LESSON STUDY AS A SUPPORT STRATEGY FOR TEACHER DEVELOPMENT: A CASE STUDY OF MIDDLE SCHOOL SCIENCE TEACHERS IN ERITREA

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DECLARATION

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (unless to the extent explicitly otherwise stated), that production and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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ABSTRACT

Against the background of education reforms, this study was conducted to determine what can be learnt from using lesson study as professional development strategy in Eritrea. The core problem discussed in the study is that the instigators of successive education reforms in Eritrea expected teachers to shift their teaching from more teacher focused to student-centred approaches with little or no support provided to them. This implies that teachers in Eritrean need effective and sustainable support systems that enable them to implement the reform initiatives. In this study, the researcher uses lesson study as a strategy that could provide teacher development experiences to teachers in Eritrea that are different from the traditional one-shot varieties such as workshops, short-term orientations and training of trainer programmes which are often normally provided by the official programmes.

Lesson study is a well-established classroom-based activity in which teachers systematically examine their teaching by collaboratively planning, teaching, observing, revising and re-teaching lessons. Several successes with lesson study have been reported in research in Japan, where it has been used extensively, as well as elsewhere. However, no study on teacher professional development has been conducted using lesson study as a strategy within the Eritrean context.

This study is an interpretive qualitative case study that explores the effects of lesson study on science teachers' learning and classroom practice in selected middle schools of Eritrea. It involved twenty one participants – fifteen science teachers, three school directors and three pedagogic heads for a duration of one year. Data were generated through questionnaires, semi-structured focus group interviews, observations, documents for generating research lesson events, video-recordings and photographs.

The findings show that participation in lesson study cycles that were extended over a period of time was effective in enhancing the learning of teachers and changing the way they teach science in their classrooms resulting in enhanced students confidence, participation and learning. Evidence reported in this study also indicates that lesson study made a contribution to minimising teacher isolation by bringing teachers together to collaborate and share professional ideas and experiences. Moreover, the findings show the existence of a direct relationship between teachers' interest in teacher development initiatives and the interest that the school leadership shows in such initiatives and in the extent of support they provide to the participating teachers.

Though participants reported receiving benefits from lesson study, they were constrained by a lack of time, curriculum overload, large class-size, teachers' poor living conditions, lack of suitable space, shortage of resources, students' poor English proficiency, newness of the process and students' negligence. This study has also contributed to extending the body of knowledge on lesson study. Finally, it is hoped that the findings of this study may be used as a guiding framework for future teacher development initiatives in the education sector or other professional development programmes in Eritrea.

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OPSOMMING

Hierdie studie is teen die agtergrond van onderwyshervormings in Eritrea onderneem om te bepaal wat uit die gebruik van lesstudie as strategie vir die professionele ontwikkeling van Eritrese opvoeders geleer kon word. Die kernprobleem van die studie is dat die opeenvolgende onderwyshervormings in Eritrea vereis dat onderwysers hulle onderrigbenadering van opvoedergerigte na meer studentegerigte metodes verander, sonder dat hulle enige noemenswaardige ondersteuning ontvang. Dit impliseer dat daardie onderwysers 'n doeltreffende en volhoubare ondersteuningstelsel nodig het om die hervormingsinisiatiewe in werking te stel. Met die lesstudiestrategie wat in hierdie navorsing gebruik is, is onderwysers in Eritrea blootgestel aan ander ontwikkelingservarings as die tradisionele eenmalige weergawes, wat gewoonlik in die vorm van werksessies, korttermynoriënterings en opleier-opleidingsprogramme plaasvind.

Lesstudie is 'n gevestigde klaskamergebaseerde aktiwiteit waarin onderwysers hulle eie onderrig stelselmatig ondersoek deur lesse in samewerking met kollegas te beplan, aan te bied, waar te neem, te hersien en weer aan te bied. Verskeie suksesse met lesstudie is al aangemeld in navorsing in Japan, waar dit op groot skaal gebruik word, sowel as elders. Tog is geen studie oor die professionele ontwikkeling van onderwysers in Eritrese verband al met behulp van lesstudie as 'n strategie uitgevoer nie.

Die metodologie vir die navorsing was 'n vertolkende kwalitatiewe gevallestudie wat ondersoek ingestel het na die uitwerking van lesstudie op wetenskaponderwysers se leer- en klaskamerpraktyk in uitgesoekte middelbare skole in Eritrea. Die 21 respondente – 15 wetenskaponderwysers, drie skooldirekteure en drie onderrighoofde – is vir 'n jaar by die studie betrek. Data is deur middel van vraelyste, semigestruktureerde fokusgroeponderhoude, waarnemings, dokumente vir die skep van navorsingslesgebeure, video-opnames en foto's ingesamel.

Die bevindinge toon dat deelname aan lesstudiesiklusse oor 'n langer tydperk onderwysers se leerpraktyk doeltreffend versterk en hulle wetenskaponderrig in die klas verander het. Dit het verhoogde vertroue, deelname en leer onder studente tot gevolg gehad. Bewyse wat in hierdie studie aangemeld is, toon ook dat lesstudie onderwyser-isolasie help beperk het deur onderwysers bymekaar te bring om saam te werk en professionele idees en ervarings uit te ruil. Daarbenewens dui die bevindinge op 'n regstreekse verband tussen onderwysers se belangstelling in inisiatiewe vir hulle eie ontwikkeling en die skoolleiers se klaarblyklike belangstelling in, en ondersteuning vir, onderwysers en hulle professionele ontwikkeling.

Hoewel deelnemers by lesstudie baat gevind het, is hulle aan bande gelê deur tydsbeperkinge, 'n oorvol kurrikulum, groot klasse, swak lewensomstandighede, 'n tekort aan geskikte ruimte, te min hulpbronne, swak vaardigheid in Engels onder studente, die nuutheid van die proses en studente se agtelosigheid. Hierdie studie dra by tot die uitbreiding van die beskikbare kennis oor lesstudie. Die bevindinge sal hopelik as 'n

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raamwerk kan dien om toekomstige inisiatiewe vir opvoederontwikkeling in die onderwyssektor sowel as in ander programme vir professionele ontwikkeling in Eritrea te rig.

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LIST OF ACRONYMS/ ABBREVIATIONS

ACCE	Asmara Community College of Education
BMA	British Military Administration
CoE	College of Education
DRHRD	Department of Research and Human Resource Development
EIT	Eritrea Institute of Technology
GoE	Government of Eritrea
MoE	Ministry of Education
ODLP	Open Distance Learning Programme
USA	United States of America
UWC	University of the Western Cape

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CHAPTER ONE
INTRODUCTION TO THE STUDY

1.1 INTRODUCTION

Historically, the Eritrean education system was shaped by both the policies of the various colonial powers, namely Italy, Britain and Ethiopia who ruled the country and the policies of the post-independence government of Eritrea. Their legacies have had a considerable effect on the present day realities of the education system because each used education as a tool for fulfilling their ideological interests. Based on the different socio-political conditions, education in Eritrea can be divided into three major periods, namely pre-colonial education, colonial education and post-independence education (see details in Chapter Two). The research on this project was conducted in the post-independence period which commenced at the time of liberation in 1991. At the time the Eritrean government inherited a population that was largely illiterate with a backlog of many children and adults who had had no formal schooling (MoE, 2007) and was faced with a huge task of dealing with an unequal and inefficient education system. The Ministry of Education (MoE) was determined to bring about changes in the education system and this determination was reflected in many of the policy documents by key words such as improving access, equity, quality and relevance. Policy documents also included imperatives that were linked to the practices of teachers and were geared towards changes that were linked to more student-centred classroom practices that required a shift from a more teacher focused approach to student-centred approaches.

This study is an exploratory collective case study that focuses on the work of teachers in this policy driven transitional phase in the country. It is reported on a research process that used lesson study to support science teachers' professional development in three purposefully selected middle schools in the *Zoba Maakel* region of Eritrea. The central theme of this research is to provide training on lesson study to middle school science teachers, to allow them to implement what they have learned in their classrooms, and finally to enquire, inductively, on the effects of lesson study on teachers' learning and classroom practices. All of this is related to policy imperatives for changes to the education system, particularly teachers' work.

In this chapter an overview will be given of the problem statement, the purpose of the study and the research questions that guide the study, and justifications for choosing lesson study as a teacher development strategy. The research design and methodology, measures taken to ensure credibility and trustworthiness and ethical considerations undertaken during the research are briefly highlighted. These are followed by an indication of the referencing method, definitions of key concepts and the organisation of the dissertation. The chapter is concluded with a summary.

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1.2 PROBLEM STATEMENT

In order to keep pace with the drastic transformations in society and technology, most countries have been engaged in intensive reforms of their education systems by mainly focusing on improving teaching and teacher education (Villegas-Reimers, 2003). Similarly, the education system in Eritrea has been reformed twice since independence in 1991. The first reform was in 1993 and the second in 2002. During these reforms it was advocated that teachers use more interactive and participatory teaching approaches as opposed to traditional teacher-centred ways of teaching (MoE, 2002, 2008b).

The problem underlying this study is that the successive reforms that were introduced in Eritrea expected teachers to change their instructional practice to student-centred approaches with little or no support provided to them. In addition to the requirements of reforms that differed from the practices that teachers in Eritrea are accustomed to, teacher development opportunities are less frequent. The limited professional development opportunities are often organised in the form of traditional workshops, short-term orientations and training of trainer programmes. These traditional professional development strategies are organised based on the notion of training of trainer, where one or two teachers from a school are trained and expected to pass the knowledge and skills gained during the training to their colleagues in their respective schools. There is consensus among researchers that these training of trainer programmes do not bring about the required changes in classroom practices (Lieberman, 1995; Le Grange & Reddy, 2000). The ineffective nature of these traditional professional development strategies also provided impetus to undertake this study in selected middle schools of Eritrea. The important position that the middle school level holds in the Eritrean education system and the high number of unqualified teachers at this level indicates that these teachers require support (see Table 2.1). Moreover, it is assumed that teachers in Eritrea work in isolation to meet the demands of the reforms. They rarely have the opportunity to meet and share their ideas and experiences about teaching with their colleagues. Such isolation could result in teachers being less open to the ideas of other and avoid trying new methods of teaching, thus limit them from changing their classroom practices (Lortie, 1975). Contrary to the expectation of the reform initiatives, thus, the classroom realities in Eritrea are dominated by lecturing and rote learning (Abdella, 2000; Ghebremariam, 2000; MoE, 2005; Tecle, 2006).

It is unrealistic to expect the implementations of such reforms without adequately preparing and supporting teachers for the new roles envisioned. As Villegas-Reimers (2003) highlight, educational reforms and teacher professional development must go hand in hand for either or both to work well, as they are mutually inclusive. Moreover, supporting teachers is important for the success of educational reforms because it is the teachers who play key roles in their implementation (Fullan, 2007). In order to deal with the requirement of the reforms, ongoing collaboration between teachers is considered to be important.

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The researcher argues that lesson study, as a teacher professional development strategy, has the potential of creating a platform for teachers to collaborate. Various reports suggest that lesson study is an ideal teacher development strategy as it allows teachers to work collaboratively to improve their learning and classroom practice (Stigler & Hiebert, 1999; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009b). It is assumed that teachers who have opportunities to discuss and share ideas will provide better learning opportunities to their students (Loucks-Horsley, Stiles, Mundry, Love & Hewson, 2010). Thus, this study was initiated in an attempt to contribute towards supporting middle school science teachers in Eritrea and to enable them to implement the initiatives of the reforms.

Although Tecle (2006) has carried out a study that explored the potential of exemplary curriculum materials to support biology teaching within the Eritrean context, no study that uses lesson study as a strategy has been conducted. In the light of lesson study being a new concept in the Eritrean education context and the possible contribution it can make to support teachers in improving their classroom practice, provided the motivation to undertake this study in selected middle schools of Eritrea free from any predetermined ideas about the outcomes.

Section 1.3 provides the justification for choosing lesson study.

1.3 JUSTIFICATIONS FOR USING LESSON STUDY

Lesson study is a teacher development strategy that originated in Japan. It is a classroom-based strategy that allows teachers to come together to collaborate in a meaningful way, to share ideas (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Lewis, 2002a; Yoshida, 2002; Lewis, Perry, & Hurd, 2009; Coe, Carl, & Frick, 2010) and systematically examine their practice in order to become more effective teachers (Fernandez & Chokshi, 2002). Lesson study allows teachers to plan lessons collaboratively, observe lessons in teams and participate in post-lesson debriefing meetings to analyse and reflect on the lessons (Stigler & Hiebert, 1999; Lewis, 2002b; Rock & Wilson, 2005).

According to Lewis (2002b), a team of teachers who teach the same subject or grade plan a lesson, the so called research lesson, collaboratively after selecting a suitable topic. When one teacher teaches the lesson, others examine and observe it in order to gather relevant data. The next step is to conduct a debriefing session in order to reflect on the lesson as a team. Following this discussion, another team member teaches the revised lesson to another class if the group decides to revise and improve the lesson. This re-teaching is followed by a second debriefing session (Lewis, 2002b). For the purpose of this study, the steps of lesson study are conceptualised diagrammatically in Figure 1.1.

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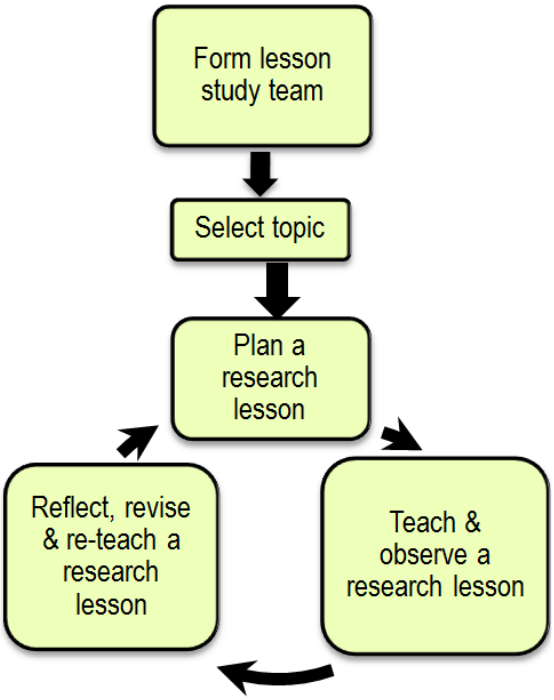
Figure 1.1: Steps of lesson study



Source: Lewis (2002b)

The reasons for choosing lesson study as a suitable teacher development strategy for this study are threefold. Firstly, lesson study was chosen because of its inherent characteristics that are consistent with the characteristics of effective professional development (see Sections 3.2.5 and 3.4.1.1). Secondly, the theoretical underpinnings make it a suitable strategy. Underpinned by the theory of social constructivism (Vygotsky, 1978), lesson study provides a platform for teachers to interact, collaborate, observe and discuss with one another (Rock & Wilson, 2005). Since the teachers who participate in this study are adults, lesson study provides active learning opportunities that enable them to share with their colleagues the rich professional experiences that they have developed over the years (Knowles, 1984). Finally, the availability of suitable conditions makes lesson study an appropriate strategy for the Eritrean context. In order to determine the suitability of lesson study to Eritrean schools, the work of Stigler and Hiebert (1999) and Lewis (2002a) were consulted. They highlighted having a centralised curriculum as one of the supporting conditions for implementing lesson study. A centralised curriculum enables teachers who teach the same subject and grade to share lessons that are relevant to a wider audience (Lewis, 2002a). Since Eritrea, similar to Japan, has a centralised curriculum, lesson study was chosen as a suitable teacher development strategy.

The following Section 1.4 provides the purpose and research questions of this study.

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1.4 PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

The purpose of this study is to implement lesson study as a teacher development strategy to support science teachers in three purposefully selected middle schools of Eritrea and then explore its effect on their learning and classroom practices. In addition, this study attempted to obtain information on factors surrounding the lesson study process, which might have influenced the middle school science teachers' professional development. Findings of this study may be used as a basis for programmes concerned with teacher development in Eritrea and in broader context. It is also assumed that the outcome of this study will extend the emerging knowledge base of lesson study. More specifically, the study attempts to answer one main research question and seven research sub-questions. The main research question is:

1. What is the effect of lesson study on the learning and classroom practice of selected middle school science teachers in Eritrea?

The following serve as research sub-questions:

a) What are teachers' reactions to the professional development arrangement?

b) What are teachers' perceptions about their knowledge and skill gain due to their participation in lesson study?

c) What is the nature of organisational support available to teachers?

d) How did lesson study contribute to breaking the culture of isolation?

e) To what extent did teachers who experimented with lesson study apply the new knowledge and skills gained in their teaching?

f) What are the positive experiences of teachers regarding lesson study?

g) What challenges did teachers identify in the use of lesson study?

Four of the above seven research sub-questions, namely b, d, f and g were included in the proposal submitted for approval. However, while in the fieldwork the researcher identified gaps between the data generated and the research questions. Hence, he proposed that three more research questions should be added. Accordingly, three research questions, namely a, c and e were added after consultation with the promoters of this study. Four of the research questions, namely a, b, c and e were developed based on the work of Guskey (2000). Guskey (2000) gives five levels for evaluating professional development, namely participant reactions, participants' learning, organisational support, changes in classroom practice and student learning outcomes (see also Section3.5.3). In order to answer the research questions stated above, it was decided to conduct theory-generating research that would enable the researcher to look for the subjective experience of the participants rather than testing a theory, as briefly discussed in Section 1.5 (see also Section 4.3).

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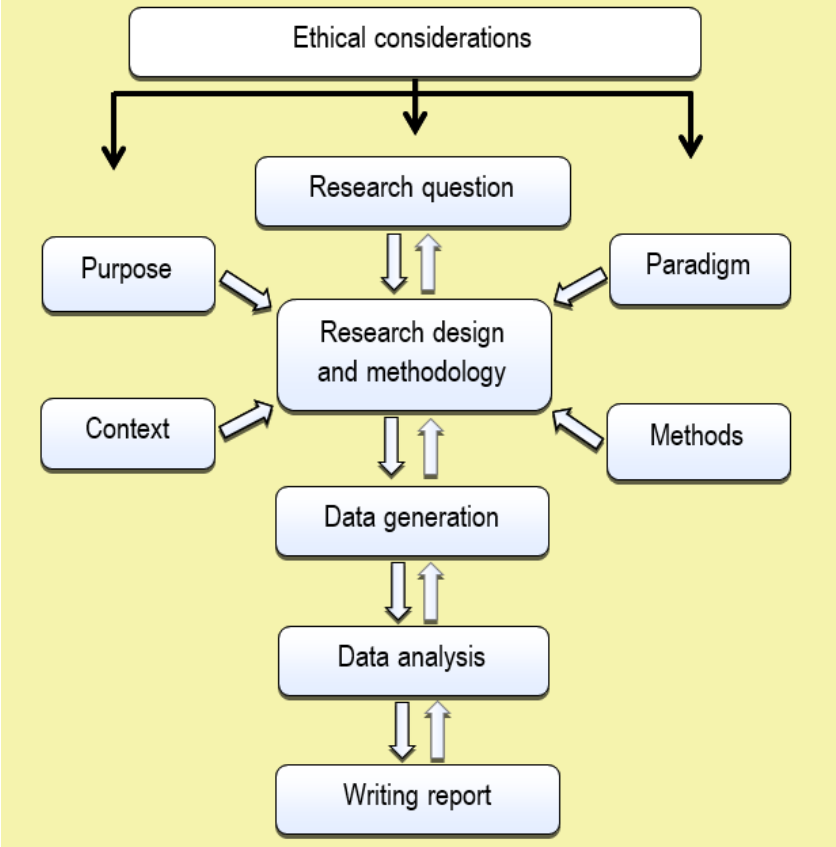
1.5 RESEARCH DESIGN AND METHODOLOGY

The research design and methodology for this research is diagrammatically represented in Figure 1.2. The figure indicates a coherent research design established by identifying appropriate input from five dimensions, namely context, purpose, paradigm, methods and data generation in order to answer the research questions (Durrheim, 2006). Context is not discussed in this section because it is extensively provided in Chapter Two. In this chapter the purpose, paradigm, methods, data generation, data analysis, credibility and trustworthiness and ethical considerations of this study are highlighted (see also Chapter Four for details).

Figure 1.2: Graphic representation of the research process



Source: Adapted from Durrheim (2006)

1.5.1 Paradigm

Three generic orientations, namely ontology, epistemology and methodology influence how researchers understand and view the world (Gray, 2009; Denzin & Lincoln, 2011). These three orientations, collectively named the paradigm (Denzin & Lincoln, 2011), guide the planning, implementation, analysis and interpretation process (Guba & Lincoln, 1994; Terre Blanche & Durrheim, 2006). Paradigm is defined as a "net that contains the researcher's epistemological, ontological and methodological premises" (Denzin & Lincoln, 2011, p. 13). Three terms, namely positivist, interpretive and critical describe the coherence and integration of these

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orientations (Carr & Kemmis, 1986; Merriam, 1998; Waghid, 2000; Henning, Van Rensburg, & Smit, 2004), each with its own strengths and weaknesses.

An interpretive paradigm was deemed appropriate for achieving the purpose of this research because it assists the researcher to understand the participating teachers' experiences of the lesson study cycles. Within a qualitative interpretive paradigm, there are several research methodologies, each with its own underlying philosophies, practices and ways of interpretation. Creswell (2009) identifies five research methodologies, namely case study, ethnography, grounded theory, narrative research and phenomenology. For the purpose of this study, case study was deemed to be the appropriate way to execute the research process and grounded theory to analyse the data, as briefly discussed in Sections 1.5.1.1 and 1.5.1.2 respectively.

1.5.1.1 The case study approach

Of the various qualitative research designs, a case study was found to be the most appropriate research methodology for answering the research questions (Yin, 1984, 1993). Yin (1984) describes case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" (Yin, 1984, p. 23). The phenomenon in this study is investigating the effects of lesson study on middle school teachers' learning and classroom practice. As in the case of this study, case study is the methodology of choice when investigating a contemporary phenomenon in depth and within its real life context (Yin, 1984, 1993).

This research is a bounded, a collective, an exploratory and an embedded case study. It is a bounded system (Stake, 1995; Merriam, 1998) because it took place in separate middle schools in the *Zoba Maakel* region. It is categorised as a collective (Stake, 1995) or multiple case study (Yin, 1984; 1993) because it took place in three separate middle schools. This study is also an exploratory case study as suggested by Yin (1984, 1993) because the research questions are framed so as to explore the learning and classroom practice of the participants. Yin (1984; 1993) indicates that analysis in case study design can be holistic or embedded. Holistic case study involves one unit of analysis, while the embedded case study involves more than one unit of analysis (Yin, 1984; 1993). Therefore, this study qualifies to be a holistic case study design with a group of middle school science teachers as its unit of analysis. More information on data analysis is given in Sections 1.5.1.2 and 4.4.

1.5.1.2 Grounded theory as an analytical tool

In this study, a grounded theory approach was employed to build theory inductively through successive conceptual analyses of data as highlighted in literature (Glaser & Strauss, 1967; Charmaz, 2000; Auerbach & Silverstein, 2003; Henning, et al., 2004). Grounded theory was found to be appropriate for three reasons. Firstly, grounded theory helps the researcher to proceed through the process in an inductive way without being driven by a theory, as there are no theories to be tested or verified. Secondly, the iterative nature of the theory that permits flexible movement back and forth in the data analysis process influenced the choice of grounded

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theory. Finally, the researchers' personal comfort with the analytical tool made grounded theory an appropriate choice for this study. The research methods are briefly described in Section 1.5.2.

1.5.2 Methods

It is important to highlight how the study was conducted and how the data were generated. After identifying schools, the participants who would participate in this study were acquainted with lesson study through two successive workshops each followed by the actual implementation of lesson study at classroom level to enable the participants to come together to collaborate, share ideas and find solutions for their pedagogical problems. The research was concluded by a third workshop (see Table 1.1).

1.5.2.1 Selection of schools and participants

This study was conducted in three purposefully selected (Merriam, 1998) middle schools of the *Zoba Maakel* region in Eritrea. Schools within suitable travel distance and that have at least three willing science teachers were selected for the study. Permission to conduct this study in the schools was obtained from the MoE (see Appendix-A-2 and A-3). Teachers were selected based on their willingness to participate, the fact that they are currently teaching science, their commitment and their ability to articulate their thoughts and feelings. The study involved 15 science teachers (including three heads of departments), three school directors and three pedagogic heads from three middle schools. School directors, pedagogic heads and heads of departments are important leadership figures in Eritrean schools. A school director is the leader of a school and usually assumes the role of administrator. The pedagogic head being subordinate to the school director is concerned with academic matters at the school such as overseeing teachers' weekly lesson plans, supervising classrooms and providing teachers with pedagogic support (see Figure 4.2).

1.5.2.1 Conducting training and implementing of lesson study

According to Garet, Porte, Desimone, Birman and Yoon (2001), an effective professional development programme is one that provides teachers with sufficient time to put into practice the newly obtained knowledge and skills. Teachers identified for this study participated in the professional development programme for a period of one academic year (two semesters), in order to provide them with sufficient time to internalise and practise what they had learned. The programme was further structured to take place in two phases, namely participating in training workshops and implementing what had been learned in classrooms (see Table 1.1).

