learners participate in the lesson?				
	Was there a presentation by learners in the lesson?				
	Was there a discussion among learners to find answers or better solutions to the given tasks?				

APPENDIX E: QUESTIONNAIRE FOR LEARNERS

Name of your School:.....
Grade:.....
Sex : Male [ ] **Girl** [ ]

Please indicate your answer by ticking in the boxes either YES, NO, or NOT SURE. On each item you are required to tick once

S/N	ITEM	YES	NO	NOT SURE
1	My Biology teacher asks us to make presentation after group activities			
2	My Biology teacher uses teaching /learning aids in Biology lessons			
3	My Biology teacher wants everyone to participate in group activities			
4	My Biology teacher presents situations and problems which provoke thinking in me during Biology lessons.			
5	My Biology teacher tells us to memorize facts and scientific concepts so that we learn			
6	My Biology teacher wants me to think for myself in Biology lessons			
7	My Biology teacher thinks that as pupils we are responsible for our own learning			
8	My Biology teacher is more interested in finishing the syllabus than helping us to learn Biology			
9	My Biology teacher lets us work in groups so that we can discover things together			
10	My Biology teacher gives us time to say what we have learnt at the end of the lesson			