

**TEACHERS' PERCEPTIONS ON THE IMPLEMENTATION OF LESSON STUDY IN
BIOLOGY AND ITS IMPACT ON LEARNERS PERFORMANCE IN SOLWEZI
DISTRICT SCHOOLS**

BY

KING SALWENYEKA

**A Dissertation submitted to the University of Zambia in partial fulfillment of the
requirements for the award of the degree of Master of Education in Science Education**

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LUSAKA

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DECLARATION

I, King Salwenyeka declare that, this dissertation was written through personal reading and scientific research. It represents my own work and has not, in part or in whole, been presented as material for the award of degree at this or any other University before. Where other people's work has been cited, acknowledgement has been made by use of complete reference.

Signature: Date:

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CERTIFICATE OF APPROVAL

This dissertation titled, the implementation of lesson study in biology in solwezi district schools, by King Salwenyeka is approved as fulfilling part of the requirements for the degree of Master of Education in Science Education of the University of Zambia.

Examiners:

Name.....Signature.....Date.....

Name.....Signature.....Date.....

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ABSTRACT

The purpose of the study was to examine the implementation of lesson study in biology in secondary schools in Solwezi district. Since its introduction in Solwezi district, it seems that there has been no study done to establish whether the implementation of lesson study has improved teaching skills for teachers and learner performance in biology.

The study used mixed method, employing a concurrent triangulation design. Questionnaires, interview guide and analysis of grade twelve examination results for the period 2005 to 2014 for the schools sampled from Solwezi district was used to collect information. A sample comprising 48 participants and examination results for grade twelve for the period between 2005 and 2014 were drawn from four schools in Solwezi district in North-Western province. The participants were purposively selected for the study. The study analysed qualitative data from questionnaires and interviews by categorizing it into emerging themes while quantitative data were analysed using descriptive and inferential statistics.

The study established that lesson plans generated from school based CPD lesson study activities are kept for reference as the teachers plan lessons for their class in biology. The study also revealed that teachers through lesson study activities, had acquired teaching skills such as planning learner centered lessons, planning lessons that engage learners, ability to collaborate and being open criticize each other, when preparing lessons, reflecting on lesson, plan activities for learners that promote hands on activities and formulating lesson objectives. The study further established that lesson study activities in the secondary schools in Solwezi district had a positive impact on the performance of learners in Biology national examination, implying that lesson study implementation has helped improve the performance of learners in biology national examination.

The study recommended that, there should be considerations of introducing lesson study in the colleges of education. In addition, lesson study activities in schools should focus on identifying areas in biology as a subject that cause challenges to learners so that they can address the challenges.

DEDICATION

I dedicate this work to my beloved wife Katendi Chilila, my sons Kayombo and Likoji who had to endure the discomfort while I was away to pursue my studies.

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LIST OF ACRONYMES

MoE	Ministry of Education
SPRINT	School Programme for In-service for the Term
CPD	Continuing Professional Development
SMASTE	Strengthening Mathematics, Science and Technology Education
SBCPD	School Based Continuing Professional development
PEO	Provincial Education Office
DEBS	District Education Board Secretary
ECZ	Examination Council of Zambia
JICA	Japanese International Cooperation

CHAPTER ONE

INTRODUCTION

This chapter presents the background to the study and the statement of the problem. The chapter also highlights the purpose of the study, research questions, general and specific objectives of the study, significance of the study, theoretical framework, limitations of the study and operational definition of the terms used in the study.

1.0 Background to the study

The provision of quality education depends on the teachers' implementation of the curriculum offered to the learners to suit the needs of the nation. According to Ministry of Education [MoE] (1996), the quality and effectiveness of an education system depends heavily on the quality of its teachers. Ministry of Education [MoE] (2010) further contends that, the educational and personal wellbeing of children in schools hinges crucially on the teacher's competence, commitment and resourcefulness. In view of this, the caliber of teachers and of the teaching profession is of paramount importance.

In the quest to improve the caliber of teachers in science and mathematics, the Ministry of Education (MoE), introduced in-service professional development program such as, the school Programme of In-service for the Term (SPRINT) in 1998. The main purpose of introducing SPRINT was to conduct in-service training among group of schools called zone, (Baba and Nakai 2011). They further contend that under SPRINT, teachers who teach the same grade or subject were supposed to meet regularly to discuss issues pertaining to their subjects.

However, MoE realized that SPRINT was costly to manage, as such decided to develop a sustainable Continuous Professional Development (CPD) programme, which was cost effective at the same time benefited many teachers but had fewer disturbances on the teaching and learning process. This led to the introduction and piloting of Strengthening Mathematics, Science and Technology Education school based CPD (SMASTE- SBCPD), (Ministry of Education [MOE], 2007). This further led to the introduction of lesson study through SPRINT under

SMASTE- SBCPD programme, in Central Province in 2006, to allow teachers learn both content and methodology at the same time, (Banda, Mudenda, Tindi & Nakai 2014).

MOE (2007), points out that, Ministry of Education realized that, teachers needed to continuously improve on their content, teaching methodologies and delivery of lessons in class, and that it was not possible to send all teachers for in-service training in the colleges and universities. The only way was through school programme of in-service for the term. The ministry of education put in place measures to enhance school based Continuing Professional Development (SBCPD) through lesson study. According to Japanese International Co-operation [JICA] (2015) lesson study is a mechanism in which teachers observe classes with related persons inside and outside of school and consider approaches to improve classes and their own teaching skills. Lenski and Caskey (2009) defines lesson study as a method of professional development that encourages teachers to reflect on their teaching practice through a cyclical process of collaborative lesson planning, lesson observation, and examination of student learning. Therefore, the purpose of introducing SBCPD lesson study in schools was to improve teaching skills of the teachers and learning activities in a classroom and in turn improve the performance of learners in school. The program was first implemented in Central Province in 2006 as Strengthening of Mathematics, Science and Technology Education – Continuing Professional Development Program (SMASTE-CPD Program).

It was found that in Science (physics and chemistry) and biology subjects, examination pass rates in Central province, where lesson study activities had been implemented for more than five years, were slightly higher than those of non-implementing provinces (Banda et al, 2014). This indicated that practice of lesson study had impacted positively on the improvement of learners' examination pass rates. Realizing its effectiveness on the improvement of teaching skills of teachers and sustainability as a framework of SBCPD in Kabwe, the MOE in 2008 rolled out the program to all subjects and to all the provinces in the country, (Ministry of Education [MoE], 2009).

In Solwezi district North Western Province, lesson study as an approach for SBCPD was introduced in 2008, with Mathematics and Science as the entry point subjects. Lesson study has been implemented in the district for over five years now. During the period 2008- 2015, when

lesson study has been implemented in the district, biology has been one of the science subject areas where lesson study has been implemented. However, it is not known whether lesson study as a SBCPD program has helped improve both the teaching skills of the teacher and the performance of the learners in the district, hence this study.

1.1 Statement of the problem

Lesson study as an SBCPD approach is an important mechanism for enhancing the knowledge and skills of teachers like any other profession. The enhanced skills of the teacher are expected to be reflected in the effective teaching and ultimately improved learner performance. In Central Province lesson study implementation has been found to have a positive impact on performance in science subjects. However, from the time lesson study was introduced in the secondary schools of Solwezi district, it seems there is no study done to establish whether the implementation of lesson study has improved the teachers' skills in teaching biology and ultimately improved learner performance in biology at grade twelve in national examinations?

1.2 Purpose of the study

The purpose of the study was to examine the implementation of lesson study in biology in Solwezi District.

1.3 General objective

The main objective was to examine the implementation of lesson study in biology in the secondary schools of Solwezi district.

1.4 Specific objectives

The objectives of the study were to:

- 1.4.1 Explore teachers' perceptions on lesson plans generated from lesson study cycle implementation activities in biology.
- 1.4.2 Determine the skills teachers' have acquired from lesson study activities in biology.
- 1.4.3 Establish the impact of lesson study implementation on the performance of learners in biology.

1.5 Research questions

This study aimed at answering the following research questions.

- 1.5.1 How do teachers perceive lesson plans generated from lesson study cycle implementation activities in biology?
- 1.5.2 What skills if any of lesson study implementation activities in biology have teachers acquired?
- 1.5.3 What is the impact of lesson study implementation in classroom on the performance of learners in biology?

1.6 Significance of the study

This study is important in the sense that, it would provide feedback to the institutions where lesson study is being implemented, to ensure that they are responding to the purposes of what the program was set to achieve. It is hoped that the findings of this study could provide useful information on effectiveness of lesson study implementation in science subjects like biology. Furthermore, the findings might be used by decision makers and other stakeholders at different levels of the education system, to come up with strategies of improving or re-enforcing lesson study implementation. It is also hoped that the study findings would contribute to the academic body of knowledge worldwide.

1.7 Theoretical framework

The theory of constructivism, with an emphasis on social constructivist ideals, provides a framework that supports the use of the lesson study process as a method for increasing teacher professional knowledge and development. The principle of social constructivism asserts the social nature of knowledge and the belief that knowledge is constructed through social interaction and is a shared rather than an individual experience (Vygotsky, 1978). Therefore, knowledge is constructed in response to social interactions through social negotiation, discourse, reflection and explanation. This supports the idea that teachers should be engaged in activities that necessitate interacting verbally and communicate often with both inexperienced and experienced teachers in their subject area.

During the lesson study process, professional collaboration occurs as teachers of various levels of experience work together in a group to discuss their practice through the implementation of lesson study. Prawat and Floden (1994) argue that knowledge acquisition is an adaptive function designed to organize one's experiences. Therefore, teachers should first encounter a problem in their delivery of lessons in class which should motivate them to seek, test, and assess answers within socially collaborative environments. In the initial phase of lesson study, teacher study groups work to set a goal statement that describes what they would like to develop in their students and themselves. These goal statements are constructed based on a challenge that the teachers' identify between their aspirations for their students and how students are actually developing in their school (Ertle, Chokshi & Fernandez, 2002). With this in mind, teachers focus the lesson study around problems or challenge in their practice that they are motivated to resolve. In this vein, Cobb and Yackel, (1996) contend that, knowledge is the result of active mental processing by the individual in a social environment. Therefore, teachers should be activated to reflect on their experiences, to create understanding, to evaluate their understanding and to explain their understanding to others. As teachers work through the lesson study process, there are multiple opportunities for them to reflect, analyze, create action steps, evaluate, and share understandings amongst themselves. These principles of social constructivism underpin lesson study and justify why each step of the lesson study process is important in bringing about increased professional knowledge and skills, with the overall effect of improved learner performance.

1.8 Limitations of the study

The decline of one secondary school to participate in the study, because the secondary school administrators said the school was no longer under the administration of Solwezi district education board secretary was a constraint to the study as it caused a reduction in the number of the sampled schools from five to four. Another limitation was that, the career guidance and counseling teachers' offices who were tasked with the responsibility of could not easily find result sheets for grade twelve resulting in unnecessary prolong of the data collection period.

1.9 Delimitations of the study

This study was delimited to Solwezi district because that is where the researcher resides. The study was conducted in four secondary schools in the district where lesson study activities were closely monitored by officers from the Provincial Education Office and Provincial and District Resource Centre Co-ordinator's Offices.

1.10 Operational definitions

1.10.1 Lesson Study: Lesson study will be defined as a teacher-led school based instructional improvement professional development in which teachers work collaboratively to formulate goals for student learning, plan a lesson, teach and/or observe the lesson, discuss and reflect on the taught lesson, re-teach and compile and share the lesson.

1.10.2 Sprint: A school-based system of CPD for teachers based in schools, supported by teachers' Resource Centre. The system involves small teacher group meetings that meet on a regular basis to discuss issues related to the teaching and learning process.

1.10.3 School Based Continuous Professional Development: These are activities that are conducted or use the school as the venue for teacher professional development.

1.10.4 Lesson study implementation: A practical means through which lesson study as a professional development approach, is effectively carried out in schools lead by teachers.

1.12 Ethical considerations

One important ethical issue that the researcher observed was that of obtaining permission from the Provincial Education Office (PEO) and the District Education Board Secretary's (DEBS) office before entering into the research sites (Deves, 1998). The researcher further assured the respondents of the ethical issue of anonymity and confidentiality by advising them not to disclose their names during any data collection activity.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews literature related to studies and works on the understanding and implementation of lesson study programmes in teaching. The literature was reviewed by looking at the definition of lesson study, teacher perception of lesson plans from lesson study activities, teacher's acquisition of skills of lesson study implementations and the impact of lesson study on pupil performance.

2.0 What is lesson study?

Lesson study is a teacher improvement and knowledge building process that has origins in Japanese elementary education. According to Isoda, Stephens, Ohara and Miyakawa (2007) lesson study began in the 19th century. It is a Japanese form of professional development that centers on teachers coming together to examine their practice by planning and trying out lessons (Fernandez, 2005). It has been defined in many ways, but the definitions have overlapping meanings.

Dudley (2011) has defined lesson study as a highly specified form of classroom action research focusing on the development of teacher practices, knowledge and skills. It involves groups of teachers collaboratively planning, teaching, observing and analyzing learning and teaching in what is referred to as a research lessons. Over a cycle of research lessons teachers may innovate or refine a pedagogical approach which will be shared with others both through public research lessons.

In Zambia lesson study is defined as a problem solving process of teacher professional development practice, in which small groups of teachers would meet regularly to plan, implement, evaluate and revise lessons collaboratively to sharpen their professional knowledge and skills in a given subject area, (MOE, 2010). In general lesson study could be looked at to be a teacher CPD approach that is broad-based, teacher-led system for improvement of teaching and learning.

2.1 Teachers' Perceptions of Lesson Plans generated from Lesson Study Cycle Implementation Activities

Lesson study may encourage teachers to critically reflect on their own teaching practices through detailed lesson planning. During the process of planning, evaluating and revising a research lesson usually referred to as a demonstration lesson in schools, teachers collaborate in the process sharpening each other's knowledge and teaching skills. According to Waris Herawatt, Al Muhdar and Fatchur, (2014), teachers who participate in lesson study activities exhibit changes in planning lesson and teaching practices. The positive change manifest when they reflect on their own practices from a new perspective while participating in lesson study process. In addition, teachers in Indonesia showed positive perception towards lesson study if they adapt and benefit from it. Ade Sobandi, (2014) points out that, during lesson study teachers learn through collaboration especially in reflection sessions, when planning, apply the lesson and reflecting on what is going on in the classroom.