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Table 1.1: Overview of the structure and components of the study

Duration	Structure	Components
First semester (23 Feb – 29 Jun, 2013)	Introductory workshop	Theory presentation Demonstration of lesson study skills
	Implementing lesson study at classroom level	Lesson study cycles Guidance and support Establishing organisational support Support from knowledgeable-other
Second semester (02 Sep – 31 Dec, 2013)	Follow-up workshop	Theory presentation Demonstration of lesson study skills
	Implementing lesson study at classroom level	Lesson study cycles Guidance and support Establishing organisational support Support from knowledgeable-other
End of the project	Concluding workshop	Thanking and distributing certificates

Source: Joyce and Showers (2002)

Firstly, participants identified for the study received training on lesson study. Three workshops were organised to take place at different times. The introductory workshop was organised to take place before the start of the first phase; the follow-up workshop was organised at the end of the first phase and beginning of the second phase; and the concluding workshop was organised at the end of the second phase or the end of the programme. The first two workshops comprised two components, namely presentation of theory and demonstration of the lesson study process using video clips, as suggested by Joyce and Showers (2002). The Joyce and Showers' (2002) model was chosen because this model has solid support in the literature and is said to facilitate teachers' learning and acquisition of skills (Loucks-Horsley, et al., 2010). Secondly, those who attended the workshops were allowed to implement what they had learned in the workshops in their classrooms. The implementation phase consisted of four components, namely lesson study cycles in classrooms, guidance and support, organisational support and embedding support from knowledgeable-other (Joyce & Showers, 2002). The framework that guided these two structures of the professional development programme, namely the conducting of training and the implementation of lesson study cycles is also diagrammatically represented in Figure 3.6.

1.5.3 Data-generation strategies

Data were generated during the first two workshops and lesson study cycles at classroom level by employing the following research techniques:

1.5.3.1 Questionnaires

Although this was a qualitative study, two questionnaires, namely a Participant Background Information Questionnaire (Appendix-D) and a Lesson Study Workshop Evaluation Questionnaire (Appendix-E) were administered in order to complement the data generation. Before the commencement of this study, teachers

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were requested to complete the Participant Background Information Questionnaire (Appendix-D). This questionnaire helped the researcher to obtain biographical and professional information and information about the training needs of the teachers. At the end of the first two workshops, participants also completed the Lesson Study Workshop Evaluation Questionnaire (Appendix-E). By means of this questionnaire, it was possible to obtain information about participants' perceptions about the usefulness, their satisfaction with, and the strengths and weaknesses of the workshops. Information obtained through this questionnaire was typed and prepared for data analysis.

1.5.3.2 Semi-structured focus group interviews

Data were generated using semi-structured focus group interviews conducted with both the science teachers and the school leadership. In each school, the science teachers were interviewed as a team. The focus group interviews with the teachers were conducted in two phases. During the first semester, two interviews were conducted. The first interview was conducted in the middle of the lesson study process (Appendix-H1) and the second was conducted, at the end of the first semester (Appendix-H2). For the second semester, one interview was conducted at the end of the lesson study process (Appendix-H3). The school leadership, the directors and pedagogic heads, were also interviewed once, as a group, in their respective schools (Appendix-J). All interviews were conducted in *Tigrigna* (local language) to enable participants to express their ideas better. The digitally recorded interviews were first transcribed and then translated into English. The translated interviews formed the text for data analysis.

1.5.3.3 Observation

During this study, both the participants and the researcher recorded activities during lesson observation. Overall, 29 lessons were observed in the three schools, namely 10 lessons in School 'A' (Table 4.3), 10 lessons in School 'B', (Table 4.4) and nine lessons in School 'C' (Table 4.5). A format was designed to enable the researcher to take notes of what was observed and his personal reflections of what was being observed simultaneously on the same page (Appendix-I). Even though the data obtained through this observation format (including other researcher's field notes) were not coded, they formed an invaluable source of information.

1.5.3.4 Documents designed for reporting research lesson events

Data were also generated using several formats designed to report lesson study events. An observation format (Appendix-F) was designed to enable the participants to record their observation of the lesson study events. This format contained guidelines about what procedures to follow while observing a research lesson and what to observe. Moreover, the participants prepared lesson plans on a four-column lesson plan format (Figure 3.4, Appendix-N), recorded their perceptions of post-debriefing sessions on the Team Member Log (Appendix-L) and recorded their perceptions of each lesson study cycle on the Lesson Study Report

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(Appendix-G). Data obtained through these documents, except the lesson plan format, were coded and formed text for the data analysis.

1.5.3.5 Video-recordings and photographs

In addition to the methods that generated textual data, video and photographic media were used in this study to capture the details of the research settings and activities. All lessons were video-recorded and photographed. These visual data were neither coded nor analysed. However, the researcher used these data as references and observed them time and again in order to understand the process.

In Section 1.6, the measures taken to ensure credibility and trustworthiness are highlighted.

1.6 CREDIBILITY AND TRUSTWORTHINESS

Ensuring quality is a fundamental issue in any research. In this study, appropriate measures were taken to ensure credibility and trustworthiness during the conducting of the research, the analysis of data, as well as the reporting of the findings. The criteria used for ensuring quality in qualitative research are different from the criteria used in quantitative research (Creswell, 2009; Cohen, Manion, & Morrison, 2011). To ensure quality in this study, the researcher utilised the trustworthiness model described by Guba, (1981) and Lincoln and Guba (1985). This model is based on identification of four aspects of trustworthiness, namely credibility, transferability, dependability and conformability (Guba, 1981; Lincoln & Guba, 1985).

To ensure credibility, i.e. confidence in the truth and interpretations of data (Guba, 1981; Lincoln & Guba, 1985) prolonged engagement at the study site, triangulation, collection of referential adequacy materials and peer debriefing were used (Guba, 1981; Lincoln & Guba, 1985; Merriam, 1998; Mertens, 1998). Transferability was established by providing a rich description of the context within which the study occurred (Guba, 1981) so that readers could determine the extent of similarity to their own situations (Mertens, 1998). In qualitative research, dependability refers to consistency of the result with the data generated (Merriam, 1998). In this study, dependability was ascertained by using triangulation and attaching as appendixes the instruments used to conduct the research and sample transcriptions of interviews to provide the reader with background information about the procedures followed in the research. Confirmability is concerned with ensuring that the researcher has acted in good faith (Bryman, 2008). To establish confirmability, the researcher provided characteristics of the respondents and methods of data generation, and analysis and interpretation that were used to show that the research findings are the result of the research and not the researcher's assumptions and preconceptions. Moreover, the promoters of this study, through questioning and challenging various aspects in this work, provided the researcher with the opportunity to reflect on his personal biases and values in terms of how he was conducting the research process. In Section 1.7, ethical considerations are highlighted.

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1.7 ETHICAL CONSIDERATIONS

In this study the researcher followed the necessary ethical procedures during every step of the planning and implementation of this research. Firstly, permission to undertake this study was obtained from the MoE (see Appendix-A1, A2 and A3). Secondly, the study was conducted in such a way that it caused no harm to the participants (Babbie & Mouton, 2001). The participants were informed about the aim and purpose of the study, the nature of study and the commitments involved in the study so that they could make their own decisions either to participate or not to participate in the study. All the participants signed consent paper to indicate that their participation was voluntary and a copy of the signed consent paper was given to each of them (Appendix-C). They were informed that they could withdraw from the research at any stage if they felt uncomfortable. To ensure anonymity, codes were used to protect the identity of the schools and the participants. Finally, as researchers are obliged to be honest and open wherever possible when they analyse and report their findings (Babbie & Mouton, 2001), the researcher was honest towards the research community while conducting and reporting the findings.

In Section 1.8, the referencing style used in this dissertation is provided.

1.8 REFERENCING METHOD

The American Psychological Association (APA) referencing method was used in preparing this dissertation. Citations in the text are arranged chronologically while the references are listed in alphabetical order.

In Section 1.9 the key terminologies used in the study are defined.

1.9 KEY DEFINITIONS

The key concepts and terms used in this study are defined briefly below:

Collaboration: Collaboration is a process where teachers work with colleagues to achieve shared goals. It involves joint decision-making, discussion, negotiation, trust and communication in order to improve classroom practice.

Debriefing: A discussion that takes place after the teaching and observing of a research lesson.

Geez: *Geez* is an old Semitic language, the use of which is currently confined to the Coptic Orthodox Church of Eritrea and Ethiopia. At the moment, the *Tigrigna* and *Tigre* languages use the *Geez* script, a script assumed to have developed from the *Sabaean* script written from left to right. Each character in this script represents a syllable representing a consonant plus a vowel. The main characters are modified in at least seven different ways to indicate the various vowels of the syllable.

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Shift system: teachers are required to teach separate groups of students in the morning and afternoon.

Guests: People from outside the lesson study team who are invited to observe a research lesson.

Knowledgeable-other: An individual who works with the lesson study team, providing expertise in content knowledge, pedagogy, lesson study cycles and other relevant areas.

Lesson study cycle: A complete series of steps in a lesson study process.

Lesson study process: The steps involved in conducting a lesson study.

Lesson study: A teacher development strategy in which a group of teachers collaborate to plan, teach and observe a research lesson in order to collect data on students' learning and use that data to refine the research lesson.

Ministry of Education: A Ministry responsible for leading curriculum, policy, and resourcing for state education in early childhood, elementary, middle and secondary education.

Pedagogic head: A pedagogic head is a person appointed by MoE who is subordinate to school director and is primarily concerned with academic matters of a school.

Research lesson: A lesson that a team of teachers plans and investigates during a lesson study cycle.

School director: A leader of a school appointed by Ministry of Education.

Student: A student is a learner attending school.

Teacher: A teacher is a person who facilitates student learning in a school.

Teacher development: Teacher development is a learning process that is undertaken by teachers after their initial preparation in order to enhance their work.

Zoba Maakel: Central administration region

In Section 1.10 an overview of the seven chapters of this dissertation is provided.

1.10 STRUCTURE OF THE STUDY

This dissertation is divided into six chapters. In Chapter One, the research problem is established and the importance of carrying out the study to support middle school science teachers in Eritrea is highlighted. The research methodology, methods used to ensure quality, ethical considerations, key terms and the outline of chapters in the dissertation are presented. In Chapter Two, a historical overview of educational developments in Eritrea is provided in order to situate the study in context and to demonstrate why teacher development is needed. In Chapter Three, the theoretical base for the study is set. Relevant literature on teacher development and lesson study is provided. The insights obtained from the literature are used to identify appropriate teacher

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development for middle school science teachers in Eritrea. In Chapter Four, an overview of the research design and methodology used in this study and that enabled the researcher to answer the research questions is provided. This includes reasons for choosing the interpretive case study design. Moreover, the sampling procedures and the data generating and analysing methods are described. In Chapter Five, the data that were generated through multiple techniques as well as the findings that emerged from the study are presented. In Chapter Six, conclusions and recommendations are provided. The dissertation ends with references and appendices.

1.11 CHAPTER SUMMARY

In this chapter an overview of this study is provided. The underlying research problem of the study and justification for choosing lesson study as suitable teacher professional development strategy is presented. A qualitative collective case study was found to be the most appropriate research methodology to achieve the purpose and answer the research questions. The exploratory nature of the research questions is the reason why an interpretative paradigm was considered to be the most suitable research perspective. This paradigm can assist the researcher to understand the participating teachers' experience of the lesson study process. Multiple techniques including questionnaires, semi-structured focus group interviews, observation, documents designed for reporting research lesson events, video recording and photographs were used to generate data. The data generated were analysed and interpreted using the grounded theory approach in order to answer the research questions. Appropriate measures were taken to ensure credibility and trustworthiness during the whole research processes including generation of data, analysis of data, as well as reporting of research findings. Finally, appropriate ethical procedures were followed to conduct the research.

In the following chapter a historical overview of education in Eritrea is provided in order to situate the study in context.

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CHAPTER TWO
THE CONTEXT OF THE STUDY: ERITREA

2.1 INTRODUCTION

In this chapter the aim is to situate the study within the context of Eritrea. In Section 2.2 the history, geography and climate of Eritrea are described. A brief historical overview of education in Eritrea during the different periods is given in Section 2.3 because several changes in social, political and economic had occurred in Eritrea before and after independence that have direct influence on education. In Section 2.4 teacher education in Eritrea is discussed. Finally, a summary of the chapter is provided in Section 2.5.

2.2 HISTORY, GEOGRAPHY AND CLIMATE

Eritrea is located in North East Africa. It shares terrestrial borders with Djibouti, Ethiopia and Sudan. It also shares maritime borders with Saudi Arabia and Yemen. The total area of the country is about 117 600 sq. km. The population of Eritrea is about 6.07 million, 80% of which live in rural areas and participate in various agricultural activities. Eritrea is a pluralistic country with nine distinct ethnic groups, namely *Afar*, *Beja*, *Bilen*, *Kunama*, *Nara*, *Rashaida*, *Saho*, *Tigre* and *Tigrigna*. The working languages are Arabic, *Tigrigna* and English. The population of Eritrea is about equally divided between Christians (mainly ethnic *Tigrigna*) and Muslims (diverse ethnic groups).

Figure 2.1: Map of the State of Eritrea

Source: http://www.luventicus.org/maps/africa/eritrea.html

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As indicated in Figure 2.1, Eritrea is divided into six administrative regions called *Zoba*, namely *Anseba*, *Debub*, *Debubawi-Keyih-Bahri*, *Gash-Barka*, *Maakel* and *Semenawi-Keyih-Bahri*, each with its own education division office. This study took place in three schools of *Maakel* region.

Long before the Italians colonised Eritrea, the coastal lowlands of what is now called Eritrea were under the control of the Ottoman Empire, which was later taken over by Egyptians in 1820s. The Italians first entered Eritrea 1865. Then they slowly extended their control over the various territories until they finally established a new colony in 1890. After defeating the Italians, the British ruled Eritrea from 1941 to 1952. Later, Eritrea was federated with Ethiopia as an autonomous state from 1952 to 1962. The Ethiopian imperial government unilaterally abolished the federal arrangement and annexed Eritrea in 1962, which led to 30 years of bitter war for liberation. This war severely affected the socio-economic condition of the people, including education. Eritrea finally gained its *de facto* independence in 1991 and *de jure* in 1993 after a UN supervised referendum in which the people of Eritrea overwhelmingly voted in favour of independence. Shortly after independence, in 1997, Eritrea entered into renewed political and military tension with Ethiopia, which negatively impacted on all aspects of life in Eritrea, including education.

There are two major topographical regions in the country, namely the central highlands and the eastern and western lowlands. The diversity of these topographies range from 75 metres below sea level at *Dalul* located in the Danakil Depression to 3,018 metres above sea level at Mt. *Embasoyra*. The climate of Eritrea is warm and wet in the highlands, semiarid towards the western escarpment and the lowlands, and hot and dry along the east coast. The rainy seasons are from December to March along the coast and from June to September in the other parts of the country.

In the following section, Section 2.3, the historical development of education in Eritrea is briefly discussed.

2.3 THE ERITREAN EDUCATION SYSTEM

2.3.1 Introduction

In this section, Section 2.3.1, the historical development and provision of education in Eritrea is discussed. Studying the historical development can provide insight into the contemporary situation of education in Eritrea. Historically, the Eritrean education system was shaped by the policies of the various colonial powers, namely Italy, Britain and Ethiopia, which ruled the country, and the policies of the post-independence government of Eritrea. Their legacies have had a considerable effect on the present day realities of education because each of them used education as a tool for fulfilling their ideological interests. Based on the different socio-political conditions, education in Eritrea can be divided into three major periods, namely pre-colonial education, colonial education and post-independence education, as elaborated on in the following sections.

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2.3.2 Pre-colonial education

2.3.2.1 Traditional education

Long before colonisation, elders were responsible for transmitting cultural and social values to the new generation. This traditional education contributed to the development of good social conscience, propagation of traditional beliefs, values, customs and acquisition of life skills. By means of oral traditions, elders told stories and recited poems about the importance of becoming brave warriors and defending families and society; about how to look after children and construct healthy families; and about the environment and how to protect it.

In addition religious institutes, namely the Church and Quran schools, played an important role in literacy development. The Church taught children among other things about the Holy Bible, religious dances, and the reading and writing of religious texts. It introduced children to the *Geez* script, the reading and writing of religious texts and numeracy. Likewise, the Quran schools (*Khalwa*) introduced children to the Holy Quran, the Arabic scripts, the reading and writing of religious texts, and the basic principles of Islam and the Arabic language. In religious schools, teaching is seen as transmission of knowledge. Children are expected to memorise and recite religious texts. Achievements are measured by the amount of memorisation. These religious schools with their limited capacity still provide education to children who are deprived of education.

In the next section, Section 2.3.2.2, the contribution of missionaries in introducing formal education in Eritrea, is discussed.

2.3.2.2 Early mission education (1839-1920)

Pankhurst (1972) associates the history of western styled modern education in Eritrea with the arrival of the missionaries. Even though the main purpose of the missionaries was to spread Christianity, they also taught subjects like reading, writing, arithmetic, history, geography and crafts in their teaching to win the hearts and minds of the people (MoE, 2008b). Ephraim (2007) describes the education provided by the missionaries, although limited in scope, as discriminatory in terms of religion, ethnicity, gender and region. He claims that the missionaries were the cause of the present day ethno-regional disparities in education in Eritrea. This disparity was carried over to this date without being properly addressed (Ephraim, 2007).

Although the missionaries introduced formal education in Eritrea, it was later influenced by the policies of the successive colonisers and by the post-independence government of Eritrea (Ghebremuse, 2004); each of which used education as a tool for promoting their agendas. In Section 2.3.3 the contribution of colonial powers in advancing formal education in Eritrea is discussed.

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2.3.3 Colonial education

2.3.3.1 Education during the Italian colonial period (1890-1941)

According to Trevaskis (1960), the western styled formal education was introduced in Eritrea by the Italians. They developed schools on a strictly apartheid basis with separate schools for natives and Italian children, favouring the latter (Trevaskis, 1960). Pankhurst (1972) indicates that Italian children in Eritrea had a complete system of primary and secondary schools similar to those in Italy. At first, the half-caste children were allowed to attend the Italian schools but later they were denied admission, after which they could only go to the schools for the natives (Pankhurst, 1972). The schools for the natives were limited to teaching hygiene, geography and ancient history. These schools were aimed at producing a semi-skilled labour force for the agricultural and industrial sectors; low-paid mercenaries that would serve in the military; and administrative personnel that would serve as interpreters, clerks, telephone operators and typists (Pankhurst, 1972; Trevaskis, 1960).

The Italian colonial policy of education in Eritrea was geared towards producing loyal, obedient and uncritical citizens who glorified the greatness of Italy, its culture, history and civilisation (Pankhurst, 1972). Eritreans were not allowed to progress beyond grade four. This can be seen when reading from a confidential letter circulated in 1938 by the then Director of Education in Eritrea, *Andrea Festa*, to Italian headmasters (Trevaskis, 1960, p. 33).

> *By the end of his fourth year, the Eritrean student should be able to speak our language moderately well; he should know the four arithmetical operations within normal limits; he should be a convinced propagandist of the principles of hygiene; and of history he should know only the names of those who have made Italy great.*

2.3.3.2 Education during the British Military Administration (BMA) (1941-1952)

Trevaskis (1960) indicates that the BMA treated the Eritreans better than the Italians did. Firstly, they did away with the apartheid style of education which the Italians put in place for fifty years. Secondly, they allowed Eritreans to fill in the administrative posts that were previously held by Italians. Thirdly, they improved sanitary and health services. Finally, they put in place a clear policy for the education of Eritreans. They expanded educational provision by opening middle and secondary schools, and teacher-training institute for elementary schools (Trevaskis, 1960).

According to Trevaskis (1960), Eritreans preferred Arabic and *Tigrigna* as their official languages and languages of instruction at elementary school level. English served as medium of instruction at middle schools and beyond (Trevaskis, 1960). Although progress on education in terms of access and quality was observed during this period, it was far from sufficient to satisfy the growing needs of the ordinary Eritreans.

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2.3.3.3 Education during the federation of Eritrea with Ethiopia (1952-1962)

Eritrea was federated with Ethiopia based on a UN resolution passed on September 1952. During this period, the steady development of education was observed and the number of schools increased. Based on the Federal Act, the then Government of Eritrea (GoE) attempted to widen access to education by opening new elementary, middle, secondary and vocational schools. Although this period was marked by substantial development in education, opportunities were restricted to the completion of the middle school level and access to secondary schools and beyond were limited (Ghebremuse, 2004).

Similar to in the BMA era, Arabic and *Tigrigna* were the official languages and languages of instruction at elementary school level. English served as the language of instruction at middle school level and beyond. The development of education was halted towards the end of the federal period by interference from the Ethiopian government. Finally, the Ethiopia government unilaterally dissolved the federal agreement in violation of the UN resolution and forcefully annexed Eritrea in 1962.

In Section 2.3.3.4 development of education during the Ethiopian occupation is discussed.

2.3.3.4 Education during the Ethiopian occupation (1962-1991)

Ethiopia dissolved the federal agreement and occupied Eritrea based on an accord with a segment of the population who supported the union of Eritrea with Ethiopia. This occupation downgraded the status of Eritrea from a federal state to a province of Ethiopia. The Ethiopian education system replaced the Eritrean education system. *Amharic* became an official language and language of instruction at elementary school level replacing Arabic and *Tigrigna* languages. *Amharic* was also taught as a subject beyond elementary school level (MoE, 2008b). All Arabic and *Tigrigna* textbooks including other relevant curricular documents were destroyed and replaced with *Amharic* textbooks that were stuffed with the values of Ethiopian culture, history and geography. Obtaining a pass grade in *Amharic* became a requirement to join a university.

Compared to the earlier colonial periods, access to education increased especially during the socialist Ethiopian regime, a government that replaced the imperial regime. This was done mainly by building new schools and nationalising private and mission schools. Nevertheless, this increase in access was not without problems. Firstly, teaching was heavily academic and the focus was on lecturing, passive students and rote learning. Secondly, the quality of education was constrained by factors such as a shortage of educational materials, overcrowded classrooms, a shortage of qualified teachers, and poor living and working conditions of teachers (Kiros, 1990). Kiros further indicates that the situation was aggravated because many teachers left the profession to either join the armed struggle or migrate in search of a better life (Kiros, 1990). Despite some developments during the Ethiopian socialist regime, education in Eritrea was severely affected by the long war and famine to a point of interruption in most parts of the country, because many schools were destroyed and some changed into military barracks.

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2.3.4 Post-independence education

At the time of liberation, in 1991, Eritrea inherited an education system that had been adversely affected by the 30-year long war for liberation. The Eritrean government inherited a population that was largely illiterate with a backlog of many children and adults who had had no formal schooling (MoE, 2007). Faced with the huge task of dealing with an unequal and inefficient education system, the MoE was determined to bring about changes in the education system. This determination was reflected in many of the policy documents by key words such as improving access, equity, quality and relevance. To meet these demands, the government allocated its resources to the education sector and started to transform it. As a step forward, the MoE took initiatives to phase out the pre-independence curricula and replace them with the curricula that were operating before independence in liberated areas. The MoE engaged in extensive efforts to rehabilitate the war damaged system of education on one hand and to expand the provision of education on the other. As a result, it has made great gains in improving access at all levels (MoE, 2009).

Despite some achievements, the Education system still suffers from low access and equity, low quality, lack of relevance, high external and internal inefficiency and limited institutional and financial capacity (MoE, 2005). According to the most recent report of the MoE, approximately 50% of elementary, 73% of middle and 84% of secondary school aged children and youth have no access to education (MoE, 2009). Regional disparities in enrolments are clearly observed (MoE, 2005). The enrolment rates in *Debub* and *Maakel* regions are above the national averages whilst in *Anseba*, *Debubawi-Keyih-Bahri*, *Semenawi-Keyih-Bahri and Gash-Barka* regions, the enrolment rates are below the national average (MoE, 2009). Children from families with nomadic or semi-nomadic life styles, children from families with poor backgrounds and children with disabilities are the most affected (MoE, 2005; 2008a). In addition to the factors mentioned above, the sparse population and the vastness of these regions means that there are few schools which in turn makes access more difficult because of the distance of schools. Gender disparities in enrolment are also observed in the system. Factors such as early marriage, school distance and cultural preference of parents for boys' education than girls' education affects the enrolment of girls (MoE, 2005; 2008a).

In Section 2.3.4.1 the structure of education in Eritrea is discussed.

2.3.4.1 Structure of education

Based on educational insights and political visions, the structure of education in Eritrea has undergone several changes. Figure 2.2 indicates that education in Eritrea is structured into pre-school, elementary, middle, secondary and tertiary education.

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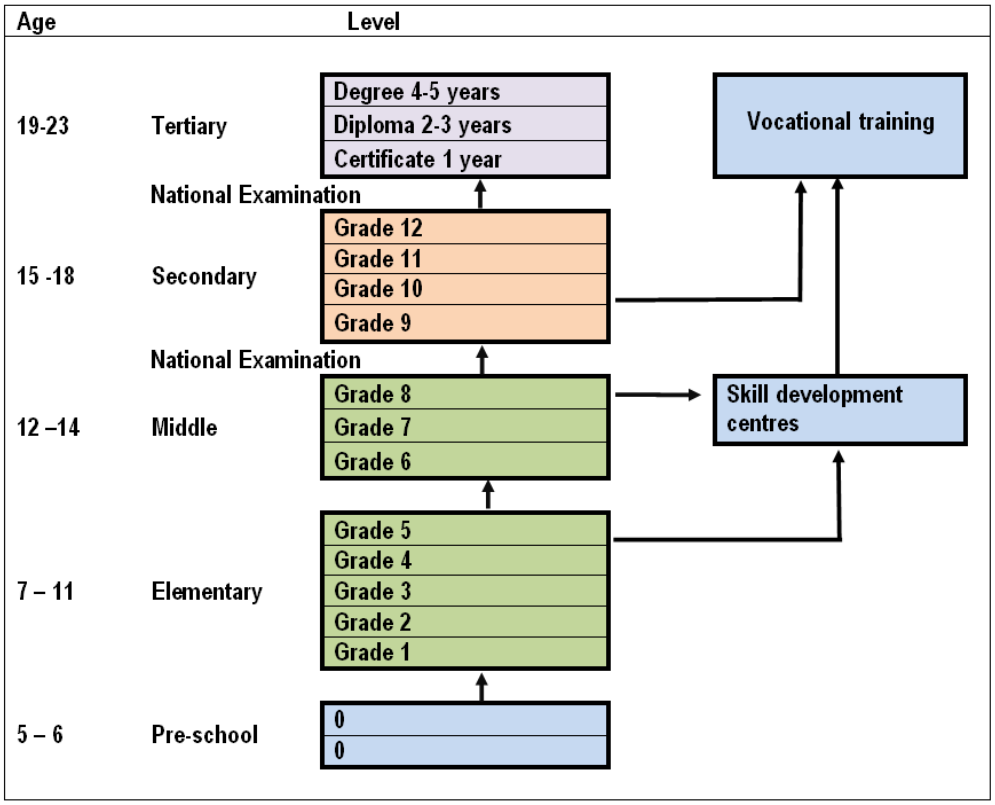
Figure 2.2: Structure of education in Eritrea



Source: Adapted from MoE (2005)

From 1991/92 to 2002/03 the education system had a 5-2-4 grade configuration, that is, five years for elementary, two years for middle and four years for secondary school levels respectively. In the year 2003, it was restructured into a 5-3-4 grade configuration, that is, five years for elementary, three years for middle and four years for secondary levels respectively. The duration in middle schools was extended to three years in order to prepare students for future education and or employment. The structure makes provision for pre-school education for children aged five to six years, but this is mainly restricted to urban areas, especially the capital. Moreover, the structure includes vocational and tertiary education.

At pre-school and elementary school levels, students are taught in their mother tongue and English is introduced as a subject from grade two and becomes the medium of instruction from Grade six onwards (MoE, 2003). Both *Arabic* and *Tigrigna* are widely used for communications but *Tigrigna* is used for all transactions in government offices. The usage of English as a language is limited to classrooms. Of the nine ethnic groups, the *Tigrigna* and *Kunama* have wholeheartedly accepted the mother tongue education policy while other ethnic groups choose Arabic as language of instruction rather than mother tongue instruction (Woldemikael, 2003). At the end of their middle and secondary school levels, students sit for national examinations in order for them to be admitted into secondary school and tertiary education institutions respectively.

In Section 2.3.4.2, the reform of education in Eritrea is discussed.

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2.3.4.2 Reforms in education and classroom realities

For many years concerns about the quality of education have been a major issue worldwide. To address these concerns, many countries became engaged in reforming their education systems (Villegas-Reimers, 2003). Similarly, education in Eritrea has experienced several reforms. Since independence, in 1991, the Eritrean education system has been reformed twice. The first reform was in 1993 and the second in 2002. The focus of these reforms was on improving the quality of education delivered to students through changing classroom practices. The reforms put new demands on teachers as these practices differed from the practices to which they were accustomed. The reforms required that teaches shift their teaching from teacher-centred approaches to a more student-centred approach and interactive pedagogy (MoE, 2002, 2008b). Teachers are required to put more emphasis on student participation and focus on teaching methods that enable students to understand, think critically and solve problems (MoE, 2002, 2008b). Despite the calls of the reforms, the actual classroom practices focused on transmission of knowledge (Abdella, 2000; Ghebremariam, 2000; MoE, 2005; Tecle, 2006). Such difficulty of translating policy into practice is not limited to Eritrea. It has also been consistently proven to be difficult elsewhere and many of the professional development programmes targeting teachers did not succeed (Lieberman, 1995; Le Grange & Reddy, 2000). This is exasperated by a lack of resources (such as textbooks, laboratories, equipment and consumables), curriculum overload and poor teacher quality (MoE, 2005).

To acquaint teachers with the requirements of the reforms, the MoE has developed manuals and supported them by teacher development opportunities in the form of short-term orientations (MoE, 2005), but produced few changes. Thus, the researcher believes that the teacher development opportunities provided by the MoE could be complemented by using lesson study as a strategy to help teachers to implement the reform initiatives.

The subsequent Section 2.4 briefly discusses teacher education in Eritrea.

2.4 TEACHER EDUCATION IN ERITREA

Teacher education in Eritrea is composed of initial teacher education, induction and continuing professional development. In the subsequent sections, Sections 2.4.1 and 2.4.2 the initial and continuing teacher education in Eritrea is discussed whereas the challenges in teacher education is discussed in Section 2.4.3.

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2.4.1 Initial teacher education

Initial teacher education is intended to supply well-trained teachers for all school levels. Currently there are two institutes that offer initial teacher education in Eritrea, namely Asmara Community College of Education (ACCE) and the College of Education (CoE) at the Eritrea Institute of Technology (EIT)[1]. ACCE offers a one-year certificate course for preparing elementary school teachers. Elementary teachers in Eritrea are generalists who teach all subjects. The duration of initial teacher education for preparing elementary teachers has been shortened to one year in order to respond to the shortage of teachers. The ACCE is not affiliated to any Higher Education Institute (HEI). The MoE is responsible for registering, employing and validating its award. In addition to a one-year certificate programme, this institute has recently (in 2013) started offering a diploma programme in educational administration.

The Faculty of Education at the University of Asmara contributed to preparing teachers for middle and secondary schools until it was closed and relocated to EIT in 2006. Currently the CoE at the EIT is responsible for training middle and secondary school teachers. Since its establishment in 2004, this college was limited to a two-year diploma-course that prepares teachers to teach one or two subjects in middle schools. Until recently there was no teacher education establishment in Eritrea dedicated to producing secondary school teachers. At the time of this research, the CoE has enrolled the first degree candidates in 2012/2013 academic year. The degree programme is a four-year course that prepares teachers to teach one or two subjects in secondary schools. The delay in commencing this programme has created an acute shortage of teachers in secondary schools. As a result, middle school teachers were used to teach in secondary schools, further decreasing the number qualified teachers in middle schools (see Table 2.1). The high number of unqualified teachers at middle school level provided the motivation to conduct this study in selected schools of Eritrea in order to support science teachers in the implementation of the reform initiatives.

2.4.2 Continuing teacher development opportunities in Eritrea

Allowing teachers to participate in professional development programmes is a way of helping them to grow personally, socially and professionally (Bell & Gilbert, 1996). In Eritrea, the MoE acknowledges that achieving quality education is not possible without well-trained, qualified and motivated teachers (MoE, 2007). The rationale behind teacher development opportunities in Eritrea is that better educated teachers will be more effective in their classroom practice. The MoE, using its Department of Research and Human Resource

[1] EIT has three colleges, namely the College of Education, the College of Engineering and Technology and the College of Sciences. Graduates of the last-mentioned two colleges are also deployed as teachers in middle and secondary schools as a fulfilment of their one year community service, after attending in a one-week induction programme. Participation in community service is a requirement for graduation.

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Development (DRHRD), runs all the teacher development programmes. Since education is highly centralised, it is the MoE who decides what should go into the training programmes and who should receive the training.

Some measures have been taken to provide continuing professional development opportunities through sending teachers for postgraduate studies to overseas universities or enrolling them in the local teacher education establishments for undergraduate studies (MoE, 2006). Besides this, many teachers have benefited from distance education programmes while they are at their work stations. About 267 unqualified teachers attended a Distance Education programme that certifies them to teach in elementary schools (MoE, 2007). Moreover, 1700 middle school teachers obtained a diploma that qualifies them to teach in middle schools through the Open Distance Learning Programme (ODLP) (Russom, 2011). Although the appropriateness of using distance education to upgrade teachers is debatable because it always lacks face-to-face contact and a laboratory component (for sciences), many teachers have benefited from the programmes.

In addition to the arrangements mentioned above, some measures have been taken to provide continuing professional development opportunities through workshops, short-term orientations and training of trainer programmes. Apart from being infrequent, these professional development opportunities are often organised in such a way that one or two teachers from a school are trained and requested to pass the knowledge and skills gained during the training to their colleagues back in the schools. Theoretically, it is believed that teachers who participate in such programmes will pass the knowledge and skills acquired from the workshops to teachers down the layers (Lieberman, 1995; Reddy, 2004). However, there are concerns as to whether those who participate in the training actually do pass the intended information down the layers (Lieberman, 1995; Reddy, 2004). Moreover, these workshops are organised according to the one-size-fits-all approach, where the same information is provided to all participants (Loucks-Horsley, et al., 2010). Learning from such sessions rarely transfers to classroom practice. The researcher felt that it is important to initiate a teacher development programme that allows active participation of teachers. Thus, this study, that uses lesson study as a strategy to allow teachers to come together to discuss and solve their pedagogical problems, was initiated (see Section 3.4).

2.4.3 Challenges in teacher education

2.4.3.1 The high number of unqualified teachers

The Eritrean school system suffers from an acute shortage of trained teachers. Table 2.1 shows that about 60% of the total teachers in elementary schools and about 80% of the teachers in middle and secondary schools are males. The table also indicates that there are more qualified teachers in elementary and secondary schools than in middle schools. Mulkeen (2010) contends that there are always imbalances between rural and urban areas, usually in favour of the latter because better-qualified teachers are usually assigned to urban areas.

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Table 2.1: Percentage of females and number of qualified teachers 1991/92 – 2012/13

Academic year	Percentage of female and total number of teachers								Teachers qualified (%)			
	Elementary		Middle		Secondary		Grand total					
	Female (%)	Total	Female (%)	Total	Female (%)	Total	Female (%)	Total	Elementary	Middle	Secondary	Total qualified (%)
1991/92	38.7	3674	17.8	783	8.8	758	31.2	5215	NA	NA	NA	NA
1992/93	37.1	4978	16.7	855	10.3	905	30.9	6738	42.7	56.6	47.6	45.1
1993/94	35.4	5272	14.3	978	10.2	1015	29.0	7265	39.1	72.6	47.2	44.7
1994/95	35.4	5583	14.7	948	10.0	1081	29.2	7612	47.9	69.7	46.9	50.5
1995/96	34.7	5828	15.7	992	9.9	1039	29.0	7859	72.4	49.4	52.0	66.8
1996/97	36.1	5476	16.7	1017	11.3	942	30.3	7435	68.4	43.9	55.9	63.5
1997/98	32.6	5799	14.5	1162	11.8	959	27.4	7920	67.5	43.0	71.1	64.3
1998/99	35.0	5576	12.3	1208	11.4	982	28.5	7766	72.8	37.9	72.8	67.4
1999/00	37.4	6229	12.7	1312	10.4	1047	30.3	8588	71.8	32.0	69.6	65.5
2000/01	40.6	6668	11.6	1377	9.7	1188	32.3	9233	70.5	35.3	73.1	65.6
2001/02	38.3	7498	11.6	1529	10.2	1419	30.6	10446	72.8	30.8	72.7	66.6
2002/03	35.8	7692	11.4	1614	11.0	1277	29.1	10583	80.5	31.4	68.1	71.5
2003/04	35.9	8033	9.6	2241	13.1	1645	27.8	11919	83.1	28.2	78.6	72.2
2004/05	39.9	7942	10.0	2449	13.4	1607	30.3	11998	83.6	28.9	81.6	72.2
2005/06	43.4	7711	12.6	2491	13.1	1552	32.9	11754	87.5	28.5	82.2	74.3
2006/07	47.7	6936	10.0	2478	11.7	1778	33.6	11192	87.1	36.8	85.7	75.7
2007/08	44.3	7311	10.5	2704	11.6	1811	31.6	11826	90.2	42.0	80.2	77.6
2008/09	40.3	7802	9.9	3352	11.7	2292	27.9	13446	92.2	54.5	78.3	80.4
2009/10	40.9	7535	13.2	3680	12.7	2472	28.4	13687	93.8	60.6	80.1	82.4
2010/11	40.6	7704	14.4	3707	14.7	2561	28.9	13972	90.9	69.2	78.2	82.8
2011/12	40.6	8166	16.3	3867	16.1	2845	29.6	14878	83.9	81.3	79.9	82.5
2012/13	37.5	8680	17.2	3905	18.1	3076	28.6	15661	79.9	86.9	80.0	81.7

Source: MoE (2013) Eritrea: Essential education indicators (NA = Data not available)

To solve the shortages of teachers at middle and secondary school levels, graduates from HIE[2] are deployed after attending an induction programme for one week. In addition to their lack of pedagogical knowledge, these graduates are usually requested to teach subjects in which they possess no qualification (MoE, 2006). Besides the need to address the shortage of teachers in the system, the reason that these graduates who are not qualified for teaching are assigned to teaching is because there is a general belief among the authorities that anyone who has a diploma or a degree in a field of study can teach. This notion contradicts what is found in the literature. Darling-Hammond (2006, p. 20) states that "although many people believe that anyone can

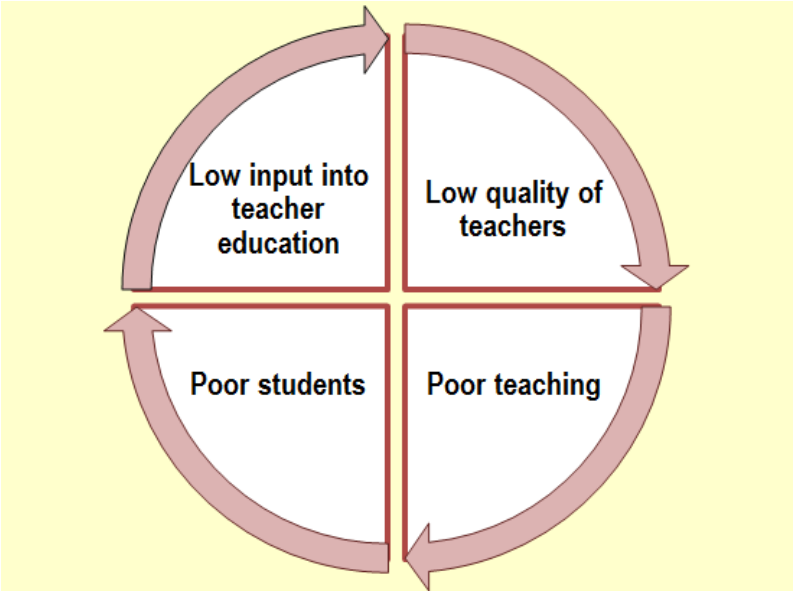
[2] The Higher Education Institutes are the College of Education, the College of Engineering and Technology and the College of Science of Eritrea Institute of Technology at Mai Nefhi, the College of Agriculture at Hamelmalo, the College of Arts and Social Sciences at Adi-Keih, the College of Business and Economics at Halhale, the College of Health Sciences in Asmara and the College of Marine Sciences and Technology at Massawa.

teach – or, at least, that knowing a subject is enough to allow one to teach it well – the evidence strongly suggests otherwise". It is argued that deploying such paraprofessionals in teaching is one of the causes of the prevalent use of traditional teaching methods (MoE, 2010). It is indispensable to have qualified and dedicated teachers in place in order to implement a reform like the one introduced in 2002. Thus, this low qualification of teachers, especially in middle schools, has provided the motivation to embark on this research.

2.4.3.2 Inability to recruit appropriate candidates

Another challenge in initial teacher education is the inability to recruit appropriate high calibre candidates. Teaching is not an attractive profession in Eritrea. Candidates who join the teacher education programme are those that are the least academically qualified. The teacher education establishments tend to admit candidates who failed to get places in their first, second, or third choice of courses. This implies that not all of the candidates who are admitted to the initial teacher education in Eritrea are necessarily interested in teaching. The poor entry requirement into teacher education leads to low output in terms of quality of teachers, which in turn results in poor teaching performance and poor students, where the vicious cycle begins again. The challenge for the future is therefore to find a way to break this cycle and to recruit appropriate candidates. A pictorial representation of this scenario is presented in Figure 2.3.

Figure 2.3: Type of candidates entering teacher education



2.4.3.3 Shortened teaching practice

As in many other countries, the curriculum for initial teacher education in Eritrea is comprised of four components, namely academic subjects, foundations of education, developmental psychology and teaching practice. As teacher educator, the researcher has noted that the teaching practice component receives little attention when compared to the other three components. It usually takes place for about one month. Teaching practice was shortened because of logistical constraints such as lack of transport due to physical distance

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from the schools and not wanting to disrupt the academic programmes for longer periods as the student teachers participating in teaching practice take courses with students from other colleges. This entails that the initial teacher education does not equip teachers with sufficient practical skills.

The challenges described above indicate that teacher development opportunities are infrequent, the presence of high number of unqualified teachers in the system, and the inability to recruit high calibre candidates. Also teaching practice during training is very short. These challenges are more relevant to middle school teachers, and this is the focus of this study. In this study, the researcher aims to provide teacher development opportunities that are in line with the requirements of the reform initiatives.

In Section 2.5, a summary of this chapter is provided.

2.5 CHAPTER SUMMARY

In this chapter the context in which the study was conducted is described. The historical development of education in Eritrea indicating the changes that took place during the pre-colonial, colonial and post-independence eras in relation to education is described. Since independence, in 1991, the education system in Eritrea has experienced two reforms. Although these reforms call for shifts in teaching from teacher focused to student-centred approaches, the classroom realities are dominated by traditional didactic approaches (Abdella, 2000; Ghebremariam, 2000; MoE, 2005; Tecle, 2006).

Divided along ethnic and linguistic lines, most Eritreans have lived and are living in poor economic conditions. The continued war with Ethiopia negatively impacted on all aspects of life in Eritrea, including education. Despite some achievements in the education sphere after independence, the Education system still suffers considerably from low access and equity, low quality, lack of relevance, high inefficiency and limited institutional and financial capacity. At classroom level, large class size, a lack of resources, curriculum overload and poor teacher quality are factors that constrained the implementation of the reforms. These contextual and socio-economic factors also affected teacher education. More specifically, these are:

- Mismatch between an increase in enrolment and improvements in the teaching force.
- Lack of qualified teachers, especially in middle schools.
- Inability of teacher education to attract appropriately high calibre candidates.
- The inability of teachers to implement student-centred teaching methods.
- Low motivation of teachers.
- Very short teaching practice.

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- Limited teacher development opportunities. Those that exist are in the traditional formats that are not aligned with the reform initiatives of the MoE.

These factors acted as the impetus to conduct this research. Therefore, the researcher used lesson study as a strategy to support middle school teachers in improving their classroom practice. In the next chapter the focus will be on the conceptual construction of the study. There will be a review of the literature on teacher development in general as well as lesson study in particular. Lesson study will be discussed in the light of the need to create a platform for teachers to collaborate in order to enable them to achieve the goals of education in Eritrea.

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CHAPTER THREE
A LITERATURE REVIEW ON LESSON STUDY AS A TEACHER DEVELOPMENT STRATEGY

3.1 INTRODUCTION

In this chapter a literature overview of teacher development and lesson study as a strategy for supporting teacher development, is provided. The aim of this literature review is threefold, namely to conceptualise teacher development and lesson study, to use the insights obtained from the literature to identify a training model that uses lesson study as a professional development strategy and to use the literature to interpret the findings obtained in order to answer the research questions indicated in Sections 1.4 and 4.2.

The chapter is organised into six sections. Section 3.1 is the introduction. In Section 3.2 teacher development is conceptualised. The importance of teacher development in keeping teachers abreast with the advances occurring in education in order to enable them meet the ever-increasing demands of education, is underscored. Moreover, the characteristics that make teacher development more effective are identified and the recent shift to a reform type of teacher development is described. In Section 3.3 it is indicated that isolation is a wide spread phenomenon that restricts teachers from developing professionally. The importance of collaboration in breaking the culture of isolation is stressed. Furthermore, lesson study as a strategy to create a platform for teachers to collaborate is identified. In Section 3.4 lesson study and its cyclic nature are conceptualised. The characteristics that make it effective and the justifications for choosing lesson study as strategy are provided. There is a discussion of the roles of knowledgeable-others and school leadership in sustaining teacher development and the benefits and concerns of lesson study. In Section 3.5 various teacher development models, namely transmission, translation and transformation are discussed and then the model used in this study is described. In Section 3.5.3 the importance of evaluating teacher development is highlighted and justification for choosing Guskey's (2000) model of evaluation is provided. Finally, an overall summary of the chapter is provided in Section 3.6.

3.2 TEACHER DEVELOPMENT

This Section 3.2 reviews the following trends of teacher development: definition, importance, comparison of traditional and reform-based teacher development and characteristics of effective teacher development.

3.2.1 Definition

Teacher development offers an important way to improve schools, increase teacher quality and improve student achievement. Recent trends in literature view teacher learning as a lifelong process that starts with

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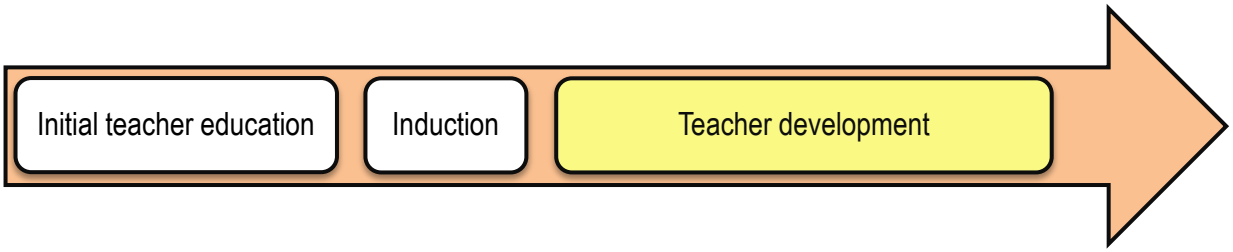
initial teacher education, followed by induction and then with continuing teacher development (Feiman-Nemser, 2001; Earley & Bubb, 2004). The last-mentioned stage is the focus of this study (see Figure 3.1).

Figure 3.1: Teacher development continuum



Teacher development is a learning process that is undertaken by teachers after their initial preparation (Bell & Gilbert, 1996). Several terms are used to describe this learning process. In this study, the term teacher development was used interchangeably with other terms such as teacher professional development, continuing professional learning, continuing professional development, and professional development to describe the learning process that occurs after teachers have attended initial teacher education and participated in some form of induction programme.

An analysis of the literature reveals a number of nuances and slight differences for defining teacher development. The professional development of teachers is generally viewed as a process designed to transform teachers' knowledge, skills and attitudes in order to improve the learning of students (Bell & Gilbert, 1996; Guskey, 2000; Feiman-Nemser, 2001; Garet, Porte, Desimone, Birman, & Yoon, 2001). Day (1999) opined that the purpose of teacher development should go beyond focussing on the acquisition of knowledge and skills. He provided the following simple but useful conceptual definition for describing teacher development.

> […] all natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school and which contribute, through these, to the quality of education in the classroom. It is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents to the moral purpose of teaching and by which they acquire and develop critically the knowledge, skills and emotional intelligence essential to good professional thinking, planning and practice with children, young people and colleagues through each phase of their teaching lives *(Day, 1999, p. 4)*.

This definition describes five important elements regarding teacher development. Firstly, teacher development is a comprehensive activity that encompasses both individual teachers' aspirations and the organisational interest (Earley & Bubb, 2004). Secondly, teachers are change agents, which imply that the learning process should assist teachers to negotiate and adapt to change. Thirdly, teachers need to be critical – a skill that is needed by teachers to question ideas and select appropriate teaching strategies to achieve an intended outcome. Fourthly, collaboration is important as the teachers interact with colleagues to work and share opinions aimed at improving classroom practices. Finally, teacher development is regarded as an on-going

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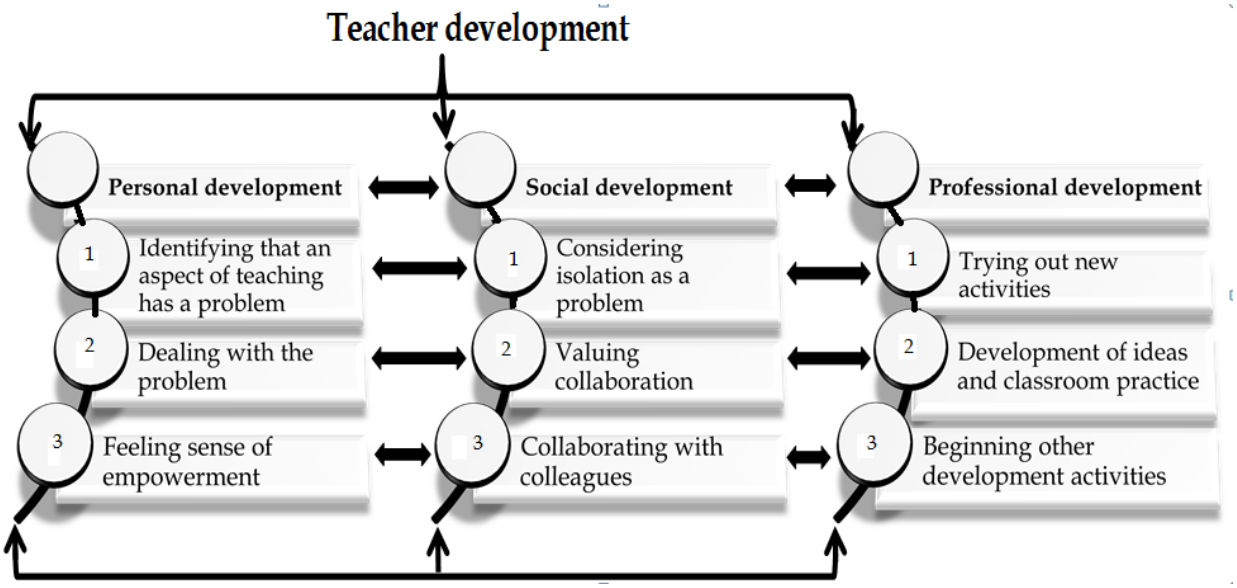
process that starts with initial teacher education, followed by induction including development opportunities that take place throughout the teachers' career and concluding with retirement (Earley & Bubb, 2004).