The key pathways to improvements that underlie successful lesson study are improved quality of available lesson plans (Lewis, Perry & Hurd, 2004). According to Stigler and Hiebert (1999), research on teacher learning shows the importance of collaboration among teachers for the purpose of improving lesson planning, learners' achievement, curriculum and pedagogy, and access to alternative ideas and procedures. By getting involved in lesson study activities, teachers look closely at the student activities, work behavior and share what they learn from the situation. In this way teachers are most likely to build a strong set of teaching knowledge and skills that make teachers be aware of pupils learning needs and develop strategies to meet these needs as they plan their lessons. In addition, it is widely understood that a lesson plan is an important product of lesson study. Teachers involved in lesson study activities improve their instructional knowledge as well as skills of writing lesson plans as a product of lesson study activities, which are key components in lesson delivery in class, (Fujii, 2016).

According to Cerbin and Kopp (2006), lesson plans from lesson study activities are described in enough detail that teachers could adapt them to their own classrooms and be replicated or modified by other teachers during actual lessons in classrooms. It is therefore expected that after a series of lesson study implementation in a school, there will be an accumulation of lesson plans

that teachers keep for reference during subsequent lesson planning and implementation in class as they teach. Hiebert, Gallimore and Stiglar, (2002) also adds that, a lesson plan as a product of the lesson study cycle provides a unit for analysis which provides teachers with knowledge that can be generalized to real classroom situation.

In addition, lesson study approach is an effective tool for lesson planning, lesson presentation and lesson evaluation, (Honigsfeld & Cohan, 2008). The interaction between teachers as they work together results in success that makes the work stronger than the collection of the individual talents (Bandura, 2006). According to Hiebert and Stigler, (2000), when teachers collaborate with a collective shared responsibility for improving the practice of teaching and learning the school and pupils benefit. The benefits that the school accrues are associated with its teachers being effective when it comes to teaching and a bank of lesson plans that have inputs from teachers with different experiences, while the learners benefit from improved learning from the teachers resulting in improved performance on the part of the learners in assessments such as the national examinations. According to MOE, (2007), in Zambia, teachers have been taken to be the main actors in the lesson study and should be beneficiaries by getting involved. They are expected to collaboratively prepare lesson plans, demonstrate, observe lessons demonstrated, participate in discussions, revise lesson plan, record discussions, prepare reports on SBCPD-lesson study meetings and implement acquired knowledge and skills in their classrooms. Among the many benefits that come with conducting of lesson study activities is that, as teachers get involved in the lesson study activities, they are most likely to improve on the type of lesson plans they create, as well as changing their attitude towards teaching. Teachers are most likely to benefit from lesson plans generated during lesson study cycles by referring to the lesson plans as they plan for their classes.

It is therefore assumed that lesson study activities in the secondary school over the time has accumulated lesson plans that have inputs from teachers with different experiences, lesson plans that would stand the test of time. It is expected that, teachers document those lesson study activities lesson plans, so that other teachers can review and learn from their work, since a lesson plan is a familiar teaching instrument that is generated for every lesson conducted. These lesson plans are classroom tested and the results are seen as teachers do the lesson study activities.

However, the skills guide booklet does not show or give direction on whether teachers are to make reference to the lesson plans generated from the lesson study activities in planning lessons in their everyday teaching, though the aspect of filing the lesson plan is emphasized mostly for purposes of record for inspection.

Since lesson study is conducted as school based teacher-led CPD within the school and it's been conducted for over five years in Solwezi district secondary schools now, it is expected that teachers have a bank of lesson study generated lesson plans and would make reference to them in planning. In this study the researcher will try to establish the teachers' perception of lesson plans generated from lesson study cycle implementation activities in schools.

2.2 Skills acquired from lesson study implementation

Implementation of the lesson study has taken different formats in different countries. Teachers begin the lesson study process by identifying a lesson study goal and content area they want to work on together. Work on the lessons study begins with teachers jointly drafting a lesson plan that is taught to a class while other teachers observe. The teachers then discuss the merits and demerits of the lesson and bring out ideas on how to improve the lesson. The discussions lead to the revising of a lesson plan, re-teaching the lesson to a different class, and again meeting to discuss the revision lesson, (Cannon, Chokshi & Fernandez, 2002).

In Zambia like other countries, eight steps process of lesson study implementation is followed by teachers. Step one involves defining a problems or challenge, step two involves collaboratively planning a lesson, step three is the implementing of a planned lesson, step four involves discussing of lesson and reflecting on its effect, step five involves the revising of the lesson, step six involves teaching of the revised lesson, the seventh step involves the discussion of the lesson and reflecting again, and the eighth step is the compiling and sharing reflections, (Banda et al, 2014, Han & Paine 2010). The eight steps that the teachers go through before they compile a detailed report and reflection on the lesson offers an opportunity for teachers to learn variety of skills for teaching different topics from experience and newly trained teachers. The skills acquired would in turn be used in the class as the teachers teach. According to UNESCO

(2015), lesson study has the potential to improve skills of teaching and lesson delivery by the teacher especially that skills of teaching are rapidly becoming out dated or improved and teachers over a long period of time cannot rely on the skills they acquired in pre-service training to cope with new situations in their classrooms.

The skills guide booklet that provides guidance to teachers on the implementation of lesson study in Zambia emphasizes the importance of teachers acquiring the necessary skills that lesson study as an approach for SBCPD encourages. The skills guide booklet suggests ideas to enable teachers to obtain skills needed for better teaching, especially in the framework of SBCPD through lesson study. It further adds that it is hoped that teachers will come up with proper strategies of learner centered teaching and learning, (MOE 2009). This statement shows that teachers are expected to acquire skills that would help them deliver learner centered lessons in classrooms. lesson study in Zambia was introduced to shift from chalk-and-talk lessons, which mainly aim at the transmission of knowledge to learners, to participatory lessons where both the teacher and the learner have a part to play and aim at the development of learners' thinking and activities, (Baba & Nakai, 2011). It is expected that through lesson study, teachers would acquire skills that will help them develop various abilities in learners such as interests, attitudes, thinking abilities and skills in learners that will help them learn science effectively.

MOE (2007) points out that, teachers have a responsibility to deepen their knowledge, extend their professional skills and update themselves on major developments in areas of pedagogy and subject content. The ministry of education, therefore believes that through lesson study implementation activities, the discussion or rather the collaborative nature of lesson study is likely to allow teachers exchange teaching skills that will promote a variety of teaching strategies that focus on stimulating learning through inquiry, guided-discovery, problem solving, application and other skills that are based on teaching and learning. This in turn is expected to help improve the way teachers conduct lesson and later on also improve performance of learners and reduce school dropout as pointed out by JICA (2015), that the problem in Zambia is that many learners fail to keep up with lessons and drop out because of the lack of teaching skills by the teachers.

Lenski and Caskey, (2009), also believe that, lesson study as an approach for professional development is ideal for teachers to learn skills. They point out that, in lesson study, learning occurs as teachers' exchange ideas and collaborate on lessons for their actual classroom.

It is clear that teachers are expected to acquire from lesson study activities skills that would help them conduct lessons that are learner centered. In Solwezi district it is not clearly known what teaching skills teachers who teach biology have acquired from lesson study activities from the time lesson study was introduced. It is against this situation that the study was conducted to establish skills that biology teachers in the secondary school in Solwezi district have acquired over the five years' lessons study has been implemented. This research will therefore try to find out the skills that teachers say have acquired from lesson study implementation activities, that would help them deliver effective lessons and in turn help improve learner performance.

2.3 Impact of lesson study implementation on learner performance in biology

Staff professional development program in any organisation is meant to improve the efficiency of its staff. Supovitz and Turner, (2000), argue that in education, teacher professional development is aimed at improving student achievement. They further argue that, the implicit logic of putting emphasis on professional development as a means of improving student achievement is that, high quality professional development will produce improved teaching in classroom, that in turn translate into high levels of student performance.

However, to prove the effect of a professional development on the achievement of learner poses a challenge. According to Yoon, Duncan, Lee, Scarloss and Sharpley, (2007), showing that professional development translates into gains in student achievement poses tremendous challenges, despite an intuitive and logical connection, they go on to say, to substantiate a link between professional development and student achievement, studies should ideally establish two points that, there are links among professional development, teacher learning and practice, and student learning and that the empirical evidence is of high quality and that the study proves what it claims to prove. Yoon et al, (2007) also adds that, professional development affects student achievement through three steps. First, professional development enhances teacher knowledge and skills. Second, better knowledge and skills improve classroom teaching. Third, improved

teaching raises student achievement. If one link is weak or missing, better student learning cannot be expected. If a teacher fails to apply new ideas from professional development to classroom instruction, learners will not benefit from the teacher's professional development.

In Zambia a notable change in teachers has been observed, (Baba & Nakai, 2011). They further say, through lesson observation and interviews, changes in teachers are noted as more teachers write lesson plans, set the lesson objective clearly, develop a more interactive lesson process, and increase activities in the lesson. However, changes in pupil performance in class are not expected within a short period of time. The effect on learners' performance depends on the length of time of implementation of any professional development program, as Colbert, Brown, Choi and Thomas, (2008) points out that, one factor that prevents a researcher from gathering more formal student achievement data concerning professional development programs is the implementation period. The period of implementation of lesson study in Solwezi district in particular has been over five years since its introduction and as such this gives a long period to assess learner performance.

Lesson study practice of science teachers in Central Province provided positive effect on pupil performance in science subjects in the national examination. This provided positive hope that implementation of lesson study in schools results in higher pass rate performance of pupils in science, (Banda et al, 2010). The impact survey research does not compare the performance of pupils before implementation of lesson study to the performance after the implementation of lesson study in the national examination results of the schools where lesson study is being implemented. This is supported by Ngumbwe, (2013) who established that although it was generally cited that the strengthened secondary school teachers CPD had a positive impact on pupil performance, reality on the ground showed that, grade twelve results from 2009 at school level were not continuously improving every year but were changing following the up and down ward reverse pattern of performance. She points out that, the assertions given by the respondents were not substantiated but was just mere assumptions without tangible evidence. To establish the impact of lesson study implementation on the achievement of pupils, actual grade twelve results of learners before lesson study implementation and results of learners from the time lesson study started being implemented have to be compared to establish any change. The national

examination results were used in this case because they were considered to be standard since they are prepared for all the schools regardless of the location of the school. Good performance has positive correlation to the quality level of lesson study implementation, (Banda et al, 2014). Teachers find the collaborative aspect of lesson study to have a big impact on their teaching and student learning, (Van Sickle, 2011). Collaborative professional development can have an impact on teaching practices, especially in teachers' ability to provide instructional support to children that promotes higher order thinking and cognitive development (Poekert, 2012). For a professional development activity like lesson study to help improve teachers' instructional skills, it should exhibit certain characteristics.

Research literature on teacher continuing professional development suggests that high-quality professional development should be collaborative (Guskey, 2003), coherent (Desimone, Porter, Garet, Yoon, & Birman, 2002), based on content matter (Desimone, 2002), focused on instructional practice (Wilson & Berne, 1999), and sustained over time (Yoon et al, 2007). In addition, institutions that are implementing CPD activities show that teacher preparation in these institutions was positively related to student achievement, (Darling-Hammond, 1999). Teacher preparedness in terms of lesson planning is important in ensuring effective lesson delivery to meet the needs of learners. However, duration and structure of a professional development is linked to increased student achievement in science (Johnson, kahle & Fargo, 2007). An argument also forwarded by Ngumbwe, (2013) in the study she did in solwezi district secondary schools on strengthening of continuous professional development, where she pointed out that multiplier effects are usually achieved after a long time because by then teachers would have practiced the new teaching skills acquired during CPD activities. This point to the fact that to get positive results in a teacher's professional development like lesson study, period of implementation and structure is an important factor.

The length of time lesson study as a SBCPD has been implemented in Solwezi district is long enough to enable it to attain a stage that can qualify it to be of quality such that SBCPD lesson study activities should now have impact on the learners' performance. The structures of SBCPD lesson study in Zambia is almost similar to the ones that are implemented in other countries where it is implemented in schools. MOE (2007) points out that, SBCPD is based on the lesson study approach which has been implemented for a long time in some countries such as Japan,

America, Australia, Philippines and Malaysia and has been found to be effective for improving classroom teaching and sustainable as a teacher education CPD program.

To ascertain the impact that lesson study has had on the improvement of the teachers', teaching skills and ultimately improve learner's performance over the period lesson study has been implemented, actual results were analyzed. Grade twelve results for atleast five years before implementation of SBCPD lesson study and five years after implementation of SBCPD lesson study were analysed, as this would be enough length of time of implementation for a program to yield significant effect on both the teachers' teaching skills and learners' performance.

2.4 Summary

The chapter has reviewed literature relevant to lesson study implementation. A definition of lesson study was given and was followed by a review of literature related to teachers' perception on lesson plans generated from lesson study implementation activities, teachers' acquisition of skills of lesson study and the impact of lesson study implementation on learner performance.

The implementation of lesson study was discussed with reference to scholarly research findings and recommendations.

CHAPTER THREE

METHODOLOGY

This chapter introduces the methods that were used in carrying out this study. These include the research design, target populations, sample size, sampling procedure, research instrument, and data collection procedure and data analysis methods used.

3.0 Research Design

According to Kothari (2004), research design is the conceptual structure within which research is conducted. In this study, a mixed method was used and a concurrent triangulation design was employed. A mixed method combines qualitative and quantitative approaches in a single or multiphased study. The purpose of using a mixed method approach is to triangulate or check the complementarity of the findings of the study from one method by examining the findings using a different method. In concurrent triangulation design, qualitative and quantitative data is collected and analyzed separately but at the same time, with the findings converging in the conclusions in order to answer a research question, (Donald, Jacobs, Sorensen, & Razavieh, 2010).

The concurrent triangulation design was used to collect and analyze data to answer the qualitative and quantitative objective set at the same time. It also has a shorter data collection time when compared with other methods and offsets weaknesses inherent to one design by using both, (Terrell, 2012). In the design both quantitative and qualitative data sets were collected concurrently, and then integrated in the discussion. The data collected from the Examination Council of Zambia documents, obtained from the sampled schools (quantitative), data from questionnaires and interviews were integrated in the discussion. This enabled better understanding of the research problem by converging both quantitative trends and qualitative views of the problem in the study.