In the following section, Section 3.2.2, the definition of teacher development that guides this study is provided.

3.2.2 Teacher development dimensions

Bell and Gilbert (1996) consider teacher development to be a holistic learning process that involves simultaneous changes in personal, social and professional dimensions. Accordingly, these dimensions interact with and reinforce one another to create a capable teacher. Hence, teacher development cannot take place in one dimension alone independently from other dimensions, unless the other dimensions develop in par. If any one of these dimensions is given insufficient attention, the effectiveness of teacher development is threatened (Bell & Gilbert, 1996). The three dimensions and their three interrelated phases indicated in Figure 3.2 guide this study in order to determine the effect of lesson study on teachers' learning and classroom practice.

Figure 3.2: Stages of teacher development



Source: Bell and Gilbert (1996)

Firstly, in the personal development dimension, teachers take responsibility for their own learning by identifying their strengths and weakness. Accordingly, development in this dimension is influenced by teachers' personal interest, motivation and commitment to a teacher development programme. Figure 3.2 indicates the three interrelated phases of personal development. During the early phase of personal development, teachers start to become aware that they are experiencing problems in some aspects of their teaching. Then, they start to look for ways to address the problems. The next step involves dealing with and solving the problems in the teaching-learning process. In the last phase of personal development, teachers sense that they are empowered and feel that they can make a difference in the teaching-learning process. In a nutshell, personal development deals with teachers' learning that progresses from identifying aspects of teaching that are

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problematic and dealing with the problem, to developing sense of empowerment (Bell & Gilbert, 1996). Reddy (2009) argues that development in the personal dimension is important because it contributes positively towards teachers' social and professional growth.

Secondly, social development involves the ability of teachers to work with and contribute and/or share ideas with colleagues (Bell & Gilbert, 1996). During the early phase of social development, teachers realise that they are isolated from their colleagues and acknowledge that isolation is a problem. Realising the problem helps them to find a solution to the problem by discussing it and by seeking support from colleagues. As a result, they start to value collaborative ways of working with colleagues and become ready to share their experiences and receive suggestions from colleagues. Towards the end of social development, teachers' determination and confidence towards collaboration increases. Hence, they initiate activities and relationships with their colleagues, thereby fostering collaborative ways of working (Bell & Gilbert, 1996). Thus, the social dimension progresses from recognising isolation as a problem, to valuing collaboration and then to initiating collaborative ways of working with colleagues (Bell & Gilbert, 1996).

Finally, Bell and Gilbert (1996) describe professional development as the process of learning new teaching-learning activities for use in the classroom. The learning of these new teaching-learning activities enables teachers to identify aspects of their teaching that need improvement and to show willingness to change them. As a result, they abandon the old ways and try to practise the new teaching activities in their classrooms. While trying the new initiatives in their classroom, they transform their concepts and beliefs about teaching science in new ways. They also start to feel confident and become willing to participate in other development activities. They start to look for other development activities beyond the programmes in which they were involved when they see their success in their earlier practices. In a nutshell, this professional development dimension progresses from trying out new activities and bringing about changes in classroom practice, to initiating new development activities (Bell & Gilbert, 1996).

These three dimensions of teacher development are appropriate for this study. They will be used as indicators to determine whether any changes have occurred in participating teachers' learning and classroom practice (see Sections 5.5, 5.6 and 5.7).

The importance of teacher development is discussed in Section 3.2.3.

3.2.3 Why is teacher development important?

The preceding section provided operational definitions of teacher development that guide this study. This Section 3.2.3 discusses the importance of teacher development. There are plethora of literature that document on the importance of teacher development as a means of improving quality of education (Birman, Desimone, Porter, & Garet, 2000; Garet et al., 2001; Sparks, 2002). Since teachers are key role players in the

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implementation of reforms (Fullan, 2007), teacher development has become a necessary component in all educational reform efforts because teachers are required to keep abreast with the advances occurring in education and meet the ever-increasing demands. Many countries have been involved in school improvement efforts by mainly focussing on teacher education, both on the initial and continuing professional development (Borko, Jacobs, & Koellner, 2010). To highlight the emphasis given to teacher development, Guskey (1994) argues, "Never before in the history of education has there been greater recognition of the importance of professional development" (p. 42). He further stresses on the importance of professional development as follows:

> […] notable improvements in education almost never take place in the absence of professional development. At the core of each and every successful educational improvement effort is a thoughtfully conceived, well-designed and well-supported professional development component. Hence, although professional development by itself may be insufficient to bring about significant improvements in education, it is an absolutely necessary ingredient in all educational improvement efforts. *(Guskey, 2000, p. 4)*

Likewise, Feiman-Nemser (2001, pp. 1013-1014) highlights the importance of teacher development in educational improvement efforts as follows: "if we want schools to produce more powerful learning on the part of students, we have to offer more powerful learning opportunities to teachers". This is because students' learning is determined by what and how teachers teach, which in turn is dependent on their knowledge, skills and attitudes (Feiman-Nemser, 2001, pp. 1013-1014).

The above paragraphs highlight the importance of teacher development and teachers as the main stakeholders in bringing about the needed changes. They emphasise on the need of supporting teachers to improve their classroom practices and bring the required changes in students' achievements.

The next Section 3.2.4 compares the traditional and reform approaches of teacher development.

3.2.4 The traditional versus reform-based teacher development

Teacher development strategies have been categorised into traditional and reform approaches. Traditionally, teacher development was often arranged in the form of short workshops, seminars and conferences (Little, 1993; Feiman-Nemser, 2001), where teachers are expected to learn clearly defined body of knowledge and skills through well-structured process provided by outside experts. These approaches are usually conducted outside the schools in the form of single sessions, with limited time for teachers to study the material. Influenced by positivistic epistemology and behaviouristic psychology, the traditional approaches give more emphasis to acquisition of knowledge and skills (Carl, 2008) whereby outside experts provide reports on best practices (Feiman-Nemser, 2001). Such approaches provide little attention to teachers' voices by limiting them to mere "recipients" of information (Carl, 2005, p. 223). In most cases, the sessions are neither linked to real problems in classroom nor provide opportunities for teachers to collaborate with one another (Feiman-Nemser,

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2001; Loucks-Horsley, et al., 2010). Since these approaches lack appropriate support and follow-up strategies (Guskey, 1994; Lieberman, 1995; Feiman-Nemser, 2001; Fullan, 2007; Guskey & Yoon, 2009; Loucks-Horsley, et al., 2010), teachers fail to connect the newly gained ideas to their contexts and thus unable to produce changes in their classroom practices (Kennedy, 2005; Loucks-Horsley, et al., 2010).

Since the traditional approaches have become ineffective and inadequate in offering teachers the required learning opportunities, time and content to improve their knowledge and skills, teacher development approaches have recently shifted towards reform approaches with constructivist underpinning. Constructivists considered teachers as learners, who actively engage in construction of their knowledge as opposed to passive absorption of information (Little, 1993; Carl, 2008; Loucks-Horsley, et al., 2010). There is direct relationship between what teachers learn in teacher development programmes and the way they teach in classrooms (Lieberman, 1995; Darling-Hammond, 2006; Loucks-Horsley, et al., 2010). The underlying assumption is that when teachers participate in professional development programmes that promote active learning and collaboration, they would be able to plan similar engaging experience for their students (Little, 1993).

There are six components that determine the effectiveness of teacher professional development, namely duration, form, participation, content, active learning and coherence (Garet, et al., 2001). Programmes that are arranged as a reform type rather than traditional ones, which are extended over sufficient duration, promote active learning, allow collective participation, focus on content and coherent with teachers' and state's needs are found to be more effective than the traditional formats. Lesson study, mentoring, coaching and study groups belong to the reform category (Loucks-Horsley, et al., 2010). Lesson study approach is a good choice from these professional development strategies. Teachers participating in lesson study work for extended period as a team to plan, to teach and to examine a lesson in order to find a solution for their pedagogical problem. As teachers participate in lesson study cycles, they actively discuss and share ideas on how best to engage students in learning. These active learning and collaborative opportunities (Little, 1993; Garet, et al., 2001; Darling-Hammond & Richardson, 2009; Borko, et al., 2010) result in teacher growth and empowerment (Bell & Gilbert, 1996; Carl, 2009).

Table 3.1 below distinguishes traditional from reform approaches based on six components, namely duration, form, participation, content, active learning and coherence (Garet, et al., 2001). The ways these components are emphasised determine the effectiveness of teacher development arrangement.

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Table 3.1: Characteristics of traditional and reform-based teacher development

Feature	Components	Traditional	Reform
Structural	Duration	Conducted in the form of short workshops, seminars and conferences often arranged in single session.	Arranged for longer duration in the form of mentoring, coaching, lesson study and study groups.
	Form	Focus on the transmission of knowledge to passive recipients by external experts. Usually arranged outside schools.	Oriented towards construction of knowledge by active teachers and relies on internal expertise. Usually arranged in schools.
	Collective participation	Directed towards individual teachers as the primary recipients.	Directed towards the formation of a professional learning community.
Core	Content	Offer fragmented and unrelated topics in piecemeal.	Aimed at improving and deepening teachers' content knowledge that is relevant to day-to-day practice.
	Active learning	Focus on passive learning.	Encourage teachers to become more engaged in discussions, planning, practice, observing and feedback.
	Coherence	Professional development lacks relevance to the problems that teachers experience.	Professional development experience is part of the integrated programme of teacher learning.

Source: Garet, et al. (2001)

3.2.5 What makes teacher development effective?

In Section 3.2.4 the distinction between the traditional and reform approaches of teacher development was discussed. In this section the characteristics that might make the reform-based teacher development strategies effective are described. Wei, Andree and Darling-Hammond (2009a) indicate that the students of some countries excelled on the international scales because the authorities were able to arrange sustainable and extensive teacher development practices that go well beyond the traditional one-shot sessions. One may question what characterises such professional development arrangements. So far, there is no conclusive list of characteristics that describes effectiveness of teacher development. As the knowledge base on teacher development is expanding, the characteristics that affect the effectiveness of teacher development are becoming numerous and multifaceted. In their literature review on teacher development, Garet et al. (2001) identify two important factors that affect the quality of teacher development, namely structural and core features. The structural features are those that provide context for professional development. They focus on extending professional learning over a long duration, organising it as a reform activity as opposed to the traditional arrangement and allowing for the collective participation of teachers in their professional learning. On the other hand, the core features are those that describe the process of a professional development experience. They focus on teachers' content knowledge, allow active learning as opposed to a scenario that treats teachers as passive recipients and promote continued communication among teachers. Their

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investigation revealed that the structural features (duration, form and participation) influence the core features (content, active learning and coherence). It was found that when these six features occur in a continued manner, they transform teachers' knowledge, skills and attitudes and beliefs in order to improve and bring about changes in classroom practices (Garet, et al., 2001) (Table 3.1).

Through the analysis of 13 prominent educational research works, Guskey (2003) also identifies 21 characteristics that determine the effectiveness of teacher development. He ranked these characteristics based on the frequency of their occurrence. The top 13 characteristics are presented in Table 3.2. Depending on context, some of these characteristics are more important than others. For the purpose of this study, eight characteristics, namely focusing on pedagogical content knowledge, providing sufficient time, providing structures for collaboration, being based on teachers' identified needs, focusing on student learning, focusing on individual and school improvement, establishing an organisational support and being job-embedded are selected from the list. Apart from complying with the reform approach, these characteristics have been selected because they are found to be consistent with the principles of lesson study (Stigler & Hiebert, 1999; Murata, 2011).

Table 3.2: Characteristics of effective teacher development for use in this study

	Guskey's (2003) list	Characteristics identified for this study
1.	Enhancing teachers' content and pedagogical knowledge	Focusing on pedagogical content knowledge
2.	Providing sufficient time and resources	Providing sufficient time
3.	Promoting collegiality and collaboration	Providing structures for collaboration
4.	Including procedures for evaluation (discussed in Section 3.5.3)	
5.	Aligning with other reform initiatives	
6.	Modelling high-quality instruction	
7.	Being school or site-based	
8.	Building leadership capacity	
9.	Basing teacher development on teachers' identified needs	Basing teacher development on teachers' identified needs
10.	Being driven by analysis of student learning data	Focusing on student learning
11.	Focusing on individual and organisational improvement	Focusing on individual and school improvement
12.	Including follow up and support	Establishing an organisational support
13.	Being ongoing and job embedded	Being job-embedded

Since most of the characteristics overlap with one another, their interconnectedness is shown in Figure 3.3.

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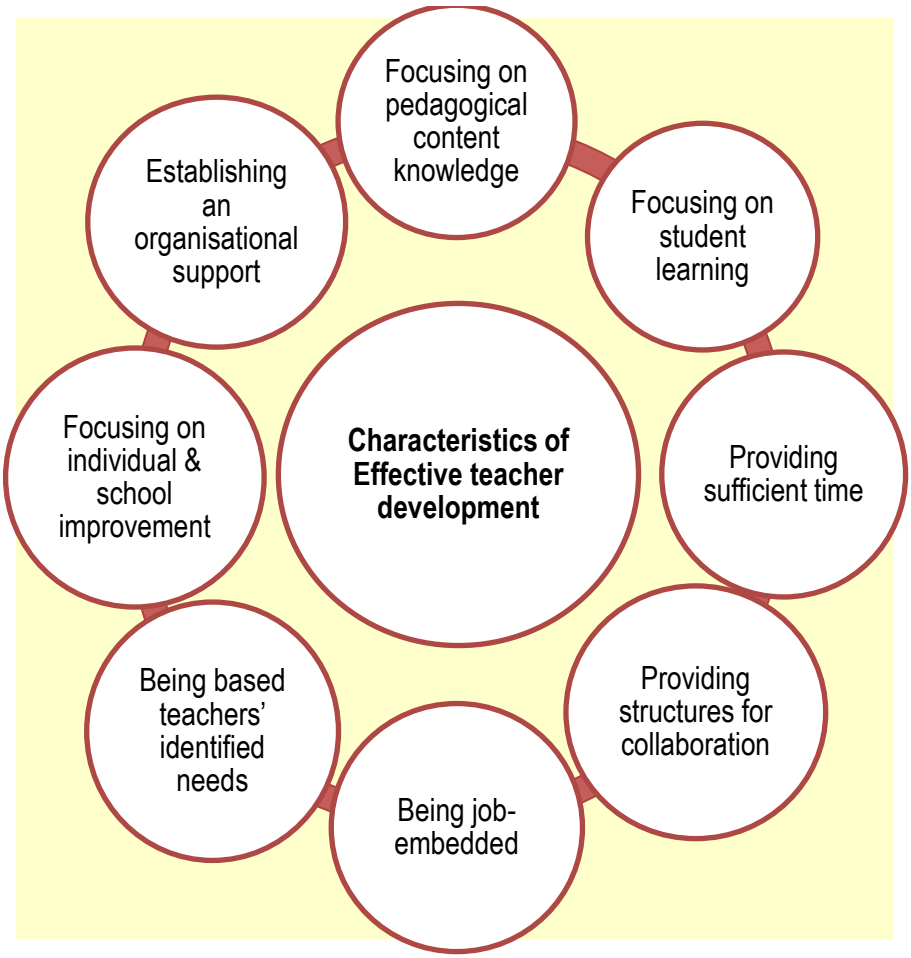
Figure 3.3: Characteristics of effective teacher development



These eight characteristics will be discussed in Sections 3.2.5.1, 3.2.5.2, 3.2.5.3, 3.2.5.4, 3.2.5.5, 3.2.5.6, 3.2.5.7 and 3.2.5.8.

3.2.5.1 Focusing on pedagogical content knowledge

Any profession has its own specialised knowledge that differentiates it from other professions. Teaching as a profession has its own specialised knowledge. Such knowledge is pedagogical content knowledge, which is a combination of content knowledge – what to teach and pedagogical knowledge – how to teach (Shulman, 1986). To be effective, teachers need this specialised knowledge. It has been reported that teachers improve their knowledge, skills and practice when they undergo professional development that focuses on pedagogical content knowledge (Garet, et al., 2001). Traditionally professional development programmes have provided teachers with pedagogical knowledge in isolation from content knowledge. To enable teachers to teach effectively, teacher development programmes should be designed in such a way that they deepen the pedagogical content knowledge, because knowing what to teach is as important as how to teach it (Shulman, 1986; Sparks, 2002). The teacher development programmes that enable teachers to increase their pedagogical content knowledge play an important role in improving their classroom practices (Borko, et al., 2010).

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3.2.5.2 Providing sufficient time

Garet et al. (2001) notes the necessity of sustaining teacher development over an extended period of time. Teacher development opportunities that provide teachers sufficient time also allow them to conduct in-depth discussions, broaden their pedagogical content knowledge, study students' work and try new practices of teaching (Guskey & Yoon, 2009), as well as investigate and reflect on their actions (Loucks-Horsley, et al., 2010). The traditional approaches have been criticised for not providing enough time for teachers to actively engage in the professional learning (Lieberman, 1995). On the other hand, the reform-type of teacher development approaches provide considerable time that is reasonably spent on either content or pedagogy or both and help teachers to internalise the newly learned concepts (Guskey, 2000; Garet, et al., 2001). Supovitz and Turner (2000) and Wei, et al. (2009b) suggest that teacher development activities that are sustained for more than two weeks could be effective in improving classroom practice and classroom culture. Teachers, who spent more time on professional development, were found to implement and practice the teaching strategies that they learned during training more frequently. Intensive teacher development programmes that are extended over a long period of time provide teachers sufficient time to bring new knowledge to planning and instruction; to try out ideas in the classroom; and to reflect on the results of their experiments (Wei, et al., 2009b). Time could be provided to teachers in several ways such as extending school days, infusing flexibility in the teachers' timetable and assigning some days for professional development activities (Raywid, 1993; Guskey & Yoon, 2009). However, Guskey and Yoon (2009) and Loucks-Horsley et al. (2010) opine that finding more time does not guarantee effectiveness but that using time wisely and creatively is important in order to produce desired outcomes. The implication of finding time for this study implies that the researcher has to work towards creating time for the teachers participating in lesson study through communicating with the school leadership and the participants.

3.2.5.3 Providing structures for collaboration

Effective teacher development provides suitable structures for teachers to work together. Garet et al. (2001) provide four reasons to confirm the need for creating structures for collaboration in the teacher development process. Firstly, teachers who work together and collaborate with one another discuss concepts, skills and problems that may arise during their professional development experiences. Secondly, creating collaborative structures contributes to the development of collective professional cultures and enables teachers in the same school or teachers teaching the same grade or subject to develop shared understanding of instructional objectives, strategies, problems and solutions. Thirdly, creating collaborative structures enables teachers who share the same students to discuss students' achievement across classes and grade levels. Finally, collaboration helps a group of teachers to sustain changes in practice over time, as new teachers join the teaching profession. It has been further indicated that little research is available on the impact of collaboration on teacher development, but there is some evidence that it can be effective in improving classroom practice

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(Garet, et al., 2001). Effective teacher development cannot materialise if teachers continue to be isolated from one another (Loucks-Horsley & Stiles, 2001). Teachers, especially those who usually work in isolation, are in favour of strategies that allow them to work collectively because in the process, they learn from one another and improve their classroom practices (Garet, et al., 2001). For this reason lesson study will be used in this study as a strategy to bring teachers together and minimise their isolation.

3.2.5.4 Being job-embedded

As indicated in Section 3.2.4, traditional approaches are arranged outside schools in the form of workshops. In most cases, the activities presented in such workshops are not relevant to the problems that teachers experience in the classroom. It is up to the teachers to link the knowledge and skills gained during the workshop to their classroom situations. However, in the reform approaches the activities are related to the day-to-day activities of teachers. Therefore, relating professional development to teachers' real classroom situation is an important feature of effective teacher development (Day & Sachs, 2004). Guskey (2000) asserts that effective teacher development is one that is on-going and embedded in the day-to-day practice of teachers. He adds that changing teachers' classroom practices should be a key goal of professional development, along with changing their attitudes and beliefs and students' learning achievements. This implies that if professional development does not address teachers' practices during classroom teaching, then changes in teachers' attitudes and beliefs, as well as students' learning achievements will not materialise. When teacher development opportunities are organised inside schools, they allow teachers to match the activities to their needs and address their problems immediately (Bell, 1991). Teacher development opportunities arranged inside schools were found to be more relevant to teachers than when they are arranged outside schools. Unlike in the one-shot workshops, which are provided by external experts, the resource persons in job-embedded arrangements are internally located (Wei, et al., 2009b). However, Lewin and Stuart (2003) opine that arranging job-embedded teacher development is more difficult in low-income countries, because of the lack of adequate schools to provide proper training environments, the lack of qualified teachers to mentor unqualified teachers and the lack of sufficient teaching and learning resources. This implies that this study will be arranged in such a way that it contains a component of classroom practice that allows the participating teachers to practise what they have learned in their schools over an extended period of times.

3.2.5.5 Basing teacher development on teachers' identified needs

Effective teacher development acknowledges teachers' personal and professional needs. Teachers consider professional development as relevant when it directly meets their requirements and concerns (Guskey, 1994). In the traditional approach, participants are provided with the same information based on the concept one-size-fits-all (Loucks-Horsley, et al., 2010). Such arrangements ignore the fact that teachers have different experiences, teach different subjects and require different information. It has been reported that most teachers

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find the conventional teacher development programmes boring and irrelevant because the designers pay little attention to teachers' needs in relation to the content they teach and the strategies they use (Sparks, 2002). Loucks-Horsley et al. (2010) highlight that teacher development designers should consider the diverse learning needs and experiences of teachers while designing professional development programmes for teachers. Moreover, the expertise of experienced teachers could be utilised by assigning them certain roles to play (Loucks-Horsley, et al., 2010). This implies that in this study the participating teachers will identify topics that either they themselves or their students find difficult and find solutions collaboratively through participating in lesson study. During this process the more experienced teachers will guide and coach the less experienced teachers.

3.2.5.6 Focusing on individual and school improvement

There are two categories of interest within teacher development. The first category is concerned with the needs of the individual teacher and the second is concerned with the needs of the school. Several researchers in the literature describe teacher development as both individual and organisational improvement (Bell, 1991; Craft, 1996; Guskey, 2000; Earley & Bubb, 2004). As a result of the intimate link that exists between these two needs, a teacher cannot improve if the organisation is in a poor condition. At the same time the healthy operation of the school depends on the individual teachers' efforts and contributions towards the development of the school (Bell, 1991; Craft, 1996). Guskey (1994) while acknowledging the interdependence of the individual teacher and the school proposes that professional development approaches should balance individual and organisational needs in order to bring about the desired changes. This implies that the current study will be designed in such a way that it encourages the formation of professional learning communities where the participating teachers work with the leadership to satisfy both their needs and the school's needs.

3.2.5.7 Establishing organisational support

Teacher development advocates have indicated the importance of support and follow-up activities to sustain professional development. Most of the time the traditional approaches that involve workshops of the one-shot variety are criticised for being a waste of money and time, because they offer limited support and follow-up to teachers, once the teachers return to their schools (Guskey & Yoon, 2009). On the other hand, the reform approaches extend their support and follow-up in order to promote the transfer of the newly acquired concepts and skills into the classrooms (Guskey, 1994; Darling-Hammond & Richardson, 2009). Support and follow-up can be offered in diverse ways, including through involving school leadership. School leaders are important role players in the implementation of teacher development programmes. They should show an active interest in the innovation, motivating teachers, and providing moral and material support to teachers (Fullan, 2007). In this study, obtaining support from the school leadership was considered to be important. Hence, the heads of science departments, school directors and pedagogic heads were invited to attend the workshops. Joyce and

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Showers (1988) suggest that support and follow-up should take the form of coaching, where the participating teachers receive on job assistance from either heads of departments, school directors or other professionals. The implication for the current study is that the researcher will consider allowing the participation of heads of departments to assist in the coaching of the less experienced teachers and including the school leaders in order to gain their support. The researcher will take the role of a knowledgeable-other to guide the teachers through the process of lesson study.

3.2.5.8 Focusing on student learning

Conceptions about students' learning have changed. Students are no longer seen as passively receiving and memorising information but as actively processing information. Students often come to class with prior knowledge about the topic at hand, at times with contrasting perceptions (Loucks-Horsley, et al., 2010). Effective teacher development places the learning needs of students at its core and considers the prior knowledge of students as its major input into the design (Loucks-Horsley, et al., 2010). In order to help students build their own knowledge, teachers are not expected to continue with their conventional role of imparting knowledge. This implies that the participating teachers will be encouraged to identify topics that are of particular interest for the students and plan engaging activities for their students that satisfy the reform agenda of the MoE.