3.1 Location of the Study

The study was conducted in selected secondary schools in Solwezi district targeting teachers in the science department. These secondary schools were purposively sampled because they were

among the earliest schools that got involved in the lesson study programmes when it was rolled out to North-Western Province. Schools that had implemented lesson study activities for less than five years were excluded from the study to help reduce potential researcher bias. In addition, Grade twelve national examinations results in biology for the secondary schools before and after they started implementing lesson study were collected, for purposes of determining the effects of lesson study on students' performance.

3.2 Target Population

Donald et al, (2010) have defined population as, all members of any well-defined class of people, events, or objects, while Scott and Johnston, (2009) have defined a population as the universe of people to which the study could be generalized.

The target population was 17 secondary schools in Solwezi district from which Headteachers, SBCPD coordinators and teachers in the science department were identified as participant for the study. Grade twelve Biology national examination results, from examinations council of Zambia for the schools sampled were also used to assess the impact of lesson study implementation on learner performance in biology in Solwezi district.

3.3 Sample Size

A sample is a subset of people from the population that will participate in a study, (Scott & Johnston, 2009). Sampling is the techniques used to select a sample from a wider population, (Jupp, 2006). This is done because it is not usually possible to include the whole population in a study; as such a sample size is referred to as the size of the subset of a population. The sample size comprised four Headteachers, four SBCPD lesson study Coordinators, forty science teachers from the science departments of the schools sampled, from each of the sampled schools. All the science teachers in the science departments of the schools involved in the study were involved since the teachers at this level may teach any of the three science subjects.

Solwezi district currently has 17 secondary schools, however only four secondary schools were purposively sampled out of this number because these were the secondary schools that were involved in lesson study implementation when it was introduced in the district and are still implementing lesson study. Table 3.1 shows a summary of demographic information of the respo

3.4 Sampling Techniques

The study used purposive sampling because in this method, the researcher was targeting a group of people believed to be reliable for the study (Kombo & Tromp, 2006). Purposive sampling was used to select four schools, because they were among the secondary schools that were involved in SBCPD lesson study implementation when it was introduced to Solwezi district. The Headteachers and SBCPD lesson study coordinators were also sampled because of their role in monitoring and organizing the activities of SBCPD lesson study. Purposive sampling was also used to pick teachers in the science department because they have been involved in lesson study implementation since its introduction in the secondary schools sampled. Purposive sampling was used because it allowed the researcher to select supposedly typical or interesting cases. The power of purposive sampling lies in the selecting cases with rich information. It also gives the deliberate choice of informant due to the qualities the informant possesses. (Blaxter, Hughes & Tight, 2001, Donald, et al 2010).

3.5 Instruments for Data Collection

The instruments of data collection that were used included the questionnaire, an interview guide and analysis of authentic documents of results schedule for grade 12 from Examination Council of Zambia.

3.5.1 Questionnaire

A questionnaire as a self-report data collection instrument that each participant fills out as part of a research study is a widely used tool for collecting research information, (Johnson & Christensen, 2008). A total of forty questionnaires were used to collect data from teachers. A questionnaire has a lot of advantages such as upholding confidentiality and saving time. To ensure effectiveness of a questionnaire a pilot with a small sample was done. This ensured that the questionnaire measured what it was supposed to measure, the wording was clear and if all the questions are interpreted in the same way by all respondents (Kombo & Tromp 2009). For details of the questionnaire, see Appendix B.

3.5.2 Interview Guide

A semi-structured interview was also used to collect data on lesson study implementation. A semi-structured interview is based on the use of an interview guide. An interview guide is a list of written interview questions that need to be covered by the interview (Kombo & Tromp 2009). An interview is a flexible tool for data collection, enabling multisensory channels to be used in getting a story behind a participant's experiences, pursue in-depth information on a topic or follow-up on certain responses to questionnaires, (Boyce & Neale, 2006). An interview with the four Head teachers and four SBCPD lesson study coordinator using open ended interviews guide was done to enable the researcher get in-depth information on the implementation of lesson study in the secondary school of Solwezi district. The same interview guide was used for both Head teachers and SBCPD lesson study coordinators. For details of the interview guide see the Appendix C.

3.5.3 Document analysis

Document analysis is the detailed examination of documents produced across a wide range of social practices, taking a variety of forms from the written word to the visual image, (Kombo & Tromp 2009). Secondary data were collected through analysis of grade twelve examination results for the schools sampled. The results were used to determine the performance of pupils before and after implementation of lesson study. Three instruments of data collection were used for triangulation sake and because they are suitable for the research. The use of various data collection sources enables the researcher to collect comprehensive rich data, (Deves, 1998).

3.6 Procedure for Data Collection

To obtain the needed data from the sampled participants, the researcher first got permission from the Provincial Education Officer (PEO) and the District Educational Board Secretary (DEBS) to conduct research in the four secondary schools of Solwezi district. Permission was sort using an introductory latter obtained from the University of Zambia office of the Assistant Dean of Post Graduate Studies.

Primary sets of data for the research were collected from the teachers in the science Departments of the schools that were sampled for the research through the use of questionnaires. Furthermore, Face to face interviews with the Headmaster or the deputy head teacher and lesson study/SBCPD

coordinator were held. During the interviews, the researcher recorded and took notes of the interview. The notes taken were summarized for the respondents as a way of validating the data collected.

Secondary data were also collected through analysis of authentic documents of Grade 12 result schedules from 2005 to 2014, obtained from the schools that were sampled for the research to compare the performance of pupils in national Grade 12 examinations in Biology.

3.7 Data Analysis

Data analysis refers to examining what has been collected in a research and making deductions and inferences. It involves scrutinizing the collected information and making inferences, (Kombo & Tromp 2009).

Qualitative data collected from the questionnaires and the interviews were analyzed by categorizing it into emerging themes that were meaningfully interpreted. To achieve this, data collected from questionnaires was first tabulated into Microsoft Excel spread sheets for logical arrangement, categorizing and comprehension. This formed the basis of coding and sorting data for particular analysis.

The quantitative and qualitative data were analyzed separately and then considered together. Identification of categories and themes is the core of qualitative analysis, (Donald, et al 2010). Descriptive and inferential statistics were used to analyse quantitative data collected. Descriptive statistics were used to calculate means and frequencies. Correlation analysis using Pearson's correlation and scatter plot graph were used to determine the degree of relationship of the grade twelve results for the period before and after lesson study implementation. According to Kombo & Tromp (2009), in analyzing using correlation the researcher tries to indicate the proportion of sameness between two variables. In addition, correlation analysis, aim at measuring the relation between a dependent variable and a particular independent variable by holding all other variables constant. Since correlation analysis only indicates the proportion of sameness between two variables, the study also used *t*-Test: paired sample for means to determine the significance of the sameness.

3.8 Validity and Reliability

Validity of a measuring instrument is the extent to which it measures what it claims to measure, while reliability of a measuring instrument is the degree of consistency with which it measures whatever it is measuring, (Donald, et al 2010). Validity and reliability of data in this research was enhanced by employing a combination of methodologies in data collection. The study used three data collection methods and three categories of sources of data. The combination of methods increases reliability and validity. Validity further examines the extent to which the results of the study can be generalised to the real world (Achola & Bless, 1997). The questionnaire and the interview guides were pilot tested before using them. The pilot test was done at a secondary school in the same areas where the research was to be conducted for purposes of validation and ensure that any anomalies and ambiguous questions were corrected before the questionnaire was finally administered to the sampled population.

3.9 Ethical Considerations

According to Leedy and Ormrod (2005), whenever human beings are the focus of investigation, it is important to closely look at the ethical implications of what we are proposing to do. Ethical issues mostly seek to find out how participants are going to be protected from harm, their right to privacy and informed consent. In order to uphold ethics, the researcher asked for approval from the Provincial Education Officer, District Education Board Secretary's Office, Head-teachers of schools and teachers to collect data. Ethical issues such as confidentiality, informed consent and participants' right to privacy were upheld. Data collected were not exposed to unauthorized persons or institutions. The participants' names or personal details and actual names of the school involved in the study were not captured as the interest of the study was the information. All participants were briefed about the purpose of the research and those who wished to withdraw at any time were not forced to change their positions.

3.10 Summary

This chapter has provided an in-depth overview of the research methodology used in the study. The research methodology will include research design, target population, sample size, data collection procedure, data analysis and ethical considerations have been explained in this chapter.

CHAPTER FOUR

PRESENTATION OF FINDINGS

This chapter presents findings of the research on the implementation of lesson study in Biology in Solwezi district schools. The findings presented are based on the headings drawn from the research questions. The specific research questions which were used to answer the general research question were as follows:

1. How do teachers perceive lesson plans generated from lesson study cycle implementation activities in Biology?
2. Do teachers have the skills of lesson study implementation in Biology teaching?
3. What is the impact of lesson study implementation in classroom on the performance of pupils in Biology?

4.0 Demographic information of the respondents

The information in Table 4.1 shows that, 71 % of the respondents were male, while 29% of the respondents were female. The study had more male participants than females.

Table 4.1 also show that 15% of the respondents were in the age range of 20- 30, while 63% of the respondent were in the age range of 31- 40. It was further noted that 21% of the respondents participated in the study were in the age range of 41-50, with 1 respondent in the age range of 51- above. This information shows that most of the participants in the study were not very old rather they are still youthful and that they had not spent a lot of years in the teaching profession.

The study also took interest in the academic qualification of the respondent who participated in answering the questionnaire as well as those who participated in the interview. The information gathered revealed that 60% of the participants had a diploma in teaching, while 34% had a first degree in education. The study further revealed that there were two participants with master degree in education and a PhD degree accounting for 2% each. It should be noted however that the two individuals with master and PhD degree are all administrators.

Table 4.1 also shows information on the positions that the respondents who participated in the study were holding. The information shows that 75% of the respondents were practicing class teachers. The positions of head of department and SBCPD lesson study coordinator accounted

for 8% of the participants each, while the positions of head teacher and deputy head teacher had 4% each. The positions of Head teacher or Deputy Head teacher were included because in some school the interview was done with either the Head teacher or the deputy Head teacher.

Table 4.1: Demographic information of the respondents

Gender for the respondents		
gender	Frequency	Percentage
Male	34	71
Female	14	29
Total	48	100
Age group for the Respondents		
age group		
20- 30	7	15
31- 40	30	63
41- 50	10	21
50-above	1	2
Total	48	100
Highest Academic Qualification Attained by Respondents		
Academic qualification		
Diploma	29	60
Degree	17	35
Masters degree	1	2
PhD	1	2
Total	48	100
Position held by Respondent		
Position held		
class teacher	36	75
HOD	4	8
SBCPD lesson study coordinator	4	8
Deputy head teacher	2	4
Head teacher	2	4
Total	48	100
Length of Service in Position		
Years in position		
0 to 4	14	29
5 to 9	17	35
10 to 14	12	25
15 to 19	3	6
20 – above	2	4
Total	48	100

4.1 Teachers' perception of lesson plans generated from lesson study cycle implementation activities in Biology.

To establish the teachers' perception on lesson plan generated from lesson study implementation activities, the study first needed to determine the feeling of the teachers in relation to their initial training. Despite most of the respondent 62.5% having only a diploma in education, the results in Table 4.2 show that 72.5% of them were confident their initial training was adequate in preparing them for the teaching profession. However, 27.5% of the respondents still felt their initial training was not adequate in preparing them for teaching. This is summarized in Table 4.2 below.

Table 4.2: *Response on adequacy of initial training*

Initial training adequacy	Frequency	Percent
Yes	29	73
No	11	28
Total	40	100.0

Source: field work 2017

73% of respondents were confident their initial training was adequate in preparing them for the teaching profession. They pointed out that, they acquired the right skills and knowledge that helped them teach with less difficulty. Among the 73% who indicated yes, other also pointed out that the length of time they spent in college prepared them enough to gain right content, obtain skills, methodologies and appropriate teaching strategies that help them effectively teach biology. Respondents T4KSSQ4 wrote, *“Enough content and skills in teaching methodologies were obtained in two years of training,”* while T9MSSQ9 said, *“The period was long enough to explore all the teaching strategies”*.

However, 28% of the respondents said no, they were not confident that their initial training was adequate in preparing them for teaching profession. They cited reasons of the initial training being inadequate saying the training only prepared them to teach environmental science at junior secondary school. The respondents pointed out that, most lessons in college were more of theory

than practical because of inadequate practical material, while other respondents pointed out that the theories learnt in training institution cannot be applied in some situations of lesson delivery, because of the ever changing approaches to teaching and learning. T3KSSQ3 said, *“The theories taught in training institutions cannot be applied in some situations of lesson delivery due to the status of things in a school”*. This could be because of shortages of teaching materials like laboratories and laboratory equipment.

Some teachers among the 28% cited reasons of exposure to real situation being inadequate while the other cited the need for more training in teaching methods, as T4SDSSQ4 said, *“There was need for me to have some form of training in methodology”*, *“the exposure to real situation was inadequate”*. When the respondent points out that the exposure to the real situation was inadequate, this implies that during training the institution did not expose the respondent to a lot of real school teaching experiences.

The respondents were also asked what they knew about lesson study cycle as a SBCPD. To this effect they described lesson study cycle as a school based continuing professional development in different way depending on what they knew. However, most the responses centred on the fact that it was an activity in schools where teachers in a department shared teaching approaches, methodologies that helped in effective lesson delivery of challenging topics. In addition, the respondents also pointed out that it was an in-service program that was meant to improve teachers' content knowledge, teaching skills and kept teachers abreast with latest pedagogies in teaching. Respondent T1SDSSQ1 said; *it's an in-service training where teachers (same depart) come together and share their challenges in terms of content or methodology and the best way of overcoming such challenges”*. T7SDSSQ7 also said; *an activity done in school to help teachers share some teaching approaches, methodologies that may help in effective lesson delivery of challenging topics e.g. genetic*.

4.1.1 Benefits from lesson study activities

The study also sought to determine whether participants had benefited from SBCPD lesson study activities in schools.

The findings revealed that the participants had benefited from SBCPD lesson study activities in school and they claimed that lesson study activities had helped them improve on the teaching approaches, methodologies, teaching skills and how they prepared for practical examinations. Other benefits of SBCPD lesson study activities that respondents pointed out were that, lesson study activity was acting like a platform where teachers would enlighten each other on new developments in the teaching profession, as T4KSSQ4 said, *“it provides a platform for refresher courses and adapt with new developments and approaches in our profession”*. Other teachers also pointed out that, it is an activity where they could build and acquire effective teaching skills based on the learner centered approach. SBCPD lesson study has made the participants acquire new skills, methodologies and approaches that make delivering of lessons in class effective and learner engaging. Respondent T1MSSQ1 said, *“I learn good techniques and methodologies to employ into teaching and learning process*. While T11KSSQ11 also pointed out that, *“Because it helps me to build and acquire effective teaching skills based on the learner- centered approach”*.

However, some respondents indicated that they had not benefited from SBCPD lesson study activities in school. They pointed out that SBCPD lesson study activities is time consuming and involving, while other respondents added that, it is rarely held in the school, as Respondent T7SDSSQ7 said, *“despite been good thing it is time consuming and very involving as a result takes time to finish objectives,”* and the other one said, *“very involving as a result it takes time to finish objectives”*, while Respondent T10MSSQ10 also said, *“because they are rarely held here”*. In trying to understand the attitude of teachers toward implementation of SBCPD lesson study in schools, the respondents were asked to indicate what influenced them to participate in SBCPD lesson study activities in schools in a likert scale. The results of the likert scale were as shown in Table 4.2 below.

Table 4.3: Teacher responses on attitudes towards implementation of SBCPD lesson study

Statement	strongly		not		strongly
	agree	Agree	sure	disagree	disagree
1. To build content knowledge	47.5%	47.5%	2.5%	2.5%	0%
2. To acquire effective teaching skills	65%	32.5%	2.5%	0%	0%
3. To improve skills of lesson planning	52.5%	42.5%	5%	0%	0%
4. The administration asks us to participate	10%	27.5%	15%	30%	17.5%
5. Because other teachers are participating	0%	7.5%	10%	47.5%	35%
6. Hearing others talk about lesson study	2.5%	10%	12.5%	45%	27.5%
Average	29.6%	27.9%	7.9%	20.8%	13.3%

Source: field work 2017

Table 4.2 shows that 95% of the respondents participate in SBCPD lesson study activities to build content knowledge of the subject, while 98% of the respondents indicated that they participated in lesson study activities to acquire effective teaching skills. 95% of the participants indicated that they participated in lesson study activities to improving skills of lesson planning. However, 38% of the participants indicated that, they participate in SBCPD lesson study activities because the school administrators asked them to participate, while 8% claimed they participated in lesson study activities in school because other teachers were participating in the activities. 13% of the respondents also claim they participated in SBCPD lesson study activities because they heard other teachers talking about it. There were about 3% of the respondents who disagreed that they participated in SBCPD lesson study activities to build content knowledge.

A likert scale was also used to establish how the lesson plans generated from the activities of SBCPD lesson study were treated. The results of the likert scale were as shown in Table 4.3 below.

Table 4.4: Teacher responses on what happens to lesson plans generated from SBCPD lesson study activities

Statement	strongly		not		strongly
	agree	agree	sure	disagreed	agree
1. They are filed in lesson study files	37.5%	35%	15%	12.5%	0%
2. I make reference to them when lesson planning	22.5%	62.9%	5%	10%	0%
3. They are kept in lesson study files not accessible	0%	5%	17.5%	50%	27.5%
4. They are shared for each teacher to have a copy	27.5%	42.5%	10%	2.5%	7.5%
5. They are never used as reference when planning lessons	7.5%	15%	2.5%	40%	35%
Average	17%	29.8%	10%	23%	14%

Source: field work 2017

The results in Table 4.3 shows that 73% of the participants indicated that the lesson plans from SBCPD lesson study activities were filed in a departmental lesson study file and 13% of the participants indicated that the lesson plans were not filed in lesson study file. Eighty-five percent of the participants indicated that, during planning of lesson, teachers made reference to the lesson plans from lesson study activities, however 10% of the participants disagreed to them using the lesson plans from lesson study activities for reference. Seventy percent of the participants indicted that the SBCPD lesson study lesson plans were shared among teachers to keep their own copy probably for reference. However, 20% of the participants indicted that they disagree that the lesson plans from SBCPD lesson study activities were shared for each teacher to have a copy. Twenty-three percent of the respondents indicated that the lesson plans from SBCPD lesson study activities were never used for reference when planning lessons, while 75% of the participants also either disagreed or strongly disagreed that the lesson plans from lesson study activities were never used for reference when planning lessons. It was also noted that 77% of the participants indicated that the lesson plan from lesson study activities were kept in files that were not accessible for everyone. On the contrary an average of 10% of the respondents indicated that

they were not sure whether the lesson plans are filed in lesson study file; they make reference to them when planning; they are kept in a lesson study file that is not accessible or shared for teachers to have a copy of their own. Figure 4.2 shows a copy of a filed demonstration and revised lesson study cycle lesson plans generated from lesson study activities.

1st Demo

MINISTRY OF EDUCATION.
██████████ HIGH SCHOOL.
NATURAL DEPARTMENT LESSON PLAN.

School: ██████████ Date: 14-05-2009
Subject: BIOLOGY
Topic: DIGESTION
Sub-Topic: DIGESTION IN THE MOUTH.
Class: 11B

No. of Pupils:
Rationale: The lesson will help pupils describe digestion in the mouth.

Objectives: T.P.S.B.A.T:
- state structure that help digestion in the mouth.
- describe the types of digestion in the mouth i.e. chemical and physical digestion.

Pre-requisite Skills and knowledge:
Pupils have already been taught on the alimentary canal of human being.

Reference books: Biology (The dynamics of life).

Teaching and Learning materials/Resources: charts, chalk board.

Lesson Process

STAGE	TEACHING/LEARNING ACTIVITIES	LEARNING POINTS
Introduction	<ul style="list-style-type: none"> - The teacher will recapitulate the lesson on the previous lesson on the alimentary canal using question and answer method in the following questions. - Mention parts that make up the alimentary canal? - What is the importance of digestion? 	<ul style="list-style-type: none"> - Mouth, Oesophagus, Stomach, pancreas, Liver, large intestines, small intestines, appendix and the rectum. - To ingest food. - Digestion the food. - absorbs the digested food and eliminates the undigested materials.

Fig 4.1 –Sample picture of a demonstration lesson study lesson plans Source: field work 2017

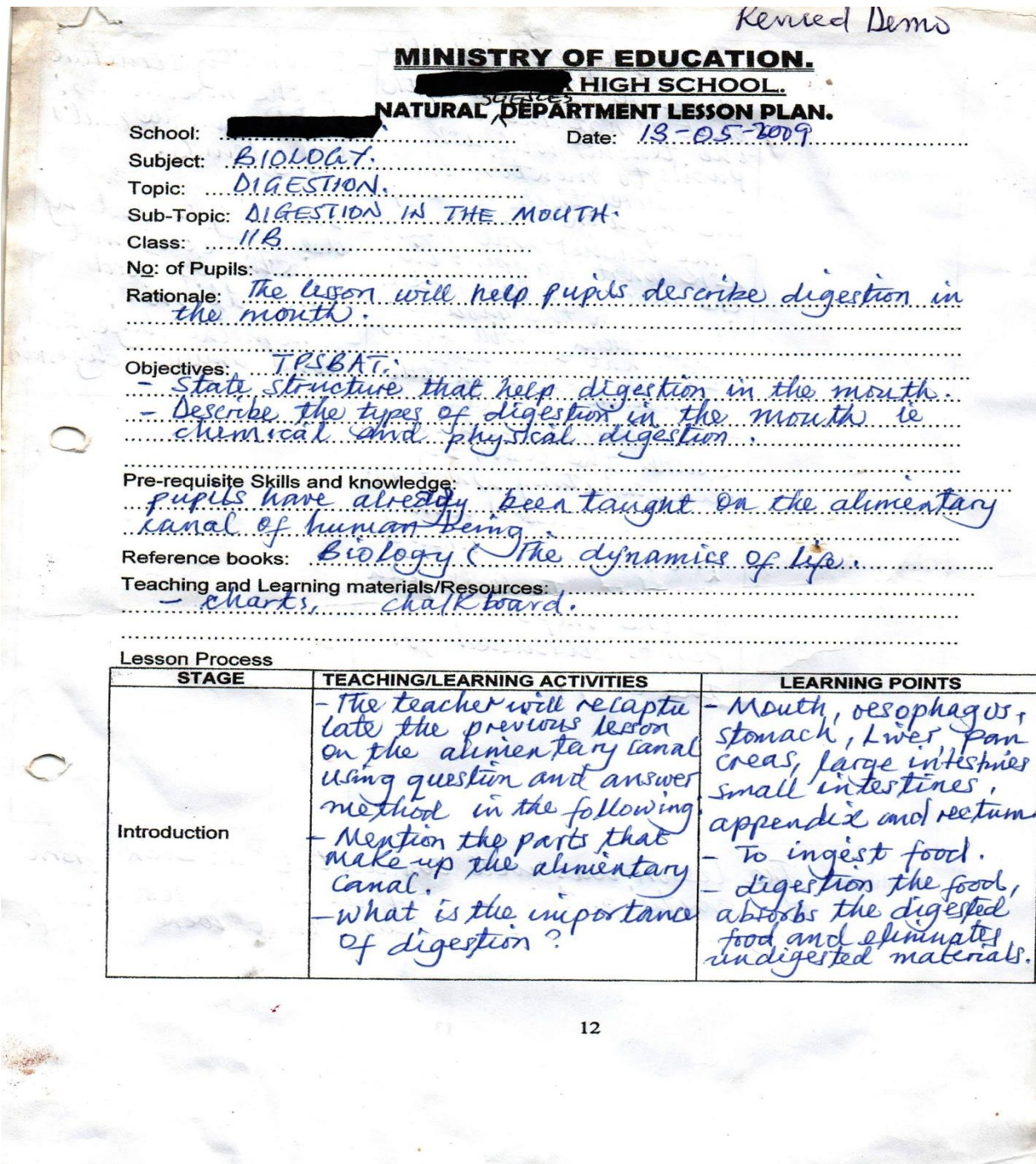


Fig 4.2 –Sample picture of a revised lesson study lesson plan Source: field work 2017

This particular lesson plan was generated in third term in 2009 at one of the sampled schools and it is securely kept in a file for reference purposes by teachers teaching similar lesson in their

classrooms especially the revised copy. This shows that these lesson study lesson plans were filed for teachers to make reference to as indicated by the participants.

4.2 Skills acquired from lesson study implementation in biology

The study also sought to establish whether teachers had acquired skills from SBCPD lesson study activities to help them improve the way they plan and conduct lessons in biology. The study inquired from the participants whether by them participating in the activities of lesson study implementation, they had acquired the skills from lesson study to help them improve the way they conduct lessons in biology in their classes.

The respondents felt that by participating in SBCPD lesson study implementation activities, they had acquired the skills of lesson study that would help them improve the teaching of biology in class. The respondents pointed out that they had learnt skills of planning lessons with pupils in mind hence executing learner centered lessons. Other respondents also stated that, by participation in SBCPD lesson study they had learnt to reflect on every lesson they conducted in class as well as plan lessons that can easily engage learners in the process of teaching and learning. Respondent T10STSSQ10 said, *“The skills learnt during the activity such as planning lesson with pupils in mind help in executing lessons that are pupil centred,”* while Respondents T3KSSQ3 also said, *“before participating in the lesson study cycle, some stages of learning were omitted or poorly handled especially the pupils’ role in the learning process”, “through the stages of the lesson study cycle implementation I have learnt to reflect on what I do in every lesson”*.

However, there are respondents who do not believe that by participated in SBCPD lesson study implementation activities in biology they had acquired the skills from SBCPD lesson study that would help them improve the teaching of biology in class. They pointed out that the aspect of acquiring skills and practicing them are two separate things. A T8SDSSQ8 said, *“Being equipped with lesson study lesson planning skills should be coupled with practice”,* while T6MSSQ6 simply said, *“You need also to practice them”*. It appears that while teachers claim that they had acquired teaching skills by participating in lesson study activities, practicing those skills in actual class teaching was also a different thing all together. In other words, the skills of

teaching that lesson study activity encourages teachers to acquire can be practiced during the activity, but putting into practice the same skills in actual classroom teaching may not be achieved.

4.2.1 Findings from the interview

The findings from the interview conducted with the SBCPD lesson study coordinators and Headteachers/ deputy Headteachers revealed that, teachers had gained skills from lesson study activities that were helping them in their teaching of biology in class. Some of those skills learnt included such skills like effective planning of lessons, delivering learner centered lessons, ability to collaborate when preparing lessons, being open minded so much that they were able to criticize each other, planning activities for learners that promoted hands on activities and formulation of lesson objectives.

The Head teacher for School D said, *“what I have seen is that most of the teachers, apart from those lessons that are planned collaboratively, they are able to plan effective lessons and are able to plan activities for the learners that promote hands on activities for the learners”*, while the deputy Headteacher for School B said, *“one outstanding benefit has been confidence in the teachers ability to deliver a lesson and that teachers are able to consult from each other when doing the preparation. On the other hand, the SBCPD lesson study coordinator for School B pointed out that, “It has helped them to improve in the way they prepare their lessons, formulation of objectives as well as skills of delivering on the part of the teacher”*.

4.3 Impact of lesson study implementation on learner achievement in biology

The third question of the study was concerned with accessing the impact of lesson study implementation on the performance of the learners in biology. Information was obtained through interviews with the SBCPD lesson study co-ordinator and the Headteacher/deputy Headteacher and analysis of grade twelve results for years ranging from 2005 to 2014. This was done for purposes of triangulating information obtained.

4.3.1 Findings from the interview

The interview with the SBCPD lesson study coordinators and Head teachers or deputy head teachers revealed mixed responses. The participants in the interview were quick to say they had seen a relationship between lesson study implementation and improvement in learner performance in examination. The respondents pointed out that, learner's performance had improved steadily with the introduction of SBCPD lesson study in schools. Others also pointed out that, they would not say there is a big improvement, but rather the improvement was minimal, not as expected. The deputy head teacher from School C said, *“There is a slight improvement, just a slight improvement which is noticeable, but not as expected. We know very well that those subjects many pupils do not perform very well to the expectation, but at least there is that improvement”*. However, another Headteacher from School B pointed out that, *“we had very low grades in biology and science. These are subjects that recorded a lot of fails, but when lesson study came into picture we recorded very good grades. This goes back to 2011 to 2013 we saw a huge surge of very good performance”*.