In summary, there is no single characteristic that can on its own bring about changes in teachers' learning and classroom practice. Thus, any teacher development programme that is designed for teachers requires that there be harmony between the eight characteristics discussed above. However, insights from literature on teacher development highlight that effective teacher development equips teachers with pedagogical approaches that promote students' learning in a constructivist way. This implies that the current teacher development programme will be organised to equip teachers to plan and teach hands-on learning activities that are in line with the Eritrean reform initiative.

3.2.6 Summary

After identifying the definitions of teacher development that guide this study, the authors of the literature reviewed in Section 3.2 overwhelmingly suggest that an effective professional development programme should focus on several qualities including but not limited to: providing pedagogical content knowledge, providing sufficient time, providing structures for collaboration, focusing on teachers' identified needs, focusing on individual and school improvement, being job-embedded, creating organisational support and ultimately focusing on student learning. The quality of teacher development organised for teachers promises better students' learning which in turn determines the overall quality of education. If we want to improve quality of education, then we must be able to offer more learning opportunities for teachers than have traditionally been available (Darling-Hammond & Richardson, 2009). One of the reasons why teacher development programmes

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usually do not bring about the intended improvements in teachers' learning and changes in classroom practice is the approaches used during the programmes. In traditional approaches "teachers are regarded as mere recipients [of information] that is developed by specialists elsewhere" (Carl, 2005, p. 223). It appears that such approaches have been widely used in continuing professional development because they are less demanding and more economical. However, it appears that such approaches are unsuccessful in bringing about changes at classroom level. There is strong support in the literature reviewed for a shift from traditional teacher development approaches to reform approaches that allow active participation of teachers and support teachers in solving problems they face in their classrooms. Mentoring, coaching, lesson study and study groups are some of such approaches that have a positive impact on teachers' learning and classroom practices. Lesson study was selected for this study because it complies with most of the characteristics of effective professional development programmes (see also Section 3.4.1.1).

In Section 3.3 the role of teacher collaboration in reducing isolation is discussed.

3.3 TEACHER COLLABORATION

In this section there is a review of the following trends in teacher collaboration: teaching as culture of isolation (Section 3.3.1) and collaboration as a way out of isolation (Section 3.3.2).

3.3.1 Teaching as culture of isolation

There is much evidence to show that teacher isolation is a common phenomenon worldwide (Lortie, 1975; Flinders, 1988; Shulman & Shulman, 2004; Lieberman & Pointer Mace, 2008). In a sociological study, Lortie as early as in 1975 concludes that sentiments of individualism, conservatism and presentism limit teachers from changing their teaching practice. He refers to individualism as a situation where teachers interact less frequently and work alone in compartmentalised cellular structures of schools. Conservatism refers to the ways in which teachers mainly imitate the cultures that their teachers used when they were students. Conservatism makes teachers resist change by making them less open to others' ideas and avoid trying new methods of teaching. Finally, presentism refers to a situation where teachers focus on short-term issues rather than on the holistic development of the school. As a result, presentism limits interaction, collaboration and collegiality. Presentism promotes individualism and conservatism because teachers know which practice provides them with immediate rewards (Lortie, 1975).

There are several possible reasons why teachers choose to work in isolation. Firstly, they view their classrooms as their territories which are not a subject for collective discussion or analysis. Secondly, they lack structures in their schools that support collaboration (DuFour, 2011). Thirdly, they think teaching is a profession that requires "little specialized knowledge" and hence they think that there is no reason for them to

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work in groups (Burney, 2004, p. 527). Finally, isolation offers them privacy and protection from outside interference and criticisms (Hargreaves, 1994). Although isolation prevents possible criticisms from outsiders, by restricting the opportunity of getting support, observation and constructive feedback (Hargreaves, 1994; Day & Sachs, 2004), as well as by inhibiting teachers from learning from one another (Lortie, 1975) it prevents teachers from improving classroom practice (Hargreaves, 1994; Day & Sachs, 2004).

Within the context of Eritrean schools, isolation is a widespread phenomenon. Teachers mostly plan and teach in isolation behind closed classroom doors with little or no interaction with their colleagues, a culture that restricts them from sharing the knowledge and experiences that they have accumulated. It is argued that in Eritrean schools isolation is preventing teachers from developing professionally as there are no structures in the schools that support teachers and make it possible for them to collaborate and observe one another. Beyond a mere exchange of information and ideas, teachers rarely participate in professional collaborative activities that enhance student learning. It is hoped that using lesson study as a teacher development strategy will minimise teacher isolation in Eritrea by creating a platform for teachers to come together to collaborate, work together, talk to one another, share ideas and observe one another.

3.3.2 Collaboration - a way out of isolation

In the past few decades, much has been written about teacher collaboration. There are several studies that have documented the benefits of collaboration. Smith and Scott (1990), for example, indicate that collaboration creates a suitable working environment for teachers in addition to enhancing mutual respect and harmony among teachers and administrators. Borko (2004) suggests that professional development initiatives that extensively use teacher collaboration are successful in supporting teacher learning, because feedbacks and new ideas emanate to a large extent from dialogues and interactions with other people (Kwakman, 2003). Collaboration also enhances confidence, teacher reflection, teachers' effectiveness, teachers' learning and changes in classroom practice (Hargreaves, 1994). Furthermore, collaboration strengthens shared beliefs, and personal, professional and social development of teachers (Bell & Gilbert, 1996). However, meaningful collaboration is more than a group of teachers sitting together. Little (1990) states that collaboration does not automatically lead to teacher's learning. It is the degree of interdependence of teachers that determines the outcome of collaboration. The more teachers are dependent on each other, the more they learn from one another (Little, 1990; Hargreaves, 1994).

Little (1990) identifies four kinds of collegial relations categorised along a continuum, from superficial relations to relations requiring deep interaction. These relationships are storytelling, help, sharing and joint work. In storytelling, team members are nearly independent. Their relations are usually limited to the sharing of quick and incomplete stories about teaching. In the help type of relationship, teachers assist one another only when they are asked to do so. Deep relationships are seldom established and teachers provide assistance to one

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another on a one-to-one basis mainly by protecting their borders and avoiding interference in other teacher's work. In the sharing type of interaction, teachers frequently share ideas and materials. In this relationship, teachers expose their ideas and intentions to colleagues but undertake little or no actual joint work. Finally, joint work is the highest form of collegiality where teachers engage in joint professional dialogue to solve their pedagogical problems, show interdependence to one another, and share responsibility and accountability. This relationship leads to the greatest teachers' learning resulting from continuous collegial interaction (Little, 1990). On the other hand, Hargreaves (1994) states that not all forms of collaboration are successful in minimising teacher isolation. He makes a distinction between three forms of collaboration in schools, namely balkanised cultures, contrived collegiality and collaborative collegiality. According to him only the last-mentioned form of collaboration reduces teacher isolation. In schools with a balkanised culture, teachers attach their loyalties to a particular group of colleagues with whom they work and socialise most closely. Such culture creates non-cohesive groups. Hargreaves (1994) describes contrived collegiality as imposed on teachers, compulsory and administratively regulated. Such culture leads to superficial interaction of teachers and hence does not produce the desired outcomes (Hargreaves, 1994). It is argued that teachers do not start collaborating by being instructed to do so. Collaboration is a culture that has to be cultivated by providing teachers with the necessary support, time and resources (DuFour, 2011). Finally, Hargreaves (1994) describes collaborative collegiality as a voluntary relationship initiated by teachers to improve their classroom practices. It is such a type of collaboration that minimises isolation and brings changes in teachers' learning and classroom practices rather than the superficial and contrived arrangements (Little, 1990; Hargreaves, 1994).

Although the collaborative collegiality discussed above promotes sharing and joint work, it is infrequently practised by teachers in most schools (Little, 1990). As indicated by Lortie (1975), teachers tend to be driven by school cultures which in most cases are dominated by isolation. In this study, lesson study will be used as an appropriate teacher development strategy and it is assumed to minimise teacher isolation by creating structures for collaboration as observed in the literature (Stigler & Hiebert, 1999; Coe, 2010; Coe, et al., 2010; Posthuma, 2012; Cajkler, et al., 2014). Thus, participating teachers are expected to voluntarily participate in collaborative planning, teaching, observing and debriefing sessions that will impact on their learning and classroom practices.

3.3.3 Summary

The literature reviewed in Section 3.3 indicates that there are no structures and cultures that support teacher collaboration in Eritrea. Teachers in Eritrea work in isolation. They rarely participate in professional collaborative activities that enhance teacher learning and classroom practice and. Each teacher struggle alone towards simultaneously fulfilling the requirements of the reform and growing professionally. In the light of this

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problem and the need for an effective teacher development opportunity, the researcher intends to use lesson study as a strategy in order to create a platform for teachers to come together to collaborate and solve their pedagogical problems.

In Section 3.4 lesson study as a teacher development strategy aimed at bringing teachers together to collaborate in order to learn from one another and change their classroom practices, is conceptualised.

3.4 LESSON STUDY AS A TEACHER DEVELOPMENT STRATEGY

The goal with this research is to use lesson study as a teacher development strategy in selected middle schools of Eritrea and then to investigate its effects on teachers' learning and classroom practice. For the purpose of this study, lesson study was chosen as a strategy to bring teachers together to collaborate, share their ideas and work together. Lesson study was chosen as an appropriate teacher development strategy for middle school science teachers in Eritrea because it promotes teacher collaboration and minimises teacher isolation (Stigler & Hiebert, 1999).

In the following sections the concept of lesson study is defined (Section 3.4.1), the steps of lesson study are described (Section 3.4.2), experience of lesson study in other countries are examined (Section 3.4.3), the benefits associated with lesson study are mentioned (Section 3.4.4) and challenges associated with lesson study are highlighted (Section 3.4.5).

3.4.1 What is lesson study?

Lesson study began in Japan as a teacher development strategy. It is a well-established classroom-based and collaborative form of teacher development activity (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Yoshida, 2002; Lewis, et al., 2009; Murata, 2011) that is used by Japanese teachers to systematically examine their practice in order to become more effective teachers (Fernandez & Chokshi, 2002).

According to Stigler and Hiebert (1999), lesson study is a collaborative approach of planning, teaching, observing, revising and re-teaching of lessons. Although rarely practiced in Japan, re-teaching is commonly used in the U.S. (Lewis, 2002b). In this study, it was included as part of the fifth step. Teachers who experiment with lesson study will identify a topic that they want to teach by conducting series of discussions on several issues such as the alignment of the topic to the curriculum, the strengths and weaknesses in students' learning, and the strengths and weaknesses in their teaching strategies and means of improving them (Watanabe, 2002; Yoshida, 2002). After identifying a topic, teachers collaboratively plan a lesson and when one teacher teaches the jointly planned lesson, others examine and observe it in order to gather relevant data for its improvement. The next step is to reflect on the lesson as a team. Following this discussion, another team member teaches the revised lesson to another group of students if the team members decide to revise

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and improve the lesson. This re-teaching is followed by a second debriefing session (Lewis, 2002b). Lesson study is distinguished from other forms of teacher development strategies because of its focuses on a lesson not on the teacher who taught the lesson, on observing student learning not on the individual teacher's performance and on collective work not on the individual performance of teachers (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, Appel, Leong, Mangan, & Mitchell, 2007). These processes enable teachers to learn from one another and improve classroom practices by observing one another and sharing ideas and experiences with one another (Murata, 2011). Such lessons that are taught during lesson study are research lessons (Lewis, 2002a; 2002b; Chokshi & Fernandez, 2005; Murata, 2011). Research lessons are different from ordinary lessons because they are collaboratively planned, observed, recorded and discussed by a group of teachers who share common objectives (Lewis & Tsuchida, 1998).

In summary, Stigler and Hiebert's (1999) publication inspired many educators to use lesson study. From the time the publication was issued, lesson study has spread substantially and has been experimented with in many countries. There are reports of successes that cannot be ignored. It is believed that if teachers in Eritrea participate in lesson study, they would be able to improve their classroom practices because the collaborative nature of lesson study will allow them to share ideas, observe one another and provide feedback to one another. Thus, the researcher will experiment with lesson study in selected middle schools in order to create a professional development opportunity for science teachers.

The characteristics that make lesson study an effective teacher development strategy are presented in Section 3.4.1.1.

3.4.1.1 What makes lesson study effective?

Several of the features of effective teacher development that were discussed in Section 3.2.5 are consistent with the effectiveness of lesson study. Firstly, lesson study is a collaborative strategy. It provides a platform for teachers to work together and collaborate (Rock & Wilson, 2005; Lewis, Perry, & Murata, 2006). During lesson study, teachers collaboratively plan, teach, observe and reflect on a research lesson. In this process, team members take joint responsibility for the improvement of the research lessons. Problems that emerge during the delivery of the lesson are ascribed to the research lesson that is planned by the team members and not to the teacher who taught the lesson (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007). Thus, lesson study creates a non-threatening situation for teachers to learn to become critical without offending one another (Stigler & Hiebert, 1999). However, teachers do not learn such critical skills overnight. Watanabe (2002) indicates that lesson study is a culture that needs cultivation. Cultivating such a culture of collaboration is demanding and challenging for many teachers including teachers in Eritrea, where isolation is a widespread phenomenon. Such a culture of collaboration can

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only be nurtured through teachers' willingness to participate in extended discussions on aspects of improving their teaching practice and student learning (Rock & Wilson, 2005). Secondly, lesson study is a strategy that puts student thinking and learning at the centre (Stigler & Hiebert, 1999). People have different perspectives about student learning. Teachers are key players in the teaching-learning process, therefore their perspectives about student learning shape the type of instruction they plan (Loucks-Horsley, et al., 2010). Teachers who are influenced by the behaviourist perspective consider students to be empty vessels to be filled with knowledge. Such teachers focus on transmitting knowledge and acquisition of skills. In such situations, telling is taken as teaching while memorising of facts is taken as learning (Loucks-Horsley, et al., 2010). The dominant way of teaching in Eritrea is linked to this perspective (Abdella, 2000; Ghebremariam, 2000; MoE, 2005; Tecle, 2006). On the other hand, the reform approaches are influenced by a constructivist view that acknowledges students' active construction of knowledge through meaningful engagement in the learning process (Loucks-Horsley, et al., 2010). These opposing conceptions about student learning have implications for this study. Lesson study which is underpinned by the constructivist perspective (Rock & Wilson, 2005) will enable the teachers participating in this study to experience a constructivist way of learning themselves so that they will be able to design similar student-centred lessons for their students as indicated in the literature (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Lee, 2008). Thirdly, lesson study is a strategy that produces small and gradual improvements in classroom practices over a long period of time (Stigler & Hiebert, 1999). This is because being a cultural activity, teaching changes over an extended period of time. Teachers do not change their classroom practices overnight. Therefore, lesson study is a suitable strategy to bring about steady and incremental changes in classroom practices over an extended period of time (Lewis, 2002b). Fourthly, lesson study deals with improvement of classroom practice by focussing on a research lesson as a unit to be analysed and improved. The frequent use of observation and reflection in lesson study enables teachers to make meaningful changes in their classroom practices (Stigler & Hiebert, 1999). Finally, lesson study is a reflective process. It provides opportunities for teachers to reflect on their classroom practices and student learning (Murata, 2011). Based on these features, lesson study was deemed appropriate for this study.

To complement the characteristics that make lesson study effective, additional justifications for choosing lesson study are given in Section 3.4.1.2.

3.4.1.2 Justifications for choosing lesson study

Lesson study is a well-established form of continuing professional development strategy extensively used in Japanese elementary schools for decades (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Yoshida, 2002; Lewis, et al., 2009). It would be inappropriate to use lesson study as a strategy to support middle school teachers in Eritrea simply because of its wide use in Japan. However, lesson study was chosen because its characteristics are consistent with the characteristics of effective professional development discussed in

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Section 3.2.5. In addition to these characteristics lesson study was chosen due to its underlying theoretical support.

Firstly, lesson study is underpinned by the theory of social constructivism (Rock & Wilson, 2005), according to which knowledge is socially constructed through the meaningful interaction of individuals with their social and physical world (Vygotsky, 1978). This theory challenges the conventional perspectives that consider teachers as transmitters, students as passive recipients, teaching as a means of passing that information to the students and learning as the memorising of information (Loucks-Horsley, et al., 2010). Influenced by this theory, lesson study allows teachers to plan research lessons collaboratively, observe research lessons in teams, attend post-lesson debriefing meetings, and analyse and reflect on the research lessons (Rock & Wilson, 2005). There is solid support from literature which indicates that lesson study promotes teacher collaboration and minimises teacher isolation (Stigler & Hiebert, 1999).

Secondly, effective teacher development acknowledges teachers as adult learners. Since the concept of learner in adult learning is distinct from in child learning, teaching adults has to be different from teaching children. In child learning, the learner has a dependent personality whereas in adult learning, the learner has an increasingly independent personality. The implication of this is that any professional development programme designed for teachers should be informed by adult learning principles – andragogy (Knowles, 1984). Knowles (1984) noted the following characteristics of adult learners:

- Adults internalise learning when they are intrinsically motivated and when learning opportunities are applicable to the real-life situations.
- Adults enter into learning with rich prior knowledge and experience, a circumstance that may enhance or hinder learning.
- Adults have an intrinsic desire to learn. They learn best through self-discovery with real and simulated experiences.
- They require a sense of trust, respect, honesty and collaboration.
- They enjoy active learning experience. They are not passive recipients of information (Knowles, 1984).

All these criteria of adult learning suggested by Knowles (1984) were found to be relevant to this study. This study ensured voluntary participation of teachers. Teachers were intrinsically motivated to practise lesson study in their classrooms. Some of the teachers who participated in this study had rich experience of teaching to support the lesson study processes.

In summary, lesson study satisfies most of the characteristics of effective professional development and can therefore be considered as an effective professional development strategy. Lesson study provides a platform

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for teachers to interact, collaborate, observe and discuss among one another. Lesson study will provide active learning experience for the participating teachers. Thus, the researcher used lesson study as a viable professional development strategy in order to promote teachers' learning and classroom practice.

In the following section the steps used in lesson study, will be discussed.

3.4.2 Steps of lesson study

Yoshida (2002) divides the activities of lesson study into three categories: identifying a long-term goal or topic, teaching a research lesson to explore the goal, and reflecting on the process. The first activity, identification of a suitable topic, can be established by looking at the gaps between where the students are in their learning experience and what the teachers' expectations are for their students (Lewis, 2002b; Watanabe, 2002; Yoshida, 2002). The second activity is accomplished by a team of teachers coming together to prepare a detailed plan on what to teach and how to teach. When one of the team members teaches the research lesson, others observe it. Lastly, teachers engage in the reflection process. In lesson study, reflections often focus on the research lesson and not on the teacher who taught the lesson (Stigler & Hiebert, 1999; Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007). The three activities suggested by Yoshida (2002) are subdivided in different ways resulting in four to eight steps depending on the context. Coe (2010) and Coe et al. (2010) are of the opinion that the three elements within a lesson study process are more essential than the actual number of steps. Taking this opinion into consideration and based on the work of Lewis (2002b), a five-step cyclical model was developed for this study. This model embeds the three activities suggested by Yoshida (2002). The five-step model of lesson study that guides this study is conceptualised in Figure 1.1. These steps are further discussed in Sections 3.4.2.1, 3.4.2.2, 3.4.2.3, 3.4.2.4 and 3.4.2.5.

3.4.2.1 Form a lesson study team

Forming a lesson study team is the first step of the lesson study process (Lewis, 2002b). According to Stepanek et al. (2007), a team in lesson study is usually formed by three to six teachers who are willing to work collectively to improve their classroom practice. To ensure multiple perspectives, a lesson study team should not consist of fewer than three members. Involving more than six members may pose a problem of finding a time when all the group members are available. Stepanek et al. (2007) indicate that in order for a team to function properly the members should take collective responsibility, communicate openly and honestly, both challenge and support one another, agree on methods for resolving conflict, view mistakes as opportunities and be willing to be held accountable for their actions.

Since lesson study is a very demanding and time-consuming process that requires teachers to regularly attend meetings in order to plan, teach, observe and debrief, teachers should participate in lesson study based on their willingness and motivation. Lesson study becomes fruitless when teachers are mandated to participate.

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Reddy (2001) observed teachers to respond negatively to externally imposed changes that often ignored their experiences. After taking the demands of lesson study into consideration the participants were requested to participate in this study voluntarily on the basis of informed consent.

3.4.2.2 Set a research lesson goal or select a topic

In the second step, teachers select a topic or a goal that enhances their professional development and students' learning. In Japan, teachers often choose topics that are either new in the curriculum, difficult for their students to understand, difficult for them to teach or topics that are of special interest (Lewis, 2002b; Watanabe, 2002; Yoshida, 2002; Cerbin & Kopp, 2006). After recognising the areas, teachers set goals that enable them to move closer to their aspirations for their development or students' learning (Fernandez & Chokshi, 2002). The implication of this step is that the participants in this study are encouraged to identify topics which are either difficult for their students to understand or difficult for them to teach (Lewis, 2002b; Watanabe, 2002; Yoshida, 2002; Cerbin & Kopp, 2006). Teachers are considered as adult learners and thus provided with the opportunity to decide on the areas that interest them.

3.4.2.3 Plan a research lesson

The third step is planning a research lesson collaboratively. In Japan, teachers spend much time studying existing lessons in order to help them guide the planning process (Lewis, 2002b). During this step, in addition to the question of what to teach, teachers consider how to teach the research lessons, what resources to use and how to manage time. They also discuss as well as record anticipated students' thinking, questions, responses and behaviours (Fernandez & Chokshi, 2002; Matthews, Hlas, & Finken, 2009). Matthews, et al. (2009) opine that such joint planning processes enhance teacher collegiality and collaboration.

Figure 3.4: The four-column lesson plan format

Learning activities	Anticipated student responses	Teacher's responses to student reactions	Goal and method of evaluation

Source: Lewis (2002b)

Figure 3.4 indicates the components of the four-column lesson plan used by the teachers to plan the research lessons (see also Appendix-N). Many aspects of this lesson plan format and the planning processes are new to teachers in Eritrea. These new aspects range from the collaborative nature of the process, dedicating many hours to planning, and preparing detailed lesson plan, to anticipating students' thinking and responses.

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3.4.2.4 Teach and observe a research lesson

Teaching and observing the research lesson is the fourth step. During this step, one teacher teaches the research lesson while others observe it. Observation is considered to be the most important skill that teachers need to develop during lesson study (Watanabe, 2002). While observing, teachers either sit or stand at the back of a classroom as one of the team members teaches the research lesson. When the students are assigned activities, the teachers are able to move around without disturbing the natural process of the lesson (Fernandez & Chokshi, 2002). Teachers walk around and collect data on what students are doing (Stigler & Hiebert, 1999). It is argued that observation should focus on student learning or the research lesson rather than on evaluating the teacher who taught the lesson (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007).

In the context of the Eritrean education system, teachers observing one another and engaging in reflective dialogue is not common. Thus it was assumed that teachers who participate in this study would lack observation skills. In such situations, Watanabe (2002) advises creating a non-threatening environment for teachers to come together and build observation skills slowly. Based on Watanabe's (2002) advice, the teachers who participated in this study were provided with an observation format that contained ground rules about how to conduct the observations and what to observe. The teachers were advised to record their observations in the space provided on the observation format (see Appendix-F).

3.4.2.5 Reflect, revise and re-teach a research lesson

The fifth step is to examine the research lesson based on the data gathered during observation, revise it and then re-teach the revised research lesson. This step of lesson study is important for the continuity of lesson study and its success. During this stage, team members must have a great deal of trust and respect for one another, because it is one of the platforms where the teachers share their expertise with one another. To indicate the importance of this step, Watanabe (2002) asserts that a research lesson "must always include a post-lesson discussion in which all participants can reflect critically on the lesson" (Watanabe, 2002, p. 37). This step begins with the teacher who taught the research lesson speaking first by detailing what parts of the lesson worked as planned and what parts require improvement. Based on the data they have collected, the other team members forward their constructive feedback required for improving the research lesson (Stigler & Hiebert, 1999; Joyce & Showers, 2002). The discussions during the reflections should not focus on the teacher who taught the research lesson rather they should focus on the lesson (Stigler & Hiebert, 1999; Yoshida, 2002; Stepanek, et al., 2007; Loucks-Horsley, et al., 2010). Based on the feedback obtained during the debriefing sessions, the team members may decide to revise and improve the lesson. Following this revision, another team member teaches the revised lesson to another group of students (Lewis, 2002b). However, Fernandez and Chokshi (2002) underscore that a research lesson should not be revised and re-taught more

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than once. This is because working on the same lesson repeatedly tends to decrease the learning experiences gained from it (Fernandez & Chokshi, 2002).

In summary, the steps of lesson study indicate that collaboration is an essential activity in the process because teachers study the research lessons as a team to examine the instructional strategies that might lead to the achievement of their goal (Fernandez, 2002). Lesson planning is an important tool in the lesson study process because it details the activities of a lesson, communicates to the observing teachers the thinking of the teachers who planned the lesson and provides guidelines for what to observe. Observing a research lesson is also the core of lesson study because student learning and development cannot be assessed by looking at a lesson plan, or watching videotaped lessons (Lewis, 2002a). Moreover, debriefing is another important component of lesson study because it provides a platform for team members to share the evidence of student learning that they have collected.

In the following section the origin of lesson study as reform-based teacher development approach is discussed and then accounts of its implementation in countries outside Japan are given.

3.4.3 Learning from the experiences of others

Lesson study is a teacher development strategy that was originated and extensively used in Japan for decades (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Yoshida, 2002; Lewis, et al., 2009). It successfully supported elementary school teachers in Japan to transform their teaching towards student-centred learning (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Lee, 2008). It helped them to improve their instruction and understand content knowledge, provided them with the opportunity to learn from each other and build a shared body of professional knowledge (Lewis & Tsuchida, 1998; Rock & Wilson, 2005). In Japan, lesson study enhanced teacher development in seven areas namely, increased acquaintance of teachers with the curriculum, stronger connection of daily practice to long-term goals, improved quality of available lesson plans, increased knowledge of subject matter, increased knowledge of instruction, stronger collegial networks and increased ability to observe students (Lewis, 2002a, 2002b).

Stigler and Hiebert's (1999) publication introduced the idea of lesson study to the world outside Japan. In their book, they strongly recommend that teachers in the United States of American (USA) to use lesson study as their strategy to improve teaching. They argued that lesson study gives Japanese teachers a model of continuous school-based professional development opportunity, which they see as one of the main factors that contributed to the success of classroom practice reforms. They explained the rationale for using lesson study as follows:

> *The premise behind lesson study is simple: If you want to improve teaching, the most effective place to do so is in the context of a classroom lesson. If you start with lessons, the problem of*

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> *how to apply research findings in the classroom disappears. The improvements are devised within the classroom in the first place (Stigler & Hiebert, 1999, p. 111).*

It is because of such recommendations that lesson study was introduced into the USA teacher development sphere. Since its introduction in the late 1990s, lesson study has spread substantially in the USA and has led to several achievements (Fernandez, 2002; Fernandez & Chokshi, 2002; Chokshi & Fernandez, 2004; 2005). Research findings indicate that lesson study benefits teachers in enhancing their subject and pedagogic knowledge, collegial networks, observation skills, lesson planning skills, motivation, effectiveness and ability to connect daily practices to educational goals (Lewis, 2002a; Lewis, Perry, & Hurd, 2004). Puchner and Taylor (2006) also report that lesson study enhances teacher collaboration, professional practices and student learning.

The implementation of lesson study has been reported from studies conducted in several countries. For example, in Australia (Doig, Groves, & Fujii, 2011), Hong Kong (Lee, 2008), Indonesia (Saito, Hawe, & Hadiprawiroc, 2008), Israel (Robinson & Leikin, 2012), Netherlands (Verhoef, Coenders, Pieters, Smaalen, & Tall, 2014), Singapore (Chong & Kong, 2012; Lim, Lee, Saito, & Haron, 2011; Cheng & Yee, 2011/2012; Tan-Chia, Fang, & Ang, 2013), Taiwan (Juang, Liu, & Chan, 2008) and the United Kingdom (Norwich & Ylonen, 2013; Cajkler, Wood, Norton, & Ped, 2014) to name a few. A similar model that has been used in China for many decades has recently been transformed into lesson study and played a key role in supporting Chinese teachers in the improvement of their practice (Chen & Yang, 2013). The studies carried out in these countries report that the approaches were a success.

In the African context, the researcher could ascertain through investigation that lesson study has been experimented with in South Africa. According to Ono & Ferreira (2010) lesson study was introduced in Mpumalanga Province of South Africa as part of the Mpumalanga Secondary Science Initiative. The purpose of this initiative was to establish a school-based in-service programme in order to improve the quality of teaching in mathematics and science in the province by enhancing teachers' subject matter knowledge and pedagogic skills. Selected teachers from this province received training on lesson study in Japan in 2004 and 2005. Upon their return, these teachers were expected to train other teachers using the cascade approach. The Japanese assumed an expert role in the initiative. Although this initiative was not sustained due to curriculum change, it contributed positively towards the establishment and enhancement of cluster systems throughout the province. Moreover, at individual level, some of the teachers who were involved in this initiative have improved their classroom practices (Ono & Ferreira, 2010).

In another study conducted by Coe (2010) and Coe et al. (2010), lesson study was experimented with on a very limited scale in one school in the Western Cape province of South Africa to find out what value a group of primary school teachers would place on the process of lesson study as a model for their own learning and instructional improvement. The findings of this study were the following:

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- lesson study was useful in bridging the gap between policy and classroom practice
- lesson study contributed to bringing teachers out of isolation through meaningful collaboration with their colleagues
- lesson study was embedded within the classroom context which made it effective in bringing about changes
- lesson study enabled teachers to incorporate new instructional strategies into routine classroom practice
- lesson study provided teachers with continuous or ongoing support (Coe, 2010; Coe, et al., 2010)

Moreover, a study conducted in a rural school in the Free State Province of South Africa was used to determine the influence of lesson study on mathematics teachers' pedagogy. It was reported that lesson study emancipated teachers from isolation, provided them with an opportunity to reflect on their teaching cooperatively in a non-threatening environment and empowered them to become change agents (Posthuma, 2012).

In summary, although lesson study has been implemented in different countries including South Africa, it has not been explored as a teacher development strategy in Eritrea. Therefore, the researcher decided to use lesson study as teacher support strategy in selected middle schools of Eritrea and then explore its effect on science teachers' learning and classroom practice free from any predetermined ideas about the outcome.

The benefits of lesson study are discussed in Section 3.4.4.

3.4.4 Benefits of lesson study

Based on the literature reviewed, several benefits may be expected from lesson study. One benefit of lesson study is that it helps teachers to build their knowledge base i.e. improve their pedagogical content knowledge for teaching (Stigler & Hiebert, 1999). Shulman (1987) identifies seven categories of teacher knowledge, namely content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts and knowledge of educational ends. Among these categories, Shulman places special emphasis on pedagogical content knowledge - an amalgam of content knowledge and pedagogical knowledge. To emphasise the importance of pedagogical content knowledge, he insists that it is not enough for teachers to know their content knowledge; they must also know how to teach it (Shulman, 1986). Teaching as a profession has a defined knowledge base. Lesson study as a teacher development strategy enables teachers to work collaboratively with their colleagues in order to build a shared knowledge base that can be easily accessed and shared among the teachers (Fernandez, 2002; Hiebert, et al., 2002).

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Another benefit of lesson study is that it enables teachers to develop their observation skills. As indicated earlier in Section 3.4.2.4, when one teacher teaches a research lesson others observe the lesson in order to collect relevant data on student discussions, students' use of resources, students' response to the lesson and the opportunities and challenges to learning that emerged during the lesson (Lewis, 2002b; Lewis, et al., 2006; Lewis, et al., 2009). This process of collecting data helps teachers to develop their observation skills.

Lesson study enables teachers to establish strong interpersonal relationships. Lawrence and Chong (2010) and Cajkler, et al. (2014) indicate that lesson study is a strategy that creates a platform for collaborative practice. Lesson study is believed to be an effective teacher development strategy because it improves teacher collegiality (Puchner & Taylor, 2006) and enhances the confidence of teachers (Rock & Wilson, 2005), as well as building a community of practice in which teachers continuously share ideas and resources (Lewis, et al., 2004). Lewis et al. (2004) add that the interpersonal relationships built during lesson study can be extended beyond the research lesson. Thus, lesson study increases the coherence, persistence, cooperation, responsibility and willingness of teachers to work with one another (Lewis, et al., 2004). Garet et al. (2001) indicate that such collaboration of teachers brings about changes in their learning and classroom practices.

It seems that lesson study enhances the motivation and self-efficacy of teachers. Motivation is important for teachers' learning. Teachers should participate in lesson study on a voluntarily basis in order to improve their teaching and use their experiences to support it. Garet et al. (2001) report that lesson study increases teachers' sense of efficacy because it provides opportunities for practical activities that are in harmony with the curricula they teach. Moreover, they indicate that teachers who gain knowledge and skills from professional development are the ones who are most motivated to change their classroom practices (Garet, et al., 2001).

It also seems that the lesson study process leads to improved quality of lesson plans (Lewis, 2002b). Each year teachers in Japan produce several research lessons, lesson plans and reports that are disseminated and shared to serve as a source of knowledge about teaching (Stigler & Hiebert, 1999; Hiebert, Gallimore, & Stigler, 2002).

Finally, lesson study serves as a strategy to break the culture of isolation by eliminating feelings of loneliness experienced by teachers. Lesson study helps teachers to come out of isolation, by empowering them to feel a sense of belonging to a larger professional community (Chokshi & Fernandez, 2005). Garet et al. (2001) indicate that teachers who had worked in isolation reported that the reform type of teacher development activities, such as lesson study, enabled them to come closer to one another and to work collaboratively. Furthermore they indicate that the reform type of teacher development activities enhanced communication among teachers that in turn facilitated teachers to change their classroom practices (Garet, et al., 2001).

In summary, in Section 3.4.4 the benefits of lesson study were reviewed. The implication of the above mentioned benefits for this study is that it is necessary to acquaint the participants with the benefits that they

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can expect from participating in lesson study. When they know the possible benefits of lesson study, they will come forward confidently and willingly to implement lesson study in their classrooms. Moreover, by exploring the benefits that the participants can obtain from lesson study, this study is expected to contribute to enriching the knowledge base of lesson study.

The challenges associated with lesson study are discussed in Section 3.4.5.

3.4.5 Challenges associated with lesson study

Although there are apparently benefits to be reaped from implementing lesson study, there are also some challenges associated with it. From the literature reviewed, three concerns were identified. The first concern is that teachers usually come with mistaken beliefs about lesson study. They think that they cannot do lesson study because they lack adequate understanding (Chokshi & Fernandez, 2004). Some consider lesson study to be the process of creating a completely new lesson. Others think that they will not benefit from refining a few lessons (Chokshi & Fernandez, 2004, p. 523). Fernandez and Chokshi (2002) state that the lesson study process is not a means of collecting tried and tested lessons, rather it is a process of creating deep and grounded reflections about the complex activities of teaching that can be shared with other teachers (Fernandez & Chokshi, 2002). This concern could be lessened by assuring teachers that lesson study will provide them with opportunities to build their pedagogic and content knowledge during the process of practice. Moreover, the collaborative nature of lesson study will enable them to complement the inadequacies of one another (Chokshi & Fernandez, 2004).

The second concern is that teachers fear teaching lessons in public because the processes of lesson study are quite different from the common practices of teachers (Chokshi & Fernandez, 2004). They have never been observed by their colleagues and have never been videotaped before, thus making them feel too nervous to open their classrooms to be publicly observed (Chokshi & Fernandez, 2004). Moreover, classroom observations are traditionally linked to the context of performance evaluation and many teachers take lesson study as a replacement for evaluation (Chokshi & Fernandez, 2004). The prevalent culture of isolation that teachers have endured for centuries also plays a major role in making teachers to feel too nervous and self-conscious to open their classrooms to external observers (Fernandez, 2002; Chokshi & Fernandez, 2004). Chokshi and Fernandez (2004) opine that the fear of making teaching public could be minimised if teachers agree to shift their focus from evaluating the performance of the teachers to assessing the instruction and by diffusing the ownership of the lesson across the group of teachers who planned the lesson (Chokshi & Fernandez, 2004).

The last concern is that teachers think it is difficult to find time for doing lesson study (2004). It is natural for teachers to be concerned about finding time because lesson study requires much time and commitment during all its phases (Rock & Wilson, 2005). Teachers spend hours meeting for planning, teaching, observing,

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debriefing, revising and re-teaching sessions. In much of the literature the importance of using the available time wisely is stressed (Raywid, 1993; Guskey & Yoon, 2009; Loucks-Horsley, et al., 2010). Chokshi and Fernandez (2004) suggest that teachers can make use of their available time effectively by assigning roles to group members, distributing materials for feedback beforehand, writing the lesson plan outside the group meetings and avoiding lengthy discussions by focusing on a few key points. Lee (2008) also suggests that school leadership should play a role in creating teacher development time.

In summary, if lesson study is to impact positively on teachers' learning and changes in classroom practice, the barriers discussed above need to be addressed. The literature reviewed has helped the researcher to make necessary preparations on how to minimise the impact that these challenges have on the current study. This was done by organising workshops in order to acquaint the participants with lesson study and the expected challenges so that they know them in advance and prepare to tackle them. To minimise their concerns, teachers were convinced that the researcher will be on their side to guide them through the lesson study processes. As teaching public lessons is not common in Eritrea, it was expected that teachers would be anxious about opening their classrooms to external observers. To minimise their anxiety, teachers were advised to focus their observations and debriefing discussions on the research lesson rather than on the teacher who taught the lesson (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007). To create time for lesson study activities, the researcher negotiated with the school leadership. Moreover, guided by one of the research questions, the researcher explored the actual challenges that the teachers experienced while participating in the study. Consequently, this study will contribute to the already available knowledge.

3.4.6 Summary

The literature reviewed show that lesson study is a viable strategy in reducing isolation of teachers. Unlike in the traditional approaches, lesson study is a job-embedded and collaboration-based form of teacher development strategy that enables teachers to collaboratively plan, teach, observe and reflect on research lessons that ultimately increase student achievement. During lesson study, teachers focus on identifying and solving practical classroom problems. They usually choose topics that are either difficult for them to teach or that their students find difficult to understand. Moreover, the reviewed literature indicate that lesson study as a teacher professional development strategy provides increased knowledge of subject matter and teaching skills, enhances the observation skills for teachers, enhances collaboration and interpersonal skills and enhances teacher motivation. Finally, since the collaborative nature of lesson study takes time, teachers should be systematic in using their time effectively. Another challenge is that teachers usually fear teaching public lessons because they link peer observation to performance evaluation and many teachers take lesson study as a replacement for evaluation. This fear could be minimised if teachers agree to shift their focus from

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evaluating the performance of the teachers to assessing the instruction, and to diffuse the ownership of the lesson across the group of teachers who planned the lesson (Chokshi & Fernandez, 2004).

An appropriate teacher development model that guides this study is identified in Section 3.5.

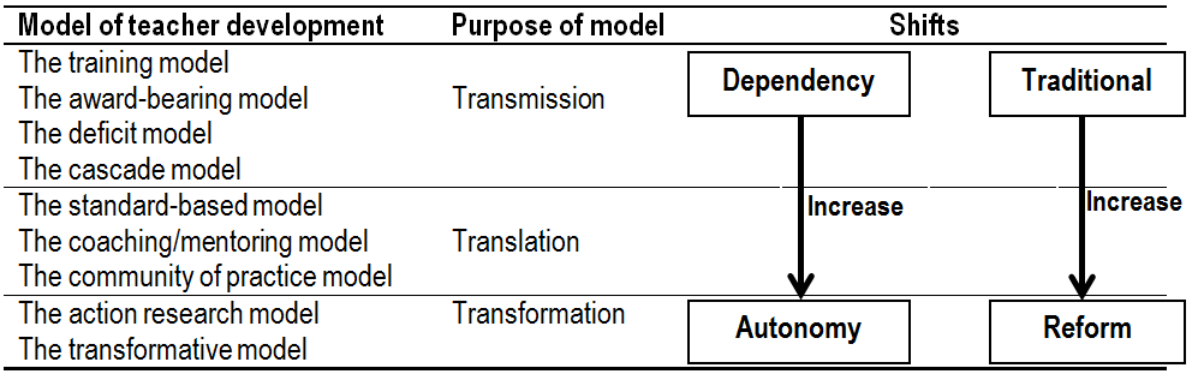
3.5 IDENTIFYING A TEACHER DEVELOPMENT MODEL THAT GUIDES THIS STUDY

This study aims to implement lesson study as a teacher development strategy for supporting science teachers in selected middle schools of Eritrea and then explore its effect on science teachers' learning and classroom practices. This Section 3.5 discusses the models that provided a theoretical base for the development of an appropriate model for this study. The model developed for this study combines elements of transmission, translation and transformation as suggested by Kennedy (2005).

3.5.1 Models of teacher development

Kennedy (2005) identifies nine professional development models and categorises them into three groups, namely transmission, transition and transformation depending on their capacity to transform teachers' practices. These models are placed along a continuum starting from the transmission through translation to the transformation stages in an order of increasing progression from dependency to autonomy and from traditional to reform orientation (see Figure 3.5).

Figure 3.5: Spectrum of teacher development models



Source: Adapted from Kennedy (2005)

Kennedy's (2005) model was selected because in addition to its widespread application in many teacher development programmes, it allows for combining practices with transmission, translation and transformation agendas. Thus, in this study aspects of transmission, translation and transformation are combined to provide professional development opportunities for science teachers in selected middle schools of Eritrea. Kennedy's (2005) model is further discussed in subsequent sections.

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3.5.1.1 The transmission-based model

Kennedy (2005) places the transmission-based model at the front end of the spectrum. This model emphasises ensuring the competence of teachers. The model adopts a technocratic approach where experts take the responsibility of equipping the teachers with the necessary knowledge and skills. In the process, teachers are expected to uncritically absorb the expert knowledge. The training model, the award-bearing model, the deficit model and the cascade model are included in this category (Kennedy, 2005). Of these categories, the training model is found to be the most suitable for this study.

i. The training model

According to Kennedy (2005), the training model is the most common model of professional development. This model views teacher development as a well-defined and structured activity that can be taught as a set of skills. The model places much emphasis on transmission of knowledge and the acquisition of teaching skills. Hence, its ability to foster teachers' growth is limited. The model adopts a technocratic approach to equip teachers with classroom skills in order to produce competent teachers (Kennedy, 2005). As indicated in Section 3.2.4, the limitation of this model is that the scope and content of the training are selected by experts, and trainee teachers are perceived as passive recipients of information delivered by experts in the form of lectures (Feiman-Nemser, 2001; Carl, 2005; Kennedy, 2005). However, the training model is a powerful strategy in introducing new knowledge to large number of teachers (Kennedy, 2005). This model was deemed appropriate for the present study and the training workshops that are designed to acquaint participants with lesson study were organised based on this model.

ii. The award-bearing model

In the award-bearing model, teachers are expected to complete a specific course that is validated or accredited by an external body, such as a university (Kennedy, 2005). After completing a specific course, teachers obtain a certificate, diploma or degree, which makes the award-bearing model more credible than the training model in terms of quality assurance. The mode of delivery in this model is similar to that in the training model (Kennedy, 2005).

iii. The deficit model

The deficit model focuses on the weaknesses identified in the teachers. According to Reddy (2004), this model focuses on perceived deficiencies of teachers that need to be corrected. It is a means of providing training to those teachers who show some deficiencies in their teaching in order to enable them to improve their competencies (Reddy, 2004). The deficit model accepts that teachers' weaknesses can be corrected by properly addressing the deficiencies (Kennedy, 2005). Thus, the focus of this model is mainly on exploring problems that teachers experience and rectifying them. However, this model could be de-motivating for the

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teachers because the model assumes that the so-called experts know more about how teachers should behave in classrooms than the teachers themselves do (Reddy, 2004).

iv. The cascade model

The cascade model is an arrangement in which teachers who attend professional development programmes are expected to transmit the knowledge and skills gained during the training to fellow colleagues in their schools (Kennedy, 2005). This model is cost effective in that the few teachers attending training are required to disseminate the information to their colleagues. It is a mechanism to reach large number of teachers with limited resources and within a short period. The cascade model assumes that the knowledge or information that was obtained in a training event flows from the experts who prepared the training to a group of teachers and in turn, the teachers are required to relay it down the layers. However, there are concerns as to whether those teachers who participated in such training pass the intended information down the layers. It has been found in practice that the information does not cascade down the layers as intended (Lieberman, 1995; Reddy, 2004).

3.5.1.2 The translation-based model

According to Kennedy (2005), the translation-based model lies mid-way between the transmission and transformative models. This implies that the underlying philosophy of the translation-based model has the capacity to swing either to the transmission-based or to the transformative-based models depending on the autonomy it gives to teachers. The translation-based model includes three models, namely standards-based, coaching or mentoring and community of practice. Of these three models, the standard-based model has close affinity to the transmission-based model in terms of restricting autonomy whereas coaching and community of practice provide some autonomy to teachers (Kennedy, 2005). Of the three categories, the coaching and community of practice models were found to be suitable for this study.

i. The standards-based model

Kennedy (2005) argues that the standards-based model emphasises complying with the standards set by the government or ministry for teacher development. Thus, it narrows down the concept of teaching to the acquisition of a standardised set of knowledge, skills and values. The standard-based model has a close affinity to the transmission-based model in relation to its mode of delivery, its emphasis on competence and the restriction of autonomy it gives to teachers. This model has been criticised for underestimating the complexity of teaching and individual teacher's creativity and contribution to the teaching-learning process (Kennedy, 2005).

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ii. The coaching or mentoring models

According to Kennedy (2005), coaching or mentoring is a one-to-one relationship, usually between two teachers, which is designed to support their development (Kennedy, 2005; Loucks-Horsley, et al., 2010). The coaching and mentoring processes have some commonalities. The major tenet of the coaching or mentoring models is confidentiality, trust and integrity. However, they differ in the nature of the interpersonal relationships they offer. In mentoring, the relationship is between an experienced teacher and a novice teacher aimed for the betterment of the latter. On the other hand coaching is understood as a mutual relationship among equals (Kennedy, 2005; Loucks-Horsley, et al., 2010). This model was deemed appropriate for this study because it allows teachers to work, guide, support, collaborate, discuss and share ideas with one another as equals in a non-threatening way.

iii. The community of practice model

Unlike in the coaching or mentoring model that involves teachers working in a one-to-one relationship, the community of practice model generally involves a group of teachers or colleagues working as a group to improve their classroom practices (Kennedy, 2005). Unlike in the coaching or mentoring model, this model does not rely on confidentiality. The participants' awareness of the existence of the community is central to the learning in this model. Moreover, emphasis is placed on the formation of new learning and development as a result of the interaction of community members. Depending on the role played by the dominant team members, learning could lean towards transmission-based or transformative-based learning (Kennedy, 2005). This model is suitable for this study, because throughout the lesson study cycles teachers worked as teams towards achieving common objectives.

3.5.1.3 The transformation-based model

Kennedy (2005) places the transformation-based model at the rear end of the spectrum. This model is characteristically opposite to a transmission-based model discussed above. The model views teachers' learning as growth through internalisation of concepts, reflection, construction of new knowledge and its application in different contexts. Moreover, this model views teachers' learning as transformation from dependency to autonomy (Kennedy, 2005). According to Kennedy (2005), the transformation-based model is eclectic because it combines practices and conditions from transmission and translation models that support a transformative agenda. By drawing heavily on the transformative aspects of both transmission-based and translation-based models, this model emphasises the transforming practices of teacher development. In this model, theory is strongly linked to practice, for example as in action research. This model includes two models, namely the action research and transformative models (Kennedy, 2005). Although the steps and cyclic nature of lesson study resemble those of action research, the transformative model was found to more relevant to this study because it allows combining of two or more models.

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i. The action research model

Kennedy (2005) places action research model at the rear end of the spectrum because it gives teachers more autonomy. In action research model, teachers investigate aspects of their practice with the intention of improving them (Kennedy, 2005). The action research model recognises the central role teachers play in actively changing their practice, rather than standing on the periphery and wait until things are "done for them and decisions [are] taken for them" by experts (Carl, 2009, p. 3). Zuber-Skerritt (1992) asserts that teachers obtain three benefits from action research, namely improvement of their practice, improved understanding of their practice and improvement of the situation in which the practices are carried out. Therefore, the action research model plays an important role in transformation. It leads teachers towards professional autonomy by shifting the balance of power towards teachers (Kennedy, 2005). Although action research model is very similar to lesson study, the researcher decided to use the transformative model in combination with the training and coaching models.

ii. The transformative Model

According to Kennedy (2005), this model involves an integration of a number of the processes and conditions stated in the models described above. The characteristic of allowing integration of two or more models makes this model suitable for this study. The transformative model is an eclectic model. It acknowledges that various processes and conditions from both the transmission-based and translation-based models can be put together to comply with a transformative agenda (Kennedy, 2005). In this sense, a transmission input from an external expert can be used in a transformative process if it provides teachers with an opportunity to experiment and use it, in order to enable teachers to generate new ideas and change their classroom practices.