4.3.2 Aspects of SBCPD lesson study that contributed to improved learner performance

The follow up question on whether teachers had noticed any relationship between them participating in SBCPD lesson study and learners' performance in biology, sought to ascertain what aspect of lesson study had contributed most to learner performance improving. The respondents brought out different aspects of SBCPD lesson study that had contributed to improved learner performance both in class and in national examination in biology. However most of these aspects seemed to centre on the collaborative nature of SBCPD lesson study activities that has enhanced sharing of different approaches, methodologies and techniques that are used in the process of teaching and learning. Respondent T8STSSQ8 said, *“it is the collaborative aspect that has enlightened me on better approaches and methods to use in the process of teaching and learning”*, while T11KSSQ11 said, *“yes the collaborative aspect of the lesson study cycle has had a major impact on causing the improvement on pupil performance”*. The other aspect of lesson study that came out as a factor that contributes to improving learners' performance in national examinations was that, lesson study emphasized the use of learner centred teaching techniques and discovery of knowledge through guided learning.

Respondent T3STSSQ3 said, *“Yes it has contributed to the change in performance. The performance has improved greatly. this Can be attributed mostly to the emphasis on the use of learner centred techniques in teaching biology”*, Respondent T11STSSQ11 also said, *“high score in classroom exercise is attributed to learners’ involvement in discovery of knowledge through guided learning done in lesson study”*. Other respondents also pointed out that SBCPD lesson study had contributed so much to the way they plan lesson, resulting in learners’ benefiting in the way teachers now taught lessons in class. Respondent T9KSSQ9 said, *“The processes involved as we go through the cycle contribute so much in the way we plan lessons as a result pupils have benefited in the way I teach and I expect their performance to improve”*. Some respondents attributed the improvement to the new teaching approaches learnt from colleagues during lesson study meeting and that during such meetings, different teachers brought out different views on lessons, hence learning from each other in turn improving the performance of learners in biology. T1KSSQ1 said, *“indeed it contributes to the change in performance because in the study cycle, different teachers bring their views and approaches on the lesson and then the group site decide the better way, while the teacher has less challenges on the lesson present the lesson while others are observing”*.

4.3.3 Findings from the analysis of the grade twelve results

Through the analysis of grade twelve results the study sought to establish whether the findings from the questionnaire and the interview was conforming with the actual results for the learners in national examination in biology.

To do this, grade twelve biology results for the period between 2005 and 2014 were analysed using descriptive and inferential statistics. The results were presented in form of descriptive statistics such as, means grades for each year and standard deviations as well as inferential statistics such as, correlation analysis on mean grades for periods between 2005 to 2009 and 2010 to 2014. A *t*-Test: Paired sample for means test was also carried out to determine the significance of difference.

The mean grades and their respective standard deviations were calculated from the actual maximum grades of 9 and a minimum grade of 1, which learners obtained in biology in the national examinations in the period 2005 to 2014, for all the schools that were sampled for the study. The calculated mean grades and their standard deviations for each year obtained by pupils

in the four secondary schools that were sampled in Solwezi district are summarized in the table 4.4 below.

Table 4.5: Mean grades and standard deviations for all the sampled secondary schools

Name of school	details	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
School A	Mean grade	8.1	7.5	8.1	7.5	6.0	5.6	6.3	6.3	5.8	7.4
	S.D	1.0	2.0	1.0	1.7	1.6	2.5	2.2	2.1	1.5	1.0
School B	Mean grade	8.4	8.6	8.4	7.4	6.2	8.1	7.1	7.1	7.5	7.2
	S.D	1.0	1.0	1.3	1.8	2.1	1.4	2.3	1.3	1.5	2.3
School C	Mean grade	7.1	6.9	6.6	7.2	6.7	6.4	6.7	6.3	7.2	7.0
	S.D	2.0	2.1	2.1	2.0	2.3	2.3	2.2	2.4	2.2	2.0
School D	Mean grade	8.5	8.6	8.5	8.4	7.7	8.4	7.6	7.6	6.9	7.8
	S.D	1.1	0.8	0.9	0.9	1.6	1.1	1.5	1.9	1.6	1.4

Source: field work 2017

The results from each of the secondary schools were divided in two periods, which were results for the period between 2005 and 2009, and those for the period between 2010 and 2014. The mean grades for each of the schools were then plotted on a graph for easy comparisons and interpretations.

4.3.4 Mean grades for School A

Generally, the mean grades for School A from Table 4.3 show that, learner performance in biology examination between 2005 and 2014 improved from 8.1 in 2005 to 7.4 in 2014. The mean grades were split into categories between 2005 to 2009 and 2010 to 2014, and then plotted on a graph for easy comparison and interpretation. Figure 4.5 below shows the results of the plotted mean grades for School A.

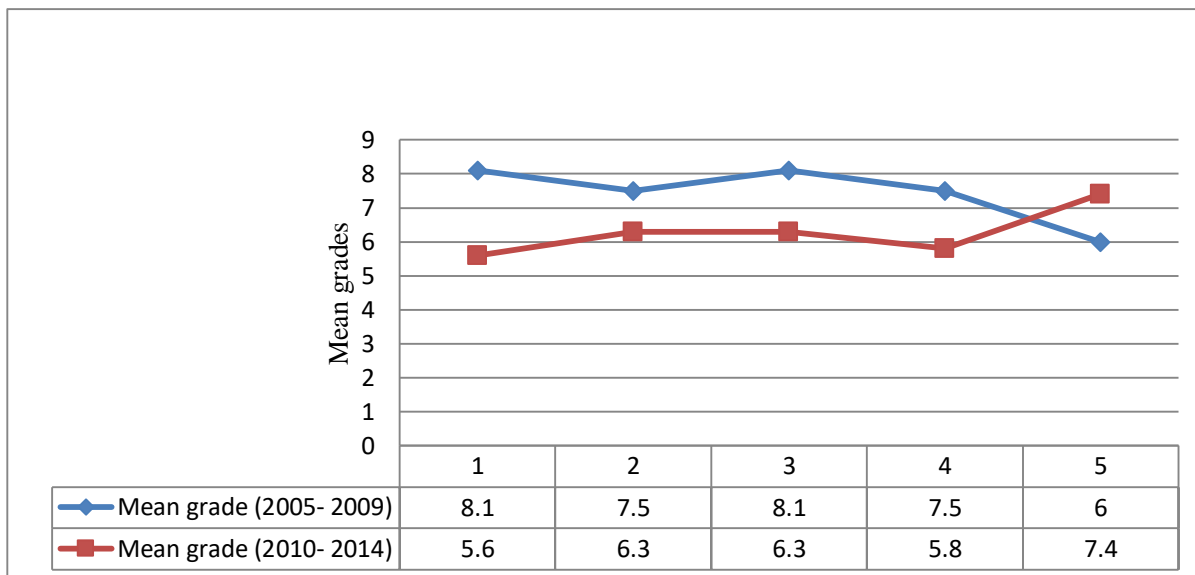


Fig 4.3- Graph of mean grades for 2005 to 2009 and 2010 to 2014 for School A

The graph compares the mean grades for the period 2005 to 2009 and 2010 to 2014 for School A. The average mean grades for School A for the periods between 2005 to 2009 and 2010 to 2014 were 7.4 and 6.3 respectively. The graph shows that between 2005 and 2007 the learners got mean grades in biology above 7. However, between 2008 and 2009 the graph shows that the learners' performance improved, obtaining mean grade of 6. Figure 4.5 also shows that between 2010 and 2013 School A learner performance in biology examinations was better compared to the performance between 2005 to 2009. Most of the learners obtained grades of 6, but in 2014 most of the learners obtained a grade of 7, which was a drop in performance. However, when a Pearson correlation analysis is done on the mean grades the results give a negative correlation value of $r = -0.9$. This implies that the mean grades for 2005- 2009 were not related to the mean grades for 2010- 2014.

4.3.5 Mean grades for School B

The average mean grades obtained by the learners in School B between 2005 to 2009 and 2010 to 2014 were 7.8 and 7.4 respectively. The mean grades for School B, were plotted on a graph for easy comparison and interpretation. Figure 4.4 shows the results of the plotted mean grades for School B. pencil

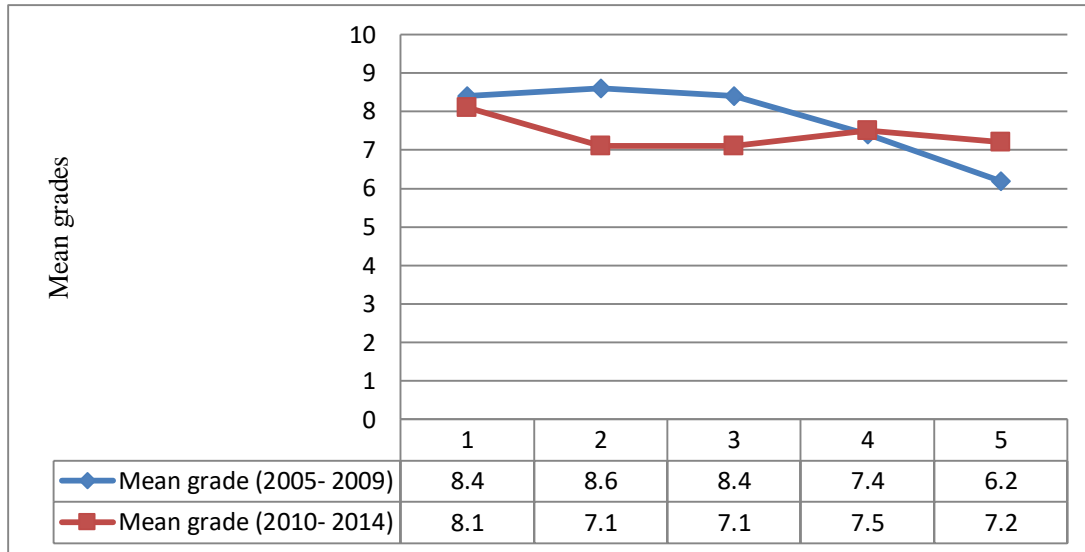


Fig 4.4- Graph of mean grades for 2005 to 2009 and 2010 to 2014 for School B

Figure 4.4 is a graph comparing the mean grades for the period 2005 to 2009 and 2010 to 2014 for School B. It shows that between 2005 and 2007 most of the learners obtained a grade of 8, however just like in School A, in 2008 and 2009 the performance in biology improved. Most of the learners obtained grades as low as 6. Figure 4.4 also shows that between 2010 and 2014 the learners performance in biology improved. Most of the learners obtained a grade around 7. When a Pearson correlation analysis was carried out on the mean grades the results give a positive weak correlation value of $r=0.3$.

4.3.6 Mean grades for School C

The average mean grades obtained by the learners in School C between 2005 to 2009 and 2010 to 2014 were 8.4 and 7.7 respectively. The mean grades for School C, were plotted on a graph for easy comparison and interpretation. Figure 4.5 shows the results of the plotted mean grades for School C.

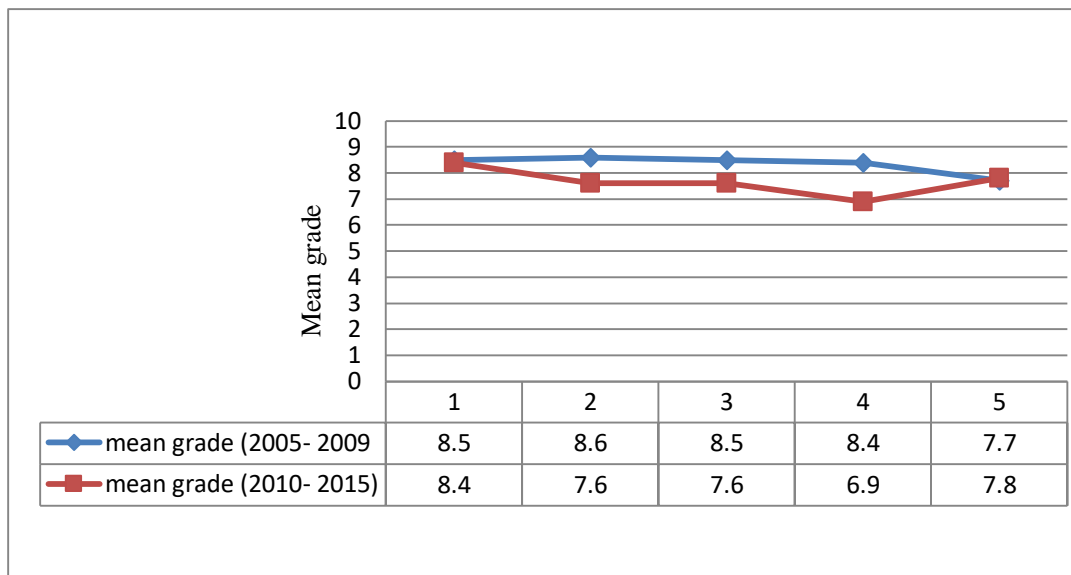


Fig 4.5 - Graph of mean grades for 2005 to 2009 and 2010 to 2014 for School C Source: field work 2017

Figure 4.5 shows that between 2005 and 2009 most of the learners obtained a grade 8, in biology examination, while between 2010 and 2014 most of the learners obtained a grade 7 in biology. This shows a minimal improvement in learner performance between the period 2005 to 2009 and 2010 to 2014. However, Figure 4.5 also shows that learner performance tends to drop in 2014 a situation observed in School A and B. When a Pearson correlation analysis is carried out on the mean grades the results give a negative correlation value of $r = -0.02$. This implies that there is a difference in learner performance in biology examinations between 2005 to 2009 and 2010 to 2014.

4.3.7 Mean grades School D

The average mean grades obtained by the learners between 2005 to 2009 and 2010 to 2014 were 6.9 and 6.7 respectively. This reveals that learners' performance before and after lesson study implementation were almost the same. The mean grades for School D, were plotted on a graph for easy comparisons and interpretation. Figure 4.6 shows the results of the plotted mean grades for School D.

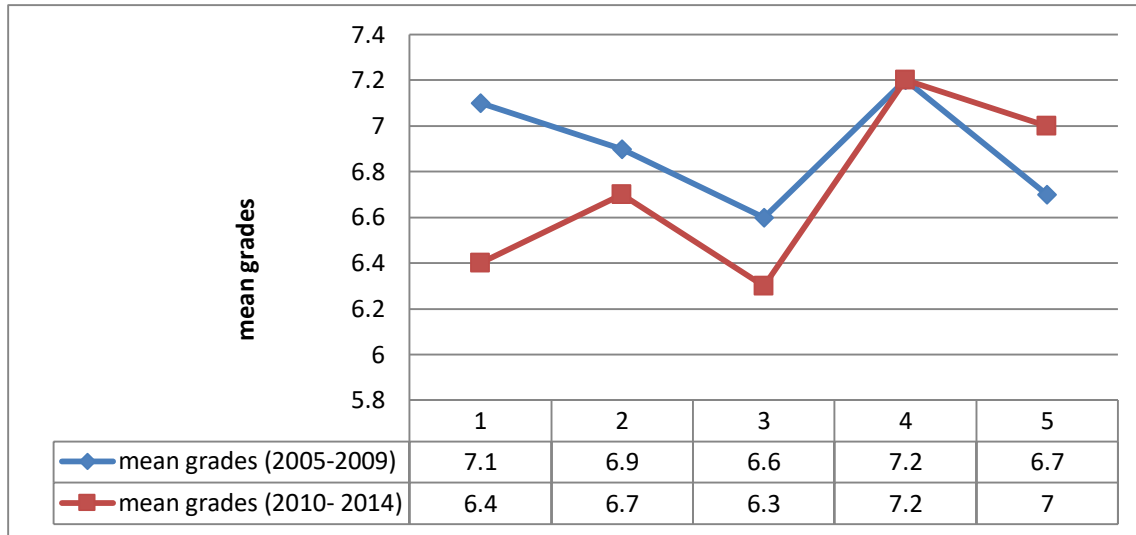


Fig 4.6- Graph of mean grades for 2005 to 2009 and 2010 to 2014 for School D Source: field work 2017

The graph comparing the mean grades obtained by the learners from School D in the period 2005 to 2009 and 2010 to 2014 show that, the performance of learners in biology examinations was not constant, it keeps improving and dropping. The correlation analysis gave a weak positive correlation value of $r=0.32$. The mean grades for all the four schools that were sampled for the study were grouped in two categories. The mean grades for 2005 to 2009 and mean grades for 2010 to 2014. The mean grades were as well analyzed to determine whether there was a relationship between the learner performance before and after lesson study implementation.

A Pearson's correlation analysis was carried out on the mean grades for 2005 to 2009 and 2010 to 2014 to establish whether there was a relationship in learners' performance in Biology in the national examinations, during the period 2005 to 2009 and 2010 to 2014. The mean grades were further plotted on a scatter plot graph to show the correlation results in graphical form and compare the relationship between the mean grades for learners before and after lesson study implementation easily. To establish the significance of the relationship between the mean grades for 2005 to 2009 and mean grades for 2010 to 2014, a *t*-Test paired two samples for means analysis was also carried out.

4.3.8 Correlation analysis results

The results of the Pearson correlation analysis on the mean grades for 2005 to 2009 and 2010 to 2014 for the sampled secondary schools gave a weak positive correlation of $r = 0.2$. Table 4.5 shows the results of the correlation analysis.

Table 4.6: Correlation result for mean grades for 2005 to 2009 and 2010 to 2014

Pair of Means	Mean Grades (2005- 2009)	Mean Grades (2010- 2014)
Mean grades (2005- 2009)	1	0.2
Mean grades (2010- 2014)	0.2	1

Source: field work 2017

4.3.9 Scatter plot correlation results

The mean grades were further plotted on scatter plot graph to compare the relationship of the mean grades in a graph. The results of the scatter plot graph on the mean grades for 2005 to 2009 and those for 2010 to 2014 are as shown in figure 4.9.

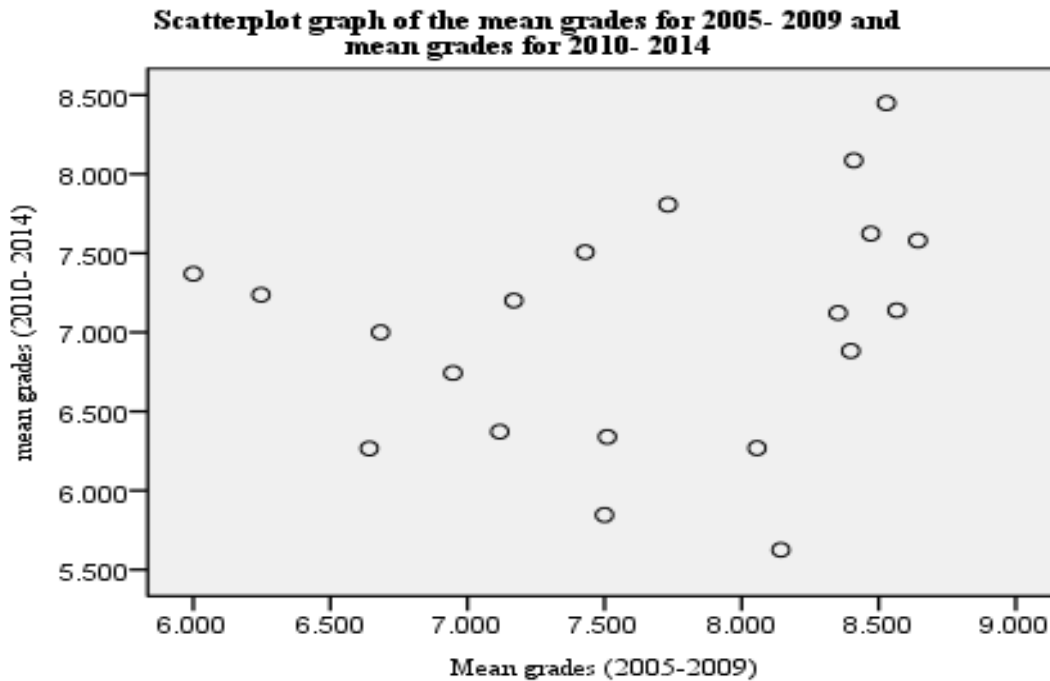


Fig 4.7-Scatter plot graph of the mean grades for 2005 to 2009 and 2010 to 2014 Source: field work 2017

Figure 4.7 shows that there is no relationship on the mean grades for the period 2005 to 2009 and the mean grades for 2010 to 2014 in either positive or negative direction. The scatter plot graph shows that there was a zero relationship between the mean grades for 2005 to 2009 and 2010 and 2014.

4.3.10 *t*- Test: Paired two samples means analysis results

Since the Pearson correlation coefficient and the scatter plot graph analysis only indicates the degree of sameness between two variables, a *t*-Test: paired two samples for means was further carried out on the mean grades for 2005 to 2009 and 2010 to 2014 to test the significance of the difference between the mean grades. The results of the analysis were as shown in Table 4.6.

Table 4.7: *t*- Test: paired samples for mean result for means for 2005 to 2009 and 2010 to 2014

Pair of Means	Means	Variance	Pearson correlation	df	<i>t</i> -statistic	<i>p</i> -value	<i>t</i> -critical
mean grades (2005-2009)	7.6	0.7	0.2	19	2.8	0.01	1.7
mean grades (2010-2014)	7.0	0.5					

Source: field work 2017

The results of the *t*-Test: paired two samples for means were $t(19) = 2.8$; $P < 0.05$ and *t* critical = 1.7. The *t*-Test paired sample for means test reveals that the calculated *p*- value was less than 0.05 therefore the mean grades for 2005 to 2009 were significantly different from the mean grades for 2010 to 2014.

4.4 Summary

In this chapter the findings of the study on the implementation of lesson study in Solwezi are presented. The qualitative data were first coded in themes that were generated while quantitative data are presented in form of tables and graphs. The tables were generated from the descriptive and inferential statistics that was used to analyze the quantitative data. The study revealed that

most of the teachers had benefited from SBCPD lesson study implementation in biology. Teachers participated in SBCPD lesson study activities to build content knowledge, acquire effective teaching skills and improve skills of lesson planning. The study also revealed that, the lesson plans generated from SBCPD lesson study activities are filed for reference when planning lessons. The study also revealed that by participating in SBCPD lesson study implementation activities, teachers acquired the skills of lesson study. The skills acquired include, skills of planning lessons with learners in mind, planning learner centered lessons, reflecting on every lesson, collaborating when planning lessons and formulating of objectives

CHAPTER FIVE

DISCUSSION OF FINDINGS

This chapter discusses the findings of the study on the implementation of lesson study in biology in Solwezi district. The discussion was guided by the research objectives which were:

1. To explore teachers' perception on lesson plans generated from lesson study cycle implementation activities in biology.
2. To determine the teachers' skills of lesson study implementation in biology teaching.
3. To establish the impact of lesson study implementation in the classroom on the performance of pupils in biology.

5.0 Teachers' perception on lesson plans generated from lesson study activities in biology

Other than just discussing the perception teachers' have on the lesson plans generated from lesson study cycle implementation activities in biology in Solwezi district, initial training adequacy and the teachers' understanding of lesson study as an approach for school based continuing professional development were also discussed.

The study established that 73% of the teachers that participated in the study were confident that, their initial training was adequate in preparing them for teaching, despite most of them having only a professional qualification of a diploma. This was attributed to the length of time spent in college or university as being enough to gain right content, obtain skills, methodologies and appropriate teaching strategies that help them teach biology effectively. Initial training may not adequately equip the teacher with necessary teaching competencies. MOE, (1996) points out that initial training provided at teacher training college and the university lays a foundation for a life time of teaching. As such initial training for teachers just acts like a foundation that prepares a teacher for teaching. The rapid changes taking place in the education system due to advancements in technology would require teachers to adapt to these changes quickly. This is supported by UNESCO, (2015) that knowledge is becoming rapidly out-dated and teachers cannot rely on the knowledge and skills they acquire in pre-service training to address new

situations in their classrooms. Teachers need to constantly update their knowledge and skills, and they have an opportunity through quality and relevant CPD.

The study further showed that, 63% of the teachers had an academic qualification of a diploma in teaching. Basically a diploma qualification prepares teachers to teach environmental science to grade eights and nine at junior secondary school. However a good number of teachers also still felt their initial training was not adequate in preparing them for teaching stating that it was inadequate because it only prepared them to teach environmental science at junior secondary school as was pointed out by one teacher that, “*the training was not adequate as it was meant to teach low classes*”. This implies that most of the teachers who were teaching biology in the secondary schools are not fully trained to teach biology at grade 10 to 12. This reveals inadequacies in pedagogical competencies in the teachers teaching biology at secondary schools.

The study further established that teachers understood SBCPD lesson study as an activity in schools where teachers in a department shared teaching approaches and methodologies that help in effective lesson delivery of challenging topics in their classes. It was an in-service program meant to improve teachers’ content knowledge, skills of teaching and keep teachers abreast with new developments in teaching.

The study established that, the implementation of SBCPD lesson study in biology had helped teachers improve on the teaching approaches, methodologies and skills in teaching biology. It has also been used as platform for refresher course and as an institution within the school where teachers build and acquire effective skills based on the learner centered approaches.

The study also revealed that every SBCPD lesson study implementation activity that is held produces a lesson plan. This tie with the assertion of Fujii (2016), who contends that, a lesson plan is an important product of lesson study. However producing a lesson plan is one thing and how that lesson plan is viewed is another issue. During SBCPD lesson study implementation in Biology, lesson plans were generated that were perfected during the SBCPD lesson study cycle. It was revealed that the Biology lesson plans generated like any other lesson plan in other subjects are kept in a departmental file that is made available for every members of the department to use as reference during planning of lesson for class teaching. These findings are in

line with Cerbin and Kopp (2006) findings that during lesson study activities member document their lesson studies so that other instructors can review and learn from it. A lesson plan is a recognizable unit of instructions and is a genre that others who teach similar topics can actually use.

5.1 Skills acquired from lesson study implementation in biology teaching

The participation of teachers in SBCPD lesson study activities has helped them acquire teaching skills that would help them improve the way they teach biology in class. The study has established that most of the teachers believed they had acquired vital teaching skills that would help improve the way they deliver lessons in biology in their classrooms. The teaching skills identified as having been acquired as teachers participated in lesson study activities include skills like planning and conducting lessons with the learner in mind, reflecting on lessons they conducted in class and planning lessons that engage learners. The study further established that teachers had learnt to collaborate when preparing lesson, planning learners' activities that promote hands on activities and formulating objectives. These findings agree with the findings of Ade Soband, (2014), who points out in his study that Teachers reported that by working together and using the lesson study process they built a stronger set of teaching skills, became more aware of student learning needs, and developed strategies to meet those needs. The study also established that a hand full of teachers feel acquiring lesson study skills as they participate in lesson study activities is one thing and practicing the acquired skills in actual lessons in the class as they teach is another thing. This implies that while teachers may claim to acquire skills from lesson study as mentioned earlier, actual use of these skills in classroom whilst teaching may not be there.

The study basically brought out three themes of skills that teachers had acquired from lesson study activities that stand out from the findings. These are; planning learner centered lessons, reflecting on every lesson conducted, collaboration among teachers and formulation of teaching and learning objective.

5.1.1 Planning learner centered lesson

Planning effective learner centered lessons was identified by the participants as a skill that teachers had acquired. This conform with the skills book MOE (2009), designed to guide teachers in implementing SBCPD lesson study. It points out that, it is hoped that the teachers will come up with proper strategies of learner-centered teaching and learning as there is no clear position on this matter in Zambia. It is therefore established that teachers are using lesson plans to conduct learner centered lessons.

5.1.2 Reflecting on lessons

The ability to reflect on every lesson that teachers conducted in class was also identified as a skill that teachers had acquired as they participated in SBCPD lesson study implementation activities. One of the objectives of lesson study in Zambia is to create a sense of reflection in a teacher before, during and after the lesson, (MOE, 2007). Lesson study has additional benefits of drawing teachers' attention to student learning as they think about their own instructional actions, (Lenski & Caskey 2009). Dudley (2011), also points out that, through the process of joint planning, observation and analysis during lesson study activities, teachers get to see aspects of pupil learning. This helps the teachers learn to reflect on the lesson while they plan, during teaching and after teaching resulting in teachers conducting lessons in Biology that tend to cater for learners with different ways of learning.