In summary, it is evident that each model has its own characteristics that make it suitable to serve a particular purpose. The professional autonomy of teachers increases while moving from transmission through transition to transformative (Kennedy, 2005). Firstly, the transmission models are designed based on positivistic epistemology where the agenda is determined by outside experts. Such teacher development models, limit teachers to passive recipients of information delivered by the experts (Carl, 2008). Secondly, the translation-based models, being at the middle of the spectrum tend to show dual characteristics. Based on the autonomy they give to teachers, these models sway towards either transmission-based or transformation-based models. Coaching/mentoring and communities of practice discussed above fit in this category. Finally, the transformation-based models, placed at the rear of the spectrum provide more autonomy to teachers than the transmission and translation-based models. Moreover, the transmission-based models make it possible to integrate a number of models that operate within the spirit of transformation. For the purpose of this study, a combination of transmission, translation and transformation models are used at different stages of teacher development (Kennedy, 2005). Thus, the researcher intends to provide training on lesson study (transmission),

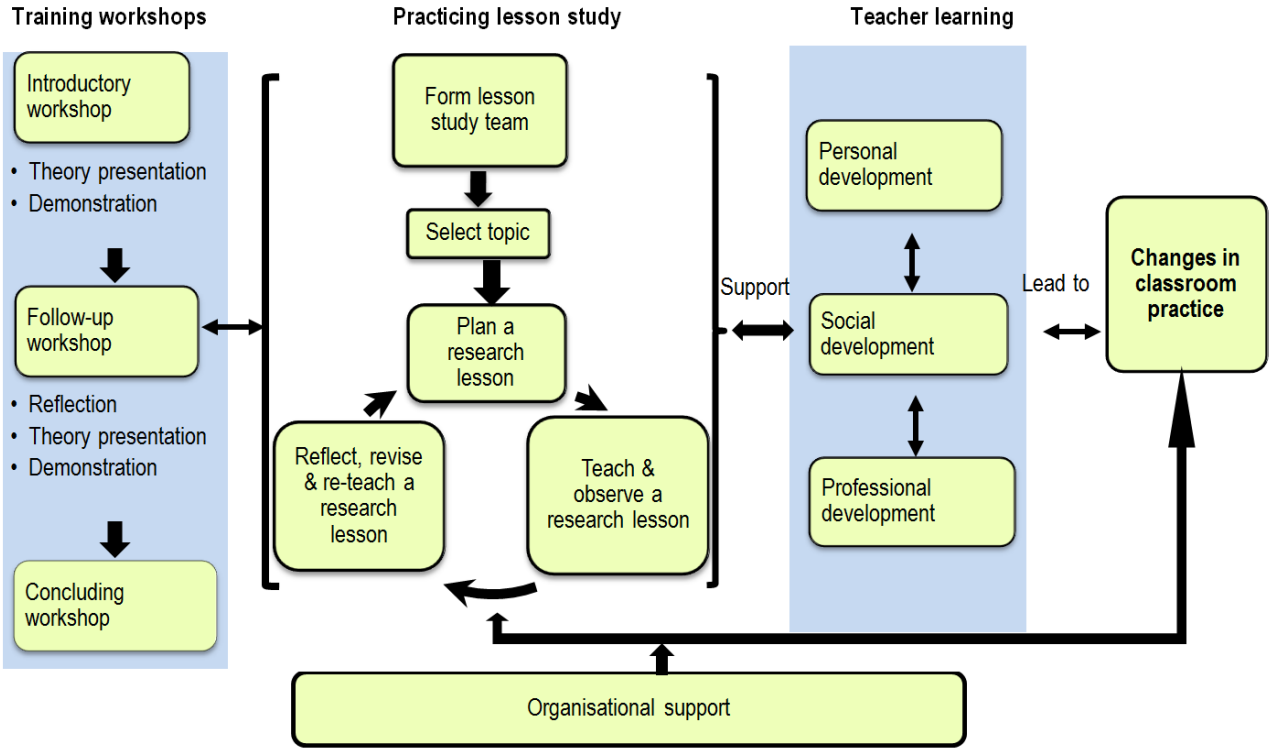
allow the teachers to implement lesson study at classroom level (transformation) as well as facilitate provision of feedbacks, support and coaching in the process (translation) as indicated in the literature (Kennedy, 2005).

The description of the model developed for this study is provided in Section 3.5.2.

3.5.2 The model that guides this study

The complexity of teacher development makes it difficult to achieve the desired ends using only one model. Hence, the model indicated in Figure 3.6 was developed to guide this study. It is based on the teacher development models reviewed in Section 3.5.1. Two or more models that promote teachers' learning and classroom practice were used at different stages of the process. The choice was supported by the literature (Bell & Gilbert, 1996; Guskey, 2000; Joyce & Showers, 2002; Murata, et al., 2004; Kennedy, 2005; Lewis, et al., 2006; Loucks-Horsley, et al., 2010).

Figure 3.6: A framework for training and implementing of lesson study cycles at classroom level



Source: Adapted from Bell and Gilbert (1996); Guskey (2000); Joyce and Showers (2002); Murata, et al. (2004); Lewis, et al. (2006); Lewis, et al. (2009)

The model presented in Figure 3.6 was developed based on a conjecture that lesson study could result in improvements in classroom practice by enhancing teachers' learning, commitment and collaboration (Murata, et al., 2004; Lewis, et al., 2006; Lewis, et al., 2009). This model indicates that the participating teachers learn and change their classroom practices in four steps. Firstly, the training workshops organised at the beginning of the study introduce the participating middle school science teachers to the concept and skills of lesson

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study. Exposing teachers to such new concepts and skills is consistent with the professional development dimension of Bell and Gilbert's (1996) model. The workshops comprise two components, namely theory presentation and demonstration. The theory presentation sessions provide the teachers with the necessary information on the lesson study process while the demonstration sessions equip them with skills on lesson study. The workshops are designed to enhance the participants' knowledge and skills about lesson study, and thus fall in the transmission category (Kennedy, 2005). To diminish the inherent limitations of the workshops, the training was followed by the implementation of lesson study cycles. During this phase the participants implement the new ideas and strategies in their classroom practices, a practice considered as transformative in nature as indicated in the literature (Kennedy, 2005). To achieve the translation agenda, participating teachers are provided with appropriate guidance and support in the process, as well as organisational support by involving the school leadership as suggested by Joyce and Showers (2002). Secondly, the iterations of lesson study activities that resemble action research enable the participating teachers to work collaboratively, plan, teach, observe, revise and re-teach the research lessons (see also Section 3.4.2). At this stage, the participating teachers reflect on their actions in order to maintain the useful skills and reject practices that are not effective, a practice which is considered as translational (Kennedy, 2005). Thirdly, the model shows that by participating in the workshops and implementing lesson study in their classrooms, the participating teachers learn and bring about changes in personal, social and professional dimensions (Bell & Gilbert, 1996). Finally, the whole process contributes to improvements in classroom practice. The cyclical nature of this model indicates that each component reinforces and provides impetus for the other.

In the following section, the effect of teacher development on teachers' learning and classroom practice is explored.

3.5.3 Exploring the effectiveness of teacher development

Evaluation is an essential component of any professional development initiative. It determines whether or not the intended goals are achieved (Loucks-Horsley, et al., 2010). There are a number of models for evaluating professional development. Kirkpatrick's (1994) designed a model for evaluating the effectiveness of professional development in business and corporate settings. This model has four levels, namely participants' reaction, participants' learning, participants' behaviour and organisational results. It is assumed that attaining positive outcomes in all the four levels indicate the effectiveness of a given professional development programme (Kirkpatrick, 1994). By adding one level to Kirkpatrick's four levels, Guskey (2000) developed a model for evaluating professional development in the field of education. Guskey's model was developed by replacing Kirkpatrick's two levels, namely participants' behaviour and organisational results with changes in classroom practice and students' learning respectively. The five levels in Guskey's (2000) model are

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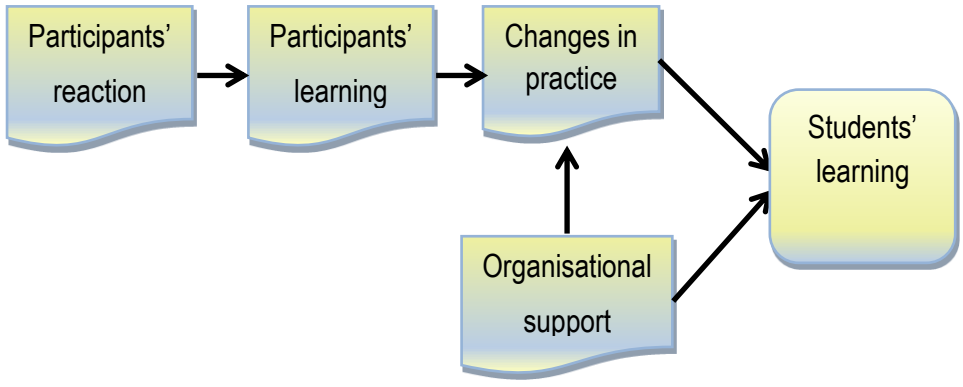
participants' reaction, participants' learning, organisational support, changes in classroom practice and students' learning outcomes. Table 3.3 summarises these two models.

Table 3.3: Comparison of evaluation models

Kirkpatrick (1994)	Guskey (2000)
Participants' reaction (level 1)	Participants' reaction (level 1)
Participants' learning (level 2)	Participants' learning (level 2)
	Organisational support (level 3)
Participants' behaviour (level 3)	Changes in classroom practice (level 4)
Organisational results (level 4)	Students' learning (level 5)

For this study, Guskey's (2000) model was found to be appropriate in order to explore the impact of lesson study on science teachers' learning and classroom practice for four reasons. Firstly, the model is simple to use and can be applied to a variety of work situations and learning processes. Secondly, the model is widely accepted among researchers for evaluating professional development. Thus, any conclusions drawn are considered valid. Thirdly, the model has an additional level that assesses organisational support, which is absent in Kirkpatrick's model. Finally, this model is specifically designed to evaluate professional development in the field of education. Figure 3.7 shows hierarchical interactions between participants' reaction, participants' knowledge, changes in classroom practice and organisational support in order to bring about improvement in students' learning. This model suggests that in order for professional development to impact on students' learning, it must first have an impact on the participants' reaction, learning and classroom practice as indicated in Figure 3.7. Of the five levels, the first four levels were found to be applicable to this study and are briefly discussed below.

Figure 3.7: Guskey's model of evaluation



Source: Adapted from Guskey (2000)

Participants' reaction is the first level and it focuses on satisfaction with a professional development programme. Although the information obtained at this stage is described by some as happiness quotient, affirmative feelings of the participants obtained at this level provide the necessary stimulus for embarking on the next higher level. Evaluation at this level focuses on participants' expectations of, usefulness and

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satisfaction with the professional development initiative. It measures teachers' reaction to the usefulness of the information delivered, to the lesson study process and to the context within which the teacher development programme is conducted. Guskey (2000) recommends classifying teachers' reactions into three categories, namely reaction towards context, process and content. Context refers to the setting in which professional development experience takes place. It answers whether or not the participants are satisfied with the food and drinks and comfort of the workshop settings. Process refers to how the professional development experience is conducted and organised and whether the organisers are knowledgeable and helpful. Content refers to the usefulness of the materials and presentation (Guskey, 2000).

Participants' learning is the second level and it measures whether the participants have acquired the intended knowledge, skills and possibly attitudes. The purpose of evaluation at this level is to explore what teachers think they have acquired from the professional development programme (Guskey, 2000).

Establishing organisational support is the third level. Guskey (2000) indicates that the success of any professional development depends on the organisation's advocacy, support, accommodation, facilitation and recognition of the change efforts. Evaluation at the third level focuses on measuring the extent of support the schools provide to participants (Guskey, 2000).

Finally, the fourth level measures the extent of teachers' use of the newly acquired knowledge and skills in real classroom situations. According to Guskey (2000), this level focuses on the difference in practice. It checks whether or not the new practices are different from the practices that teachers used in the past. Change is accomplished when teachers feel that they are confident enough to apply their new knowledge and skills in practice and feel empowered (Bell & Gilbert, 1996; Carl, 2009). Teachers require sufficient time to internalise the newly acquired knowledge and techniques and adapt them to their settings (Guskey, 2000; Garet, et al., 2001). The four levels discussed above correspond to four of the research questions indicated in Sections 1.4 and 4.2. These research questions will be used to establish whether professional development has occurred.

Table 3.4 lists the questions addressed in the interview schedules and the documents designed for reporting research lessons in relation to the four levels of Guskey (2000).

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Table 3.4: Levels of evaluation of professional development

Research question	Methods used	Questions addressed
What are teachers' reactions to the professional development arrangement? (Level-1)	Questionnaires at the end of the workshops	Did the lesson study workshop come up to your expectations? Was lesson study workshop instructive, helpful, relevant and enjoyable? Did the lesson study workshop cover the topics in sufficient detail? Did the lesson study workshop use time effectively? Was the lesson study workshop organised effectively? Was the venue comfortable? Did the method used in the workshop help you to understand lesson study? Do you support the ideas of lesson study? Are you confident enough to implement lesson study in your department/school? Would you recommend similar lesson study workshops to your colleagues?
What are teachers' perceptions about their knowledge and skill gain due to their participation in lesson study? (Level-2)	Focus group interviews, participant reflections (oral and written) and artefacts – lesson plans and worksheets	Did the lesson study workshop provide you with new information? Was the lesson study process successful in terms of improving your content knowledge, pedagogical knowledge/ teaching practice, working and sharing ideas with colleagues, observation skills and lesson planning skills? What elements of lesson study can lead to stronger collegial development? What kinds of benefits have you received by participating in lesson study? What kinds of challenges have you encountered by participating in lesson study? Did you get enough time to prepare the research lessons and reflect on them? What did you learn when you observed the research lessons? What did you learn when you reflected on the research lessons with your colleagues? How has lesson study been helpful to you as a teacher?
What is the nature of organisational support available to teachers? (Level-3)	Observations. focus group interviews with the participants, school directors and pedagogic heads and participant reflections (oral and written)	Are the school community members aware that the middle school teachers are experimenting with lesson study, a professional development strategy? Was the administration and school community helpful in supporting you throughout the lesson study process? Does the school encourage your experimenting with lesson study? Did the contributions of the "knowledgeable-other" influence what you have learned? Did your colleagues recognise and honour your participation in lesson study? Did you share ideas about lesson study and the results of the implementation with teachers in your and other schools? Did the school provide the participants enough time for participating in lesson study?

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Research question	Methods used	Questions addressed
To what extent did teachers who experimented with lesson study apply the new knowledge and skills gained in their teaching? (Level-4)	Observations, focus group interviews with participants, school directors and pedagogic heads, participant reflections (oral and written) and artefacts – lesson plans and worksheets	In what ways are the instructional strategies that you have used in the lesson study process similar or different from the strategies that you have used in the past? In what ways is the collaboration that you have experienced during the lesson study process similar or different from the collaborations that you have experienced in the past? To what extent are you applying the new knowledge and skills gained into your teaching? Do you see any impact of lesson study on your school? Do you have any intention of continuing with lesson study? What are you doing differently now from what you were doing before participating in this study?

3.5.4 Summary

In Section 3.5 literature was reviewed in order for the researcher to identify models that guide the implementation and evaluation of teacher development. Thus, the model developed for the implementation of this study contained aspects of transmission, translation and transformative in such a way that the teacher development programme increases the participating teachers' learning and autonomy (Kennedy, 2005). Thus, the central theme of this study is to provide training on lesson study to middle school science teachers (transmission), allow them to implement what they have learned in their classrooms (transformation) and finally establish a supportive environment for teachers to provide feedback, support and coach one another (translation) (Kennedy, 2005). After the implementation of lesson study at classroom level it was found to be important to investigate the effects of lesson study on the participating teachers' learning and classroom practice. Thus, Guskey's (2000) model was identified as an appropriate model to explore the effects of lesson study on the teachers' learning and classroom practice. The first four levels of this model were used. The main reason for using Kennedy's (2005) and Guskey's (2000) models was because of their wide acceptance in the field of education which implies that any conclusions drawn can be considered valid.

The following section is a summary of this chapter.

3.6 CHAPTER SUMMARY

The literature reviewed provided relevant information on teacher professional development in general and lesson study in particular. There is growing recognition that traditional teacher development approaches such as workshops, short-term orientations and training of trainer programmes are ineffective with regard to bringing about significant changes in classroom practice. Unlike in the traditional teacher development approaches, the reform approaches focus on the development of pedagogical content knowledge, provide sufficient time for

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teachers to practise the newly acquired knowledge and skills, focus on teachers' needs, focus on student learning, focus on individual and school improvement, and create a supportive school environment. Moreover, the reform approaches advocate for teacher empowerment through active participation of teachers in collaborative activities. These characteristics support teachers' personal, social and professional development. There are several teacher development strategies that are consistent with these goals. Lesson study is such a strategy that brings teachers together to participate in collaborative activities that focus on the improvement of classroom practice.

Based on the literature reviewed, a conceptual framework that guides the teacher development processes was developed. Different models were used at different phases of the study. Training was provided at the beginning of this research study to acquaint the participants with the theory and process of lesson study (transmission model). Thereafter, the participants were allowed to implement the new concept and skills at classroom level (transformation model). During the whole process, a supportive school environment was established to enable the participants to provide feedback and to support and coach one another (translation model). In addition, the literature explored indicators used to evaluate effects of lesson study on teachers' learning and improvements in classroom practice.

The following chapter comprises a discussion of the research design and methodology used in this study.

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CHAPTER FOUR
RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The way in which research is conducted may be understood in terms of the purpose of the research, the philosophical stance of the researcher, the research methodology and the methods employed in the search. In this chapter an overview of the research design, methodology and methods used in this study is provided. The highlights of the chapter are provided in Section 4.1. In Section 4.2 the purpose of the study and the research questions are stated. After providing justification for choosing the qualitative research design, the theoretical perspective that led to the choice of an interpretive paradigm, case study approach and the methods used in the research are stated in Section 4.3. In Section 4.4 how the data were prepared, coded and analysed are discussed. In Section 4.5 the issues of assuring the quality of the research are presented. The concepts underlying credibility, transferability, dependability and conformability are discussed. In Section 4.6 the ethical issues considered in this research are mentioned. The process of obtaining permission to conduct the research, ensuring voluntary participation of the participants, procedures followed to protect the privacy of research subjects and procedures to report the research finding are discussed. Section 4.7 is a summary of the chapter.

4.2 THE PURPOSE OF THE STUDY AND THE RESEARCH QUESTIONS

The purpose of this study is to implement lesson study as a strategy for supporting science teachers in selected Eritrean middle schools and then analyse its effect on teachers' learning and classroom practices. It is assumed that the outcome of this study will extend the knowledge base on lesson study and thus be used as a basis for future programmes concerned with teacher development in Eritrea and beyond. More specifically, the study attempts to answer one main research question and seven research sub-questions. The main research question was:

1. What is the effect of lesson study on the learning and classroom practice of selected middle school science teachers in Eritrea?

The following serve as sub-questions:

a. What are teachers' reactions to the professional development arrangement?

b. What are teachers' perceptions about their knowledge and skill gain due to their participation in lesson study?

c. What is the nature of organisational support available to teachers?

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d. How did lesson study contribute to breaking the culture of isolation?

e. To what extent did teachers who experimented with lesson study apply the new knowledge and skills gained in their teaching?

f. What are the positive experiences of teachers regarding lesson study?

g. What challenges did teachers identify in the use of lesson study?

In order to answer these questions, the researcher applies a research methodology that does not require him to ascribe to a theory prior to the beginning of the investigation. Thus, the researcher utilises a methodology that allows him to study subjective experience directly in its natural settings. This led the researcher to do theory-generating research, that is, qualitative research.

In Section 4.3, the research design is defined and then justification for choosing a qualitative research design is provided.

4.3 RESEARCH DESIGN

Research is a complex endeavour influenced by beliefs, feelings and expectations. Because of the complexity, researchers utilise a range of research designs to obtain answers to their research questions or problems. Every research project, including qualitative research that is "exploratory, fluid and flexible, data-driven and context-sensitive" in nature, requires a purposefully planned design in order to obtain appropriate data that leads to a valid conclusion (Mason, 2002, p. 24). Analysis of literature reveals a number of nuances and slight differences in the concepts used to describe research design. According to Bogdan and Biklen (2007, p. 54), research design is "the researcher's plan of how to proceed" with a research. Similarly Durrheim (2006) describes research design as a framework that guides a research process.

There are three well-recognised research designs, namely quantitative, qualitative and mixed research designs (Creswell, 2009). Researchers choose quantitative research design if their philosophical assumptions are associated with a positivist paradigm and choose qualitative research design if their philosophical assumptions are associated with an interpretive paradigm as in the case of this study (Mertens, 1998; Creswell, 2009). For the purpose of this study, a qualitative approach is deemed more appropriate to explore the social reality than using a quantitative approach. The justification for choosing a qualitative research design is given in Section 4.3.1

4.3.1 Choice of qualitative research design

Qualitative research encompasses a very broad concept that includes different ways of conducting research in social sciences (Merriam, 1998; Nieuwenhuis, 2007a). It is a naturalistic, holistic and inductive approach

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(Durrheim, 2006). In an attempt to define qualitative research, Merriam (1998, p. 5) provides the following key features of qualitative research which are relevant to this study:

- Qualitative research is concerned with accurately capturing the participants' perspectives
- The researcher is the key instrument for generating data rather than inanimate inventories or questionnaires
- Qualitative research is an inductive approach, that is the researcher builds theory from observations and intuitive understanding
- Qualitative research takes place in natural settings and involves fieldwork, that is the researcher is required to physically go to the field in order to observe a social phenomenon in its natural context
- Qualitative research is interpretive research
- The meaning and understanding obtained through qualitative research are richly descriptive (Merriam, 1998)

Babbie and Mouton (2001), Bogdan and Biklen (2007) and Creswell (2009) concur with the above characteristics of qualitative research. However, Creswell (2009) provides the following additional features of qualitative research:

- Data are generated through multiple sources
- Qualitative research is an emergent design i.e. the original plan for the research cannot be strictly followed and all phases of the process may change or shift after the researcher enters the field and begins to collect data
- Qualitative researchers often use a theoretical lens to view their studies
- Qualitative research provides a holistic picture of the problem or issue under study

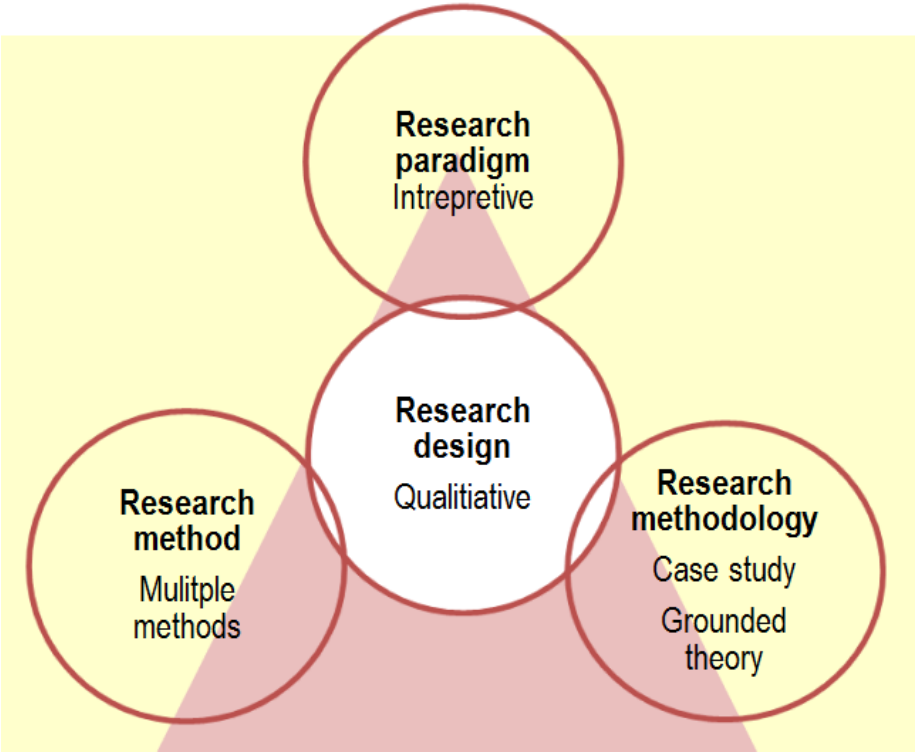
In view of the characteristics mentioned above, qualitative research design is the most appropriate approach for this study. Firstly, this study qualifies to be qualitative because it took place in a natural setting rather than in contrived settings as in a quantitative research. Secondly, this study is specifically concerned with understanding the subjective experience of science teachers as they participate in lesson study. It generates in-depth and descriptive information from the participants' perspective using multiple research techniques as opposed to breadth of data that are expressed statistically using numbers. Thirdly, in contrast to quantitative research design, where research instruments are inanimate, such as questionnaires, in qualitative research design the researcher was an instrument in selecting the designs, generating data through a series of qualitative methods and analysing and interpreting data (Merriam, 1998; Patton, 2002; Bogdan & Biklen, 2007;

Creswell, 2007). Fourthly, although generalisations are common to quantitative research, it is not the intention of this study to produce universally generalizable findings. Finally, as the study is new to Eritrea there is no theory to be tested. Instead, the intention is to conduct an inductive research and build theory using the data generated from the field through series of interpretations and interactions with the participants instead of using a deductive approach that tests existing theory as in the quantitative approach.

4.3.2 Dimensions of the research design

Creswell (2009) indicates that developing a research design requires decisions along three interconnected dimensions, namely paradigm, methodology and methods as indicated in Figure 4.1. Depending on the research questions, the paradigm influences the methodology, which in turn dictates the methods used to generate and analyse data. The paradigm also informs the choice of methods. In this study, an interpretive paradigm was found to be appropriate. Based on this paradigm, case study and grounded theory methodologies were used to execute the study and analyse the data respectively. These methodologies in turn influence the methods used to generate data. Multiple techniques were used in this study to generate data. These three dimensions of research design are further elaborated in Sections 4.3.2.1, 4.3.2.2 and 4.3.2.3.