5.1.3 Collaboration among teachers

Collaboration among teachers was another skill that was identified as having been acquired during lesson study activities. The collaborative nature of SBCPD lesson study comes about during the planning of a demonstration lesson in the department, as well as during the revising of the demonstration lesson. As teachers get involved in the discussions at various stages of lesson study activities, they learn to collaborate hence improving their way of planning lessons. This aspect of lesson study goes on throughout the process of implementation to perfect a lesson. In this study, it has been established that teachers have taken collaboration as a skill that they have acquired. They collaborate further even in a natural set up in the department as they plan material to teach in their classrooms. This is shown in the response given by one of the SBCPD lesson study coordinator at School B who said, " *we have tried to make it a natural process than*

bureaucratic and artificial, why... because there are certain teachers who don't participate, because they see a lot of recording being done as such we have made it in such a way that members within the department on challenging lessons get together, co-plan lesson, teaching is done then naturally they advise one another on what they are going to improve

According to Rock and Wilson (2005), regular collaboration with peers about curriculum objectives, teacher instruction, and information learned from field experts helped the participants learn new approaches to instructing students. This would help teachers learn from one another on how best they can teach certain topics as such improve learners understanding. The collaborative aspect can also help improve the performance of newly employed teachers, especially that some may have a feeling of inadequacy, as one teacher pointed out that, *“The training was not adequate as it was meant to teach low grades.”* This tie with the assertions of Carroll, (2013) that, the collaborative nature of the lesson study has the potential to help newly recruited teachers cope with a phenomenon known as transitional shock. Transitional shock is a situation where new teachers in the teaching system tend to abandon the learnt theories from the college and university and emulate the practice of long serving teachers in the system in an attempt to fit in the teaching environment.

5.1.4 Formulation of teaching and learning object

Teaching and learning objective are important in the process of teaching and learning. The study has established that teachers through their participation in lesson study activities have improved the way they now formulate these learning objectives. The teaching and learning objectives help the teacher speculate on how the lesson will be delivered. These finding ties with the finding of Cerbin and Kopp (2006) that some teachers reported that they rarely start with learning goals as the basis for their teaching and that the experience of lesson study made them more goal aware in their classes.

5.2 Impact of lesson study implementation on learner achievement in Biology

Information on the impact of lesson study on learners performance was obtained in three ways, through the questionnaire administered to teachers in the Science department, through the interview with the SBCPD lesson study coordinator and the Headteachers or deputy

Headteachers of the sampled schools and through the analysis of the biology grade twelve national examination results from Examination Council of Zambia (ECZ) for the schools sampled.

The study revealed that teachers were confident there was a relationship between SBCPD lesson study implementation and learner performance in national examinations. This finding conforms with the assertions of Blank and de las Alas (2009), that analysis of studies of teacher professional development programs in mathematics and science reported significant effects of teacher development on improving student achievement.

Mere assertions of confidence by teachers that there is a relationship between lesson study implementation and learner performance alone would not warrant a conclusion of lesson study implementation having a positive impact on learner performance in Biology. There was need for the study to establish aspects of lesson study that would enhance learners' performance. The study revealed that collaboration is an aspect of SBCPD lesson study that had helped create an environment for teachers to share best teaching approaches, methodologies and techniques that would improve their lessons. This finding agrees with JICA (2015), that teachers at Linda junior high school unanimously said, before lesson study was introduced, there were no opportunities for sharing information, and teachers would often struggle on their own, but now sharing ideas has improved our lesson.

The sharing of better teaching methodologies, approaches and techniques would lead to teachers improving their teaching skills. This would likely result in improved teaching and learning, hence better learner performance in examinations. One respondent pointed out that, *shared information during SBCPD lesson study has helped to come up with better teaching strategies and method which has helped pupils to learn better*. Through collaboration, teachers share pieces of information that would lead to improving their lessons and therefore improve the achievement of learners.

The shift from using teaching techniques that foster teacher centered methodologies to those that foster learner centered methodologies was another aspect of SBCPD lesson study that was pointed out as contributing to the improved performance of learners. This finding tie with the

findings by Hiroshi (2015) that, in Zambia, the change in teaching practices from teacher-centered teaching to student centered teaching was expected through lesson study. Lesson planning is another aspect of SBCPD lesson study that was identified as contributing so much to the way they plan lesson resulting in learners benefiting. This finding conforms to Baba and Nakai (2011) assertions that, through lesson observation and interviews, changes in teachers were noted as more teachers write lesson plans, set the lesson objective clearly, develop a more interactive lesson process, and increase activities in the lesson.

The study further revealed that lesson study offered an opportunity to teachers to learn from each other better ways of approaching certain lessons hence improving even those with challenges in lesson delivery. The aspects of lesson study identified as having contributed to learner performance are in a way similar to the skills that teachers have acquired as they participate in SBCPD lesson study implementation. However, knowledge of subject content was not considered as being a component that would contribute to learner performance improvement.

The study wanted to establish whether what the teachers and the SBCPD lesson study coordinators and the head teachers were saying concerning learner performance was really corresponding with the learners' actual examination results for biology. The analysis of the results was done for individual secondary schools before considering the results for all the secondary schools together. Generally, the mean grades results for the schools sampled were 7 and 8 which is a satisfactory grade.

5.2.1 School A

The analysis of the results revealed a very minimal difference in learner performance. The average mean grade difference between the mean grades for 2005 to 2009 and 2010 to 2014 was very minimal. The graph comparing the mean grades reveal that most of the learners scored a grade of 8 in biology between 2005 and 2009, while between 2010 and 2014 most of the learners scored a grade of 7. This implies that there was minimal improvement in learner performance in biology at School A. The Pearson correlation analysis of the mean grades revealed a weak positive correlation. The study therefore has established that there was no relationship in

learners' performance in secondary school A, before SBCPD lesson study implementation and after SBCPD lesson study implementation.

5.2.2 School B

The analysis of the results for School B revealed a minimal difference in mean grades obtained by learners. The graph comparing the mean grades revealed that between 2005 and 2009, most of the learners got a grade 7 in Biology, but between 2010 and 2014 most of the learners got a grade 6. However, the Pearson correlation analysis on the mean grades showed a negative correlation, implying that there was no relationship in learner achievement in biology before SBCPD lesson study implementation and after SBCPD lesson study implementation.

5.2.3 School C

The analysis of the mean grade results for School C revealed that there was a minimal difference in the grades obtained by learners in national examination biology results before and after SBCPD lesson study implementation. The graph drawn to compare the mean grades show that most of the learners got grades above 7 and just around 8. Pearson correlation analysis on the mean grades reveals a weak negative correlation, implying that there was no relationship between the national results for biology before and after lesson study implementation. However this difference in relationship was very minimal. This means that the results of learners in national examinations in biology before and after SBCPD lesson study implementation were not so different.

5.2.4 School D

The analysis of the mean grades results for School D revealed that there was no difference in the grades obtained by learners in national examination biology results before and after SBCPD lesson study implementation. The analysis further reveals that the average mean grades for 2005 to 2009 and 2010 to 2014 were almost 7.

The graph of the mean grades revealed an alternating rise and drop in performance for learners each year at School D. This finding agree with the findings of Ngumbwe, (2013) who established that although it was generally cited that the strengthened secondary school teachers CPD had a positive impact on pupil performance, reality on the ground showed that, grade twelve results

from 2009 to 2012 at school level were not continuously improving every year but were changing following the up and down ward reverse pattern of performance. However a Pearson correlation analysis on the mean grades revealed a weak positive correlation. These results imply that there was no relationship in performance before and after lesson study implementation in School D.

Generally the study has established that the results from the four secondary schools involved in the study indicated that between 2005 and 2009 when lesson study was not implemented, most of the learners obtained average lower grades of 8 or 9 in biology in national examination. However, between 2010 and 2014 when lesson study implementation started in the four secondary schools involved in the study, the learners' performance in biology national examination improved. Most of learners obtained average mean grades of between 5 and 7. This steady rise in average grades obtained by the learners, implying that a good number of learners between 2010 and 2014 were able to obtain even much better grades than 5.

The Pearson's correlations results and the scatter plot graph analysis revealed that, there was no relationship in learner performance in biology national examinations between 2005 to 2009 and 2010 to 2014 in the secondary schools that were involved in the study. The results of Pearson's correlations analysis revealed a weak positive correlation of $r = 0.2$, implying that there was no relationship in the results of the learners between 2005 to 2009 and 2010 to 2014. Further analysis using a scatter plot graph showed that there was a zero relationship in the mean grades for learners for 2005 to 2009 and the mean grades for learners' for 2010 to 2014.

The correlation analysis only showed the degree of relationship of the results for 2005 to 2009 and those for 2010 to 2014. To establish the significance of the relationship a *t*-Test: paired two samples for mean had to be done. The results of the analysis revealed that, $t(19) = 2.79$; $P < 0.05$ and t critical = 1.73. Since the calculated *p*-value of 0.01 is less than 0.05, this implies that there was a significant difference in the learners' performance between 2005 to 2009 and 2010 to 2014. The study therefore has established that the learners obtained better grades when lesson study started being implemented in the secondary schools that were involved in the study compared to the period when lesson study was not implemented. The implementation of SBCPD

lesson study has a positive impact on learners' performance in biology in the national examination. This finding was in line with the findings of Banda et al, (2010), that lesson study practice of science teachers in Central Province provided positive effect on learner performance in science subjects in the national examination

5.3 Summary

In this chapter the findings regarding the implementation of lesson study in biology in the secondary schools in Solwezi were discussed. To recap the salient points thus far:

Teachers have embraced lesson study activities and they are benefiting from the activity. It has helped the teachers to teach challenging topics with easy. Over the past five years that lesson study activities has been implemented it has generated lesson plans that teachers use for reference when planning similar lessons.

Lesson study has further helped teachers acquire teaching skills that while they were in training they could not fully understand on how to use in teaching. The skills the teachers have acquired have helped them teach biology and any other science subject that foster improved learning and teaching. The implementation of lesson study could have also benefited learners. It seems that from the time lesson study was introduced in the secondary schools of Solwezi district, there is substantial improvement in learners' achievement in biology national examination.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

The previous chapter discussed the findings. This chapter presents the conclusions drawn from the findings of the study. In addition, it also presents recommendations and proposes areas of further study based on the findings.

6.0 Conclusions

The study examined the implementation of lesson study in biology in selected secondary schools of Solwezi district. Basing on the research objectives and questions a number of conclusions were drawn from the discussions of the findings. The following were the conclusions of the study;

6.1.1 The study concluded that despite teachers being confident that their initial training was adequate to prepare them for the teaching professional, most of them were trained to teach environmental science at grade eight (8) and nine (9), indicating that most of them lacked the capacity to teach biology at senior secondary level. However, teachers have positively embraced lesson study that has helped them improve on their teaching skills approaches and methodologies in Biology. In addition, lesson study activities have over the period they have been held generated lesson plans for topics considered to be challenging to teach, that are kept for purposes of reference by teachers teaching similar topics.

6.1.2 The study has also established that through lesson study activities, teachers have acquired vital teaching skills that have helped them deliver lessons in Biology in classrooms. The skills that had been acquired include such skills like; planning and conducting lessons with learners in mind, planning learner centered lesson, reflecting on lessons. Other skills acquired were that teachers plan activities that promote hands on activities and formulating teaching and learning objectives.

6.1.3 The study has further concluded that lesson study implementation in the secondary schools sampled in Solwezi district, might have a positive impact on learner performance in Biology. The study established that there was a positive belief in these secondary schools that lesson study implementation has helped improve learners' performance in Biology. Analysis of the mean grades for the individual secondary schools sampled for the study showed that there was either a

weak positive or negative correlation (relationship) between the mean grades of the learners before lesson study implementation and the mean grades of the learners after lesson study implementation. The mean grades for all the secondary school showed that there was no relationship before and after lesson study implementation, just as the scatter plot graph analysis also showed that there was no relationship in learner performance before and after lesson study implementation.

Additional analysis using *t*-Test: paired sample for means concluded that there was a significant difference in achievement before and after lesson study implementation. These findings therefore suggest that there is improvement in learner performance in biology in the secondary schools that were involved in the study.

6.2 Recommendations

The recommendations arise from the conclusions discussed. The following are some of the recommendations;

6.2.1 The study concludes that teachers have embraced lesson study and that it has a positive impact on learner achievement, however the schools should now shift the attention of lesson study activities to focus on specific topics in biology that still of challenges to the learners. The learners should be allowed to identify a topic that is challenging and the teachers would then use the approach of SBCPD lesson study to teach such a topic.

6.2.2 The study has also concluded that lesson study has helped teachers acquire skills that have helped teachers improve the way they deliver lessons in classrooms and that through collaboration teachers help each other overcome challenges in teaching certain topics; it is therefore recommended that lesson study activities in the schools should now focus the attention on topics in biology as a subject that cause challenges to learners so that teachers can collaboratively come up with better methods and approaches of how such challenging topics can be taught to learners .

6.3 Recommendation for future research

There is very little information on lesson study implementation in Zambia. However, this study concentrated on the implementation of lesson study in Biology in Solwezi district. The following area could further be investigated;

6.3.1 Lesson study is being implemented in a lot of other subjects. To fully be certain on the impact of lesson study on both the teachers and learner's further investigations in the implementation of lesson study in other subjects can be done.

6.4 Summary

This chapter presented the conclusions drawn from the study. It also made recommendations based on the findings of the study

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APPENDICES

Appendix A: Questionnaire

THE UNIVERSITY OF ZAMBIA

DIRECTORATE OF RESEARCH AND GRADUATE STUDIES

SCHOOL OF EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE EDUCATION

QUESTIONNAIRE FOR THE HEAD OF DEPARTMENT AND TEACHERS

STUDY TOPIC: THE IMPLEMENTATION OF LESSON STUDY IN BIOLOGY IN
SOLWEZI DISTRICT SCHOOLS

INTRODUCTION

This questionnaire is designed to collect information from concerned stakeholders like you on the above cited topic. The major aim of the study is to examine the implementation of lesson study in biology in solwezi district schools.

You have been identified as one of the key informants in the study. Therefore, your willingness and honest responses will help in examining the implementation of lesson study in biology in solwezi district schools.

Your response will be treated with strict confidentiality and you will remain anonymous.

INSTRUCTIONS

Do not write your name on the questionnaire. Respond by putting a tick in the box or writing the response in the spaces provide.

SECTION A: DEMOGRAPHIC DATA

1. SEX

Male [] Female []

2. AGE (*Tick age rang appropriate to you ONLY*)

20- 30 []

31- 40 []

41- 50 []

51- 60 []

3. Highest Academic / Professional Qualification. (*Tick highest or professional qualification appropriate to you ONLY*)

i. Secondary Teacher’s Diploma []

ii. Bachelor of Education Degree []

iii. Master of Education Degree []

iv. Doctor of Philosophy in Education []

4. Position held at place of work:

.....

5. How long have you served in the position in question 3 above?

.....

SECTION B:

6. Do you think your initial training was adequate in preparing you for the teaching profession?

Yes [] No []

(a). If your answer is YES explain:

.....

.....

.....

(b). If your answer is NO explain

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.....

7. What do you know about lesson study cycle as a school based continuous professional development?

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8. From the time you joined the science department, how many school based continuous professional development lesson study activities do you attended in biology per term?

.....

9. Has school based continuous professional development lesson study activities been of benefit to you in the teaching of biology?

(TICK ON ONLY ONE OPTION)

Yes [] No []

(a) If your answer is YES, Explain

.....
.....
.....

(b)If your answer is NO, Explain.

.....
.....
.....

10. What influenced you to get involved in school based continuous professional development lesson study activities?

To what extent do you agree or disagree as to how these factors influence your participation in lesson study as school based continuous professional development (*CIRCLE ONLY ONCE IN EACH ROW*)

Influencing factor	Strongly agree	agree	Not sure	disagree	Strongly disagree
1.To build content knowledge	1	2	3	4	5
2. To acquire effective teaching skills	1	2	3	4	5
3. To improve skills of lesson planning	1	2	3	4	5
4. The administration asks us to participate	1	2	3	4	5
5. Because other teachers are participating	1	2	3	4	5
6. Hearing others talk about lesson study	1	2	3	4	5

11. What do you do to the lesson plans generated from school based continuous professional development lesson study activities?

To what extent do you agree or disagree as to how these factors influence your participation in lesson study (*CIRCLE ONLY ONCE IN EACH ROW*)

What do you do to lesson plans generated from lesson study activities	Strongly agree	agree	Not sure	disagree	strongly disagree
1. They are filed in lesson study file	1	2	3	4	5
2. I make reference to them when lesson planning	1	2	3	4	5
3. They are kept in lesson study file not accessible	1	2	3	4	5
4. They are shared for each teacher to have a copy	1	2	3	4	5
5. They are never used as reference when planning lessons	1	2	3	4	5

12. How often do you make reference to lesson study activity lesson plans as you plan for your lesson in classrooms?

To what extent do you agree or disagree, whether you make reference to lesson study lesson plans in planning lessons. *(Circle only once in each row)*

	Strongly agree	agree	Not sure	disagree	strongly disagree
1. I make reference to lesson study lesson plans when planning my lessons	1	2	3	4	5

13. How has participation in lesson study influenced the way you plan your lessons in biology?

To what extent do you agree or disagree as to how your participation in lesson study has influenced the way you plan your lessons in biology. *(CIRCLE ONLY ONE NUMBER IN EACH ROW)*

lesson study influence on planning lessons in biology	Strongly agree	agree	Not sure	disagree	strongly disagree
1. Participating in lesson study has NOT changed my way of planning lesson	1	2	3	4	5
2. since I started participating in lesson study activities my pupils show positive response to learning biology	1	2	3	4	5
3. participating in lesson study has helped me develop lesson that engage pupils in learning	1	2	3	4	5
4. I do not make reference to lesson study lessons plans when planning my lessons	1	2	3	4	5
5. Participating in lesson study has improved the way I plan my lesson in biology	1	2	3	4	5

14. Your participation in lesson study as school based continuous professional development has exposed you to the eight (8) different stages of lesson study implementation. Which stage do you understand well? To what extent do you agree or disagree as to how well you understand each of the stage of lesson study. (*CIRCLE ONLY ONE NUMBER IN EACH ROW*)

Lesson study cycle stage	Strongly agree	agree	Not sure	disagree	Strongly disagree
1. defining/identifying a problem	1	2	3	4	5
2. collaborative planning of lesson	1	2	3	4	5
3. teaching first planned lesson	1	2	3	4	5
4. discussion and reflecting on taught lesson	1	2	3	4	5
5. revising the taught lesson	1	2	3	4	5
6. re- teaching revised lesson	1	2	3	4	5
7. discussion and reflecting on re-taught lesson	1	2	3	4	5
8. compiling and sharing reflection	1	2	3	4	5

15. Does understanding of the stages of the lesson study cycle implementation imply that you are equipped with the skills of lesson study in planning lessons in biology?

Yes [] No []

(a) If you tick YES, Explain

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(b) If you ticked NO, Explain

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16. How has understanding of each of the stages of lesson study cycle implementation contributed to your effectiveness as a teacher?

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17. Have you noticed any relationship between your participating in lesson study activities and pupil performance in biology in class? (*Tick only one option*)

Yes [] No []

(a) If your answer to question 17 is YES explain.

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(b) If your answer to question 17 in NO explain.

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.....

18. If you have noticed change in performance on pupils learning in class, what about school based continuous professional development lesson study cycle activities, do you think most contributed to the change in performance. (*Write as many as you can*)

.....
.....
.....

19. Is there any relationship between schools based continuous professional development lesson study implementation and Pupil Performance in biology?

Yes [] No []

(a). If your answer is YES explain

.....

.....

.....

(b). If your answer is NO explain

.....

.....

.....

20. How has practicing of lesson study in biology impacted on pupil performance in biology?

To what extent do you agree or disagree as to how practicing of lesson study in biology has impacted pupil performance in biology. (*CIRCLE ONLY ONE NUMBER IN EACH ROW*)

Lesson study impact on pupil performance	Strongly agree	agree	Not sure	disagree	strongly disagree
1. Practicing lesson study biology has had LITTLE impact on pupil performance in biology	1	2	3	4	5
2. As a result of my participation in biology Lesson Study, my pupils seem better able to respond to learning activities in biology.	1	2	3	4	5
3. Lesson Study in biology has had LITTLE impact on my pupils' ability to respond to new ideas during class lessons.	1	2	3	4	5
4. Since I started participating in Lesson Study, my pupils are better able to articulate their thinking in biology.	1	2	3	4	5

21. Is there anything else that you would like to say about lesson study cycle activities or your experience with lesson study cycle activities?

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God Bless you for participating willingly
Thank You

Appendix B: Interview Guide for Teachers

THE UNIVERSITY OF ZAMBIA
DIRECTORATE OF RESEARCH AND GRADUATE STUDIES
SCHOOL OF EDUCATION
DEPARTMENT OF MATHEMATICS AND SCIENCE EDUCATION

STUDY TOPIC: THE IMPLEMENTATION OF LESSON STUDY IN BIOLOGY IN SECONDARY SCHOOLS OF SOLWEZI DISTRICT.

INTRODUCTION

The major reason of having this focus interview with you is to get information on the implementation of lesson study in biology in secondary schools of solwezi district. i therefore request you to participate freely to the best of your ability. Every response that you give will be treated with high confidentiality. Do not mention your names when contributing unless you want to. Will you allow us to record the discussion on a tape?

1. Describe the teachers' attitudes towards lesson study activities in the school?
2. Have teachers acquired the skills of lesson study over the time it has been implemented in your school.
3. What has been the benefit of implementing lesson study activities in your schools?
 - (i) To teachers
 - (ii) To pupils
4. Is there any relationship between lesson study implementation activities for teachers and pupil performance in class?
 - (i). If the answer is yes explain
 - (ii). If the answer is no explain
5. How do you compare the performance of pupils at grade 12 in examinations before lesson study was implemented in the school?
6. Finally what are your concluding remarks on lesson study implementation activities at your school?

God Bless you for participating willingly

Thank you

Appendix C: Correlation results for mean grades for secondary schools for 2005- 2009 and 2010-2014

	MSS mean grade (2005-2009)	KSS mean grade (2005-2009)	KSS mean grade (2005-2009)	SDSS mean grade (2005-2009)	MSS Mean grade (2010-2014)	STSS mean grade (2010-2014)	KSS mean grade (2010-2014)	SDSS mean grade(2010- 2014)
MSS mean grade(2005-2009)	1							
STSS mean grade(2005-2009)	0.39126937	1						
KSS mean Grade(2005-2009)	0.90444000	0.2783936	1					
SDSS mean grade(2005-2009)	0.90099817	0.4826594	0.9562542	1				
MSS Mean grade(2010-2014)	-0.89072064	-0.7526873	-0.7206181	-0.8232501	1			
STSS mean grade(2010-2014)	-0.65349153	0.2872532	-0.6788640	-0.4531777	0.3086078	1		
KSS mean grade(2010-2014)	0.384354553	0.6948314	0.1761533	0.2024709	-0.6318872	-0.1742459	1	
SDSS mean grade(2010-2014)	0.139287676	-0.1180231	0.2100181	-0.0196744	-0.0156562	-0.6625049	0.5126339	1

Appendix D : Correlation of mean grades for 2005 to 2009 and 2010 to 2014 for all the school

	Mean grades (2005-2009)	mean grades (2010-2014)
Mean grades (2005-2009)	1	
mean grades (2010-2014)	0.238838485	1

Appendix: E *t*-Test: Paired Two Sample for Means for mean grades for 2005 to 2009 and 2010 to 2014

Column1	Mean grades (2005-2009)	mean grades (2010- 2014)
Mean	7.6271	7.02315
Variance	0.686524937	0.54622245
Observations	20	20
Pearson Correlation	0.238838485	
Hypothesized	Mean	
Difference	0	
Df	19	
t Stat	2.78546842	
P(T<=t) one-tail	0.005895411	
t Critical one-tail	1.729132792	
P(T<=t) two-tail	0.011790822	
t Critical two-tail	2.09302405	

Appendix: F Informed Consent Form

The University of Zambia

School of Education

Department of mathematics and Sciences Education

Please read this document carefully. Sign your name below only if you agree to participate in the study and you fully understand your rights .Your signature is required for your participation in this project. You must be a teacher from the science department selected to participate in the study.

Introduction

This study is entitled the implementation of lesson study in biology in solwezi district schools. This research is directed by a Masters student in mathematics and science at the University of Zambia. This document defines the terms and conditions for consenting to participate in the study.

Description of the Study

You are invited to participate in the study on the implementation of lesson study in Biology in solwezi district schools. This study is investigating the implementation of lesson study.

Time Frame of the Study

The process of data collection will take approximately two weeks.

Risks and Benefits

You may feel uncomfortable being observed and as the researcher tests your pupils. You may not get direct benefits but you will have an opportunity to contribute to a study that may change practice in the implementation of lesson study in Biology in solwezi district schools

Confidentiality

All information obtained from questionnaire and interviews shall not be linked to any school or individuals. No names will be taken down and the information will not be shared with the school administration or the Ministry of Education. The interview guide will not have any identification information of participants to enhance confidentiality.

Participation Right

Participation in this study is purely voluntary. If you decide to withdraw at any point, there will be no consequences to you. All personal identifying information will be kept confidential and information collected during interviews and observations will be kept under key and lock in

accordance with the standards of the University of Zambia. In case of publication of the study findings, your identity will still be kept private.

Voluntary Consent

I have read (or have had the information explained to me) the information about this research as contained in the Participant Information Sheet. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction.

I now consent voluntary to be a participant in this project and understand that I have the right to end the interview at any time, and to choose not to answer particular questions that are asked in the study.

My signature below shows that I am willing to participate in this research:

Participant’s name (Printed):

Participant’s signature: Consent Date:

Researcher Conducting Informed Consent (Printed):

Signature of Researcher: Date:

Name of Witness:

Signature of Witness: Date:

Contacts

If you have any further questions about this research, please contact:

The Supervisor
Dr S. Mbewe,
University of Zambia,
Phone: 0973589355

or

The Principal Investigator,
King Salwenyeka,
University of Zambia,
Phone: 0977 688704

Appendix: G Sample of a demonstration filed lesson study activity lesson plan

1st Demo

MINISTRY OF EDUCATION.
██████████ HIGH SCHOOL.
NATURAL DEPARTMENT LESSON PLAN.

School: ██████████ Date: 14-05-2009

Subject: BIOLOGY

Topic: DIGESTION

Sub-Topic: DIGESTION IN THE MOUTH.

Class: IIR

No. of Pupils:

Rationale: The lesson will help pupils describe digestion in the mouth.

Objectives: TPSBAT:
 - state structure that help digestion in the mouth.
 - describe the types of digestion in the mouth i.e. chemical and physical digestion.

Pre-requisite Skills and knowledge: Pupils have already been taught on the alimentary canal of human being.

Reference books: Biology (The dynamics of life).

Teaching and Learning materials/Resources: charts, chalk board.

Lesson Process

STAGE	TEACHING/LEARNING ACTIVITIES	LEARNING POINTS
Introduction	- The teacher will recapitulate the lesson on the previous lesson on the alimentary canal using question and answer method in the following questions. - Mention parts that make up the alimentary canal? - What is the importance of digestion?	- Mouth, Oesophagus, Stomach, pancreas, Liver, large intestines, small intestines, appendix and the rectum. - To ingest food. - Digestion the food. - absorbs the digested food and eliminates the undigested materials.

Appendix: H Sample of a revised filed lesson study activity lesson plan

Revised Demo

MINISTRY OF EDUCATION.
██████████ HIGH SCHOOL.
NATURAL SCIENCES DEPARTMENT LESSON PLAN.

School: ██████████ Date: 19-05-2009

Subject: BIOLOGY.

Topic: DIGESTION.

Sub-Topic: DIGESTION IN THE MOUTH.

Class: 11B.

No. of Pupils:

Rationale: The lesson will help pupils describe digestion in the mouth.

Objectives: TPSBAT.
- State structure that help digestion in the mouth.
- Describe the types of digestion in the mouth i.e. chemical and physical digestion.

Pre-requisite Skills and knowledge: pupils have already been taught on the alimentary canal of human being.

Reference books: Biology (The dynamics of life).

Teaching and Learning materials/Resources: - charts, - chalkboard.

Lesson Process

STAGE	TEACHING/LEARNING ACTIVITIES	LEARNING POINTS
Introduction	<ul style="list-style-type: none"> - The teacher will recapitulate the previous lesson on the alimentary canal using question and answer method in the following - Mention the parts that make up the alimentary canal. - what is the importance of digestion? 	<ul style="list-style-type: none"> - Mouth, oesophagus, stomach, Liver, Pancreas, large intestines, small intestines, appendix and rectum - To ingest food. - Digestion the food, absorbs the digested food and eliminates undigested materials.