Figure 4.1: The interconnectedness of research paradigm, methodology and method



Source: Adapted from Durrheim (2006) and Creswell (2009)

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4.3.2.1 Research paradigms

i. Ontology, epistemology and methodology

Three orientations, namely ontology, epistemology and methodology influence how researchers understand and view the world (Gray, 2009; Denzin & Lincoln, 2011). Ontology is an area of philosophy that deals with the nature of reality and it questions whether there is a real world independent of our knowledge (Guba, 1990; Guba & Lincoln, 1994; Nieuwenhuis, 2007a; Gray, 2009; Denzin & Lincoln, 2011; Neuman, 2011). According to Neuman (2011), there are two contrasting positions within ontology, that is, the positivist and the nominalist interpretivist positions. Positivists assume that the world exists out there independent of interpretations waiting to be discovered. In contrast, the interpretivists assume that reality is constructed through interpretations (Neuman, 2011) influenced by personal experience, culture and worldviews (Guba, 1990; Neuman, 2011). The latter stance is found to be relevant because this study focuses on participants' subjective experience of lesson study. That is the reason why the researcher decided to do inductive research as opposed to testing a hypothesis.

Epistemology describes the relationship of the researcher to what is investigated. Epistemology is an area of philosophy that is concerned with the acquisition of knowledge and it focuses on what we can know about the world and how we can know it (Guba, 1990; Guba & Lincoln, 1994; Nieuwenhuis, 2007a; Gray, 2009; Denzin & Lincoln, 2011; Neuman, 2011). The researcher, with a positivist point of view, keeps a distance from what is being observed and knowledge acquisition is objective free from any kind of value judgements. In contrast, the interpretivists believe that knowledge is gained through observation, interpretation and reflection (Guba, 1990; Guba & Lincoln, 1994; Denzin & Lincoln, 2011; Neuman, 2011) influenced by complex beliefs, values and assumptions (Carr & Kemmis, 1986). From an epistemological point of view, this study is situated within an interpretive paradigm and acknowledges that reality is subjective and value-laden. This research is thus concerned with understanding the participants' subjective experiences of lesson study.

Methodology deals with how a researcher obtains the desired knowledge and understanding (Guba & Lincoln, 1994; Gray, 2009; Denzin & Lincoln, 2011; Neuman, 2011). Quantitative researches primarily utilise deductive or experimental methods that focus on verification of hypothesis, whereas qualitative research utilises inductive approaches such as interviews, observations and document analysis to generate theory (Guba & Lincoln, 1994). From a methodological perspective, this study utilises a qualitative design that is inductive and exploratory in nature.

In summary, the three generic orientations discussed above guide researchers' thinking and the way they see the world, are thus collectively referred to as paradigm (Gray, 2009; Denzin & Lincoln, 2011). Paradigm is further discussed in Section 4.3.2.1-ii below. Table 4.1 compares the different paradigms in terms of their ontological, epistemological and methodological orientations.

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Table 4.1: The three orientations of a paradigm

Paradigm	Orientations		
	Ontology	**Epistemology**	**Methodology**
Positivist	Single reality that can be observed and measured The focus is on predicting and controlling Believe in cause-effect relationship	Objective Observer is detached from what is being observed Value free	Deductive Experimental Hypothesis testing Quantitative
Interpretive	Multiple realities The focus is on understanding what is happening	Subjective Observer is part of what is being observed Value mediated	Inductive Interpretive Qualitative
Critical	Multiple realities shaped by social, political, cultural, economic, ethnic and gender values. The focus is on uncovering institutional structures and helping people to change conditions.	Subjective Observer constructing versions Value mediated	Participatory Emancipatory Qualitative

Source: Terre Blanche and Durrheim (2006)

ii. Paradigm

The paradigm of any research serves as a lens to look into and interpret the world. Kuhn was the first to introduce the concept paradigm to refer to the worldview that guides a research process (Kuhn cited in Guba, 1990). Although similar in their descriptions, many scholars have attempted to re-define paradigm. According to Denzin and Lincoln (2011), paradigm is a "net that contains the researcher's epistemological, ontological and methodological premises" (Denzin & Lincoln, 2011, p. 13). Guba defines paradigm as "a basic set of beliefs that guide action" (Guba, 1990, p. 17). According to Mertens, paradigm is "a way of looking at the world" (Mertens, 1998, p. 6). Similarly Bogdan and Biklen (2007) describe paradigm as "loose collection of logically related assumptions, concepts, or propositions that orient thinking and research" (Bogdan & Biklen, 2007, p. 24). Three paradigms, namely positivist, interpretive and critical paradigms are identified (Carr & Kemmis, 1986; Merriam, 1998; Waghid, 2000; Henning, et al., 2004). Choosing an appropriate paradigm constitutes a key task in any research as it is the paradigm that influences and guides a research process. Since a particular paradigm has its own strengths and weaknesses, what is important is choosing the one that best serves the purpose (Neuman, 2011). After briefly describing the three paradigms, justifications for choosing the interpretive paradigm for this study are given.

Positivists investigate social phenomena by applying research methods and procedures that are used in natural sciences (Mertens, 1998). Positivists believe that reality exits independent of human thoughts and interpretations (Guba, 1990; Neuman, 2011), which means everyone experiences reality in the same way. A researcher in this paradigm keeps a distance from what is being researched. It is assumed that knowledge acquisition is objective, with no room for any kind of value judgements (Guba & Lincoln, 1994). Positivists

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control situations of a research in order to discover cause-effect relationships. Moreover, they rely on statistical inferences in order to generalise their findings to a larger population (Guba, 1990; Neuman, 2011). However, for several reasons, the positivist paradigm is not suitable for this study, which attempts to explore the subjective experiences of middle school science teachers. Firstly, it is not the intention of this study to isolate and control variables. Since this study is conducted in a school or classroom context, it is impossible to create controlled situations and study a specific variable at a time. Studying school or classroom contexts requires subjective interpretations rather than numeric descriptions. Secondly, it is not the intention of this study to predict and test a hypothesis, instead it is to understand, describe and interpret the beliefs, values and assumptions of middle school science teachers. Thirdly, it is not possible to observe an event in a school or classroom environment in a neutral way without either influencing it or interacting with it. In fact, the researcher is the instrument which generates data. Finally, it is not the intention of this researcher to generalise the findings to a larger population.

Neuman (2011) describes the critical paradigm as a "process of inquiry that goes beyond surface illusion to uncover the real structures in the material world in order to help people change conditions and build a better world for themselves" (Neuman, 2011, p. 108). Unlike advocates of the positivist paradigm, advocates of the critical paradigm believe in the notion of "multiple realities" (Mertens, 1998, p. 20). These realities are shaped by values inherent in cultural, social, political, economic, ethnic and gender hegemonies (Guba & Lincoln, 1994; Mertens, 1998) that are taken for granted as unchallengeable and natural (Guba & Lincoln, 1994). In critical paradigm, a researcher assumes a "political position by promoting critical consciousness and breaking down the institutional structures that reproduce oppressive ideologies and social inequalities" (Henning, et al., 2004, p. 23). Unlike in the positivist paradigm, in the critical paradigm a researcher and participants interact with one another and the researcher influences an enquiry resulting in "value mediated" findings (Guba & Lincoln, 1994, p. 110). Even though in the critical paradigm more emphasis is put on qualitative design, quantitative design within an emancipatory framework can also be used (Mertens, 1998). Contextual factors are described to assist the researcher in uncovering the oppression and inequality (Guba & Lincoln, 1994; Mertens, 1998). As can be seen from this discussion, the critical research paradigm is not appropriate to this research because the purpose of this study is not to emancipate or transform individuals or groups; instead the aim is to understand the effects of lesson study on teachers' learning and classroom practice.

Neuman (2011) defines an interpretive paradigm as a "systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds" (Neuman, 2011, pp. 101-102). Like the critical paradigm, the interpretive paradigm acknowledges multiple realities and mental constructions (Mertens, 1998; Neuman, 2011). This means that reality is subjective and different people construct different realities based on their intentions, beliefs, values and reasons (Mertens, 1998; Henning, et al., 2004). The

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methodological implication of having multiple realities is that it is essential to have emergent research designs that evolve over time (Merriam, 1998; Mertens, 1998; Bogdan & Biklen, 2007). In contrast to the positivist view, where the observer is considered to be independent of what is being observed, in interpretive paradigm the observer is part of what is being observed and takes a more interactive and subjective role (Neuman, 2011). After considering these comparative analyses, it can be seen that this study is influenced by an interpretive paradigm. Firstly, an interpretive paradigm is an appropriate choice because the aim of this study is to understand, describe and interpret the effects of lesson study on selected middle school science teachers' learning and classroom practice. Secondly, the interpretive paradigm is well suited to the task of understanding the complex contextual and social characters of education such as teacher development. Finally, qualitative methods such as interviews, observation, videos, photographs and documents that emerge from lesson study cycles are utilised to generate data.

In the next section the research methodology is described and then reasons for choosing case study as the methodology for this study are provided.

4.3.2.2 Research methodology – case study as the methodology of choice

In any research, methodology provides the assumptions behind using a particular research design (Henning, et al., 2004). It provides the logic for taking decisions about what to do and how to do it (Mason, 2002). Several research methodologies have been identified within an interpretive research design, each with its own underlying philosophies, practices and ways of interpretations. Creswell (2009) identifies five qualitative research methodologies, namely case study, ethnography, grounded theory, narrative research and phenomenology. In this study, case study was chosen as the methodology to execute the research process. In subsequent paragraphs justifications for choosing case study are provided.

Although case study is a common and familiar term, there are divergent views about its nature and usage (Merriam, 1998). Yin (1984) describes case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" (Yin, 1984, p. 23). This definition indicates that case study is the methodology of choice when the in-depth investigation of a phenomenon is required as in the case of this study. Moreover, he indicates that case study is suitable when "the boundaries between phenomenon and context are not clearly evident" (Yin, 1984, p. 23). However, Stake (1995) and Merriam (1998) take boundary as the most important characteristic of case study. Therefore, this study is a bounded system that took place in three separate middle schools.

Case study can either be intrinsic, instrumental or collective (Stake, 1995). Intrinsic case study refers to a study that is undertaken based on the intention to understand the "particular" case in question (Stake, 1995, p. 3). This study is not an intrinsic case study as the intention was not to understand a particular case. Similarly it is not an instrumental case study, as the intention was not to look at aspects other than the focus as

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suggested by Stake (1995). This study is a collective case study as indicated by Stake (1995) and used lesson study as professional development strategy in three purposefully selected middle schools and then examined its effects on science teachers' learning and classroom practices. Collective case study is the same as multiple case study design and can serve the logic of replication, a design that is analogous to repeating an experiment in quantitative research (Yin, 1984; 1993). However, the logic of conducting this study in three schools is different from the assumptions underlying sampling in quantitative approach, where multiple respondents respond to a survey. The rationale for conducting this study in three schools is not to generalise the finding obtained to a larger population but to obtain diverse views of teachers working in different settings. Creswell (2007) indicates that the issue of generalisability has little importance in qualitative research including case study, because the sampling procedures used in qualitative research does not support it. It is argued that diversity and difference are more relevant in qualitative research than homogeneity and generalisability (Auerbach & Silverstein, 2003). Creswell (2007) warns that studying multiple cases dilutes the investigations in each case because "the more cases an individual studies, the less the depth in any single case" would be (Creswell, 2007, p. 76). The researcher agrees with the limitations of studying multiple cases, but since he was concerned that some of the schools might withdraw in the middle of the study, he opted to conduct the research in three schools in order to ensure the continuity of the research.

According to Yin (1984; 1993), case study can be either holistic or embedded based on the nature of the analysis used. Holistic case study involves one unit of analysis, while embedded case study involves more than one unit of analysis (Yin, 1984; 1993). A unit of analysis is the object being studied and it could either be individuals, groups, organisations, processes, social artefacts, cultural objects, action or interventions (Babbie & Mouton, 2001). Thus, this study is considered as a holistic case study with a group of middle school science teachers as its unit of analysis. More on data analysis is given in Section 4.4.

Moreover, Yin (1984) suggests that the type of research question is another criterion that determines any research methodology. He indicates that the "how "and "why" questions are exploratory in nature and are relevant for use in case study. He further states that when research questions are framed as "what" questions as in the case of this study, two possibilities arise. The "what" questions can be either exploratory questions or a different form of "how many" or "how much" questions. The "what" questions of this study are exploratory in nature and are aimed at exploring science teachers' experience of lesson study, as suggested by Yin (1984, p. 17). Since the research questions are framed to explore the learning and classroom practice of the participants, this study is considered to be an exploratory case study as indicated by Yin (1984; 1993) rather than confirmatory as indicated by Merriam (1998).

Based on the above discussion, case study was deemed appropriate research methodology for this study. Thus, this study is categorised as a holistic, collective and exploratory case study that took place in three

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purposefully selected middle schools of Eritrea in order to explore the effects of lesson study on science teachers' learning and classroom practice.

In the following section the research method used in this research will be discussed.

4.3.2.3 Research method

Research method is a technique used to generate data (Henning, et al., 2004). To serve the purpose of this study, data were generated from science teachers and school leadership, through a combination of six methods, namely questionnaires, semi-structured focus group interviews, observations, documents generated from the research lesson events, video-recordings and photographs. By using multiple sources of data and multiple methods of generating data, the researcher achieved triangulation as suggested by Patton (2002). The processes of data generation took place for a duration of one year divided into two phases. The first data generation was carried out from January to June 2013, while the second was carried out from September to December 2013. The processes and methods used to generate data during these periods are discussed in the next sections.

i. Sampling strategy

Sampling in research involves the process of selecting "a portion of the population for study" (Nieuwenhuis, 2007b, p. 79). According to Merriam (1998) there are two sampling strategies: probabilistic and non-probabilistic sampling. The former is mainly used in a quantitative research while the latter is used in a qualitative research. Samples selected for a quantitative study are usually large, random and representative. Such samples are selected using certain statistical techniques in order to be able to generalise results from that sample to a larger population (Merriam, 1998; Patton, 2002). The intention of this study was not to generalise the findings to a larger population. Thus, the sampling procedure used in this study was mainly focused on purposefully selecting small information-rich cases from which the most could be learned (Merriam, 1998; Patton, 2002). Since the purpose of this study was to find rich, descriptive and in-depth information rather than quantity and breadth, a purposeful sampling procedure was found to be more appropriate than a probabilistic sampling. Therefore, a total of 21 participants, namely 15 science teachers some of whom were heads of departments, three pedagogic heads and three school directors from three purposefully selected middle schools in the *Zoba Maakel* region of Eritrea took part in this study.

ii. Obtaining access and selecting schools

According to Bogdan and Biklen (2007), the first duty of a field researcher is getting permission to conduct a study. Request for permission to conduct this study started in 2012 when the Department of Curriculum Studies of the Stellenbosch University communicated with the National Board for Higher Education in Eritrea in this regard (see Appendix-A1). On 24 July 2012, the MoE accepted the request and granted permission to

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conduct the research in middle schools in Eritrea (see Appendix-A2). Based on the MoE's letter, the *Zoba Maakel* MoE regional office granted permission to conduct this study in the selected schools (see Appendix-A3). All three schools selected were government-owned schools. One of the schools was administered by a community of board. The main reason for including a school administered by a community of board was to maximise variations and to obtain diverse experiences from teachers working in different environments. In order to identify suitable schools, the researcher conducted a preliminary review prior to the selection of these schools. Selection of the schools was based on the fact that the schools had at least three science teachers willing to participate in this study. As the researcher had to work in the schools for a prolonged period, financial constraints limited the researcher to selecting schools that are within suitable travel distances. To protect the identity of the participants and the schools, the three schools where this study took place were named School 'A', 'B' and 'C'.

iii. Selecting participants and ensuring voluntary participation

After obtaining permission from the MoE, the researcher visited the schools from 07 January to 16 February, 2013. The schools welcomed the visits of the researcher. During these visits, the researcher explained the aim of the research, the nature of the research, the duration of the research, the number of teachers required and the procedures for selecting participant teachers to the directors of the selected schools.

The researcher planned to select participants himself based on criteria prepared in advance (Patton, 2002; Neuman, 2011), but this plan did not work because the directors of Schools 'A' and 'B' insisted on nominating teachers who would participate in the study themselves without revealing the criteria for selection to anyone. They assured the researcher that they would nominate teachers who satisfy the required criteria, that is, willingness to participate in the research, teachers that are currently teaching science, who are committed and who have the ability to articulate their thoughts and feelings. The researcher did not want to provoke a confrontation with the directors and accepted their idea thinking that the directors might have some reasons or they might foresee problems that might affect their relationship with the teachers. Later on, during the implementation of lesson study in the classrooms, the researcher discovered the reason why the school directors of Schools 'A' and 'B' wanted to nominate the participants themselves. The reason was that if the selection criteria were revealed to everyone and if most of the science teachers volunteered to participate in the study, the teachers who were not selected might complain and become angry. The directors also wanted to reward some of the teachers who had performed well by allowing them to participate in such a professional development programme. Moreover, the teachers who were not part of this study, asked the researcher questions such as the criteria for selecting science teachers and why other departments were not selected for the study (English, Social Science and Mathematics departments). Thus, from a total of 13 science teachers in School 'A', six teachers were selected for the study, while in School 'B' six participated from a total of seven

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science teachers. In School 'C', there were only three science teachers and all of them were willing to participate in the study. The fact that the school directors are leaders in the schools may raise doubts about whether the participants were involved in this study voluntarily. However, the researcher assured himself of their consent before the onset of the research (see Section 4.6.2).

In the three schools, the heads of department were among the nominees and continued to lead the lesson study teams in their respective schools. In addition to science teachers, the school directors and the pedagogic heads of each school participated in the research. However, they were not part of the lesson study teams. Only the science teachers formed the lesson study teams in their respective schools. The leadership of the school were included because of the posts they were holding. It was assumed that they would play a vital role in supporting lesson study in their respective schools. Otherwise, the science teachers were the target group for this study. The size of lesson study team in the schools ranged from three to five. Choosing small number of participants was a deliberate decision because it is difficult to find times which are convenient for all the participants (Stepanek, et al., 2007). Moreover, it is not the intention of this researcher to generalise the finding, but instead to generate in-depth information and understand the subjective experience of middle school science teachers as they participate in the lesson study cycles as indicated in the literature (Merriam, 1998). Hence, few teachers were selected to participate in this study.

According to Bogdan and Biklen (2007), it is necessary for researchers to establish good rapport with the research subjects with whom they will be spending time even if permission is granted by the higher authorities. Consequently, the researcher worked towards building good rapport with the school and the participants. Following the selection of the participants and after ensuring their voluntary participation, it was necessary to make two types of arrangement in order for the teachers to participate in the lesson study process, namely organising the workshops and the actual implementation of lesson study in classrooms as discussed in Sections 4.3.3 and 4.3.4 respectively.

4.3.3 Organising the workshops and the implementation of lesson study

4.3.3.1 Conducting lesson study training workshops

After identifying the schools and selecting participants, a Participant Background Information Questionnaire (Appendix-D) was distributed to get the biographical data and identify the learning needs of the participants. Three workshops, namely introductory, follow-up and concluding workshops were planned by negotiating suitable dates with the school directors prior to the workshops. The participants identified for this study were invited to attend to these workshops in order to receive training on lesson study. Only the participants who attended the workshops were allowed to participate in the research.

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Table 4.2: Number of workshop participants

Workshop	School	Gender	Teacher	Director	Pedagogic head	Total
Introductory 23-24-Feb-13	A	Female	2	0	0	2
		Total	5	1	1	7
	B	F	1	0	0	1
		Total	4	1	1	6
	C	F	1	0	0	1
		Total	3	1	1	5
	Grand total		**12**	**3**	**3**	**18**
Follow-up 07-Sep-13	A	Female	0	0	0	0
		Total	4	1	1	6
	B	Female	0	0	0	0
		Total	4	1	1	6
	C	Female	1	0	0	1
		Total	3	1	1	5
	Grand total		**11**	**3**	**3**	**17**
Concluding 22-Dec-13	A	Female	2	0	0	2
		Total	6	1	1	8
	B	Female	1	0	0	1
		Total	6	1	1	8
	C	Female	1	0	0	1
		Total	3	1	1	5
	Grand total		**15**	**3**	**3**	**21**

i. Introductory workshop

The introductory workshop was conducted before the start of the first phase on 23-24 February 2013 (for schedule see Appendix-B1). Science teachers including head of departments, pedagogic heads and school directors from the three purposefully selected middle schools participated in this workshop. The total number of the participants was 18 (see Table 4.2). The venue for this workshop was the Resource Centre in the MoE located at the centre of the Asmara, which was assumed to be convenient for all the participants. During this workshop, the participants were acquainted with the concept of lesson study, a four-column lesson plan format (see Figure 3.4, Appendix-N), syllabus guide for middle school level and tools that would be used for documenting lesson study events. During this workshop, the participants identified topics for the research lessons and expressed their commitment to teach at least three lesson study cycles for the semester in their respective schools. The researcher informed them that his role in addition to being a researcher would be to guide them through the lesson study process, provide the necessary support in content and pedagogical knowledge and provide the necessary resources.

Towards the end of the two-day workshop participants were invited for a plenary discussion to identify opportunities and challenges in their schools that could support or hinder the implementation of lesson study. They also discussed how to change their teaching in order to align it with the MoE's reform initiative – a

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student-centred and interactive pedagogy (MoE, 2002, 2008b). They agreed to prepare research lessons that comply with some or all of the following components:

- Put more emphasis on learning for understanding and less on rote learning and memorisation.
- Make the research lessons activity-based. They also agreed to minimise passive note taking by the students.
- Plan for hands-on activities that provide students with opportunities to touch and see things.
- Relate science to the day-to-day life of the students.
- Encourage interaction among the students by arranging discussion sessions.
- Plan where possible for homework in order to engage students. Students attend class in one of the two shifts, either in the morning or afternoon. Engaging them in doing homework during a shift when they had no class was felt to be necessary.

The participants were provided with a curriculum package containing reading materials on the concept of lesson study (see Appendix-M) and tools for documenting lesson study events. The effectiveness of the workshops was evaluated using the Lesson Study Workshop Evaluation Questionnaire, a questionnaire that contained both closed and open-ended questions (see Appendix-E). Finally, the participants were paid some stipends to cover their transport expenses for the two days.

ii. Follow-up workshop

The follow-up workshop was conducted at the end of the first phase and beginning of the second phase on 07 September 2013 (for schedule see Appendix- B2). Science teachers some of whom were heads of departments, pedagogic heads and school directors from three middle schools participated in this workshop. The total number of the participants was 17 (see Table 4.2). Of the teachers who participated in the introductory workshop, four withdrew and were replaced by three new participants[3]. This workshop took place in the Conference Room of the Department of General Education, MoE. The aim of this workshop was to acquaint the newly joined participants with the concept of lesson study and provide opportunities for the other teachers to reflect on their earlier practice and do the necessary planning for the second phase. The new participants were introduced to the four-column lesson plan format (see Figure 3.4, Appendix-N), the syllabus guide for middle school level and the tools for documenting lesson study events. During this workshop, the teachers identified topics and committed to teach three lesson study cycles during the semester in their

[3] One teacher transferred to another school, another teacher changed to the English department, another teacher resigned and travelled abroad and one teacher got married and took leave.

respective schools. The newly joined teachers were provided with a curriculum package containing reading materials on the concept of lesson study (see Appendix-M) and they completed the Lesson Study Workshop Evaluation Questionnaire (see Appendix-E), a questionnaire designed to evaluate the effectiveness of the workshop. Finally, the participants were paid some stipends to cover their transport expenses for the day.

iii. Concluding workshop

The concluding three hour workshop was conducted at the end of the programme on 22 December 2013. All the participants including those who withdrew were invited to attend this workshop. This meeting took place at the *Embasoyra* Hotel. The aim was to formally close the research process and convey words of thanks to the participants and the schools. During this process, opportunities were provided to the participants to give their views about the whole process. At the end of the programme, certificates of participation endorsed by the College of Education of the Eritrea Institute of Technology were distributed to all the participants who took part in this study in order to acknowledge their participation in the programme. The researcher also thanked the participants for their commitment and participation in the research for the duration of one year. In turn, the participants thanked the researcher for identifying them for the study and for issuing them with the certificates. Finally, the meeting was adjourned and lunch was served.

4.3.3.2 Components of lesson study training workshops

The introductory and follow-up workshops were organised in such a way that they contained the presentation of theory and the demonstration of lesson study (using video clips[4]) as their components as discussed in the subsequent sections (Joyce & Showers, 2002). The organisation of these components is summarised in Table 1.1.

i. Presentation of theory on lesson study

According to Joyce and Showers (2002), presentation of theory acquaints teachers with the concepts underlying lesson study. The presentation of theory is aimed at skill acquisition by increasing one's understanding (Joyce & Showers, 2002). In this study, teachers were acquainted with lesson study by using power point presentation and supplying the participants with necessary reading materials. The power point presentation session of the introductory workshop was affected due to lack of electricity. However, we presented it again when the power came back.

[4] The videos were downloaded from lesson study sites https://www.collaborativeclassroom.org/lesson-study and https://www.youtube.com/watch?v=0xgko79kO94 on 20 November 2012.

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ii. Demonstration of lesson study processes

The presentation of theory was followed by the demonstration of lesson study processes using video clips. According to Joyce and Showers (2002), demonstration helps teachers to acquire skills on lesson study. In this study the video demonstrations were intended to give the participants visual support on how to conduct lesson study and to provide them with an image of what lesson study looks like when it is implemented in classroom practice. The total running time of the videos was 50 minutes. In the next section the second component, the implementation of lesson study in the classroom, which took place after the workshops, is discussed.

4.3.4 Implementing lesson study: moving from the workshops to classrooms

In Section 4.3.3.2 it was indicated that the workshops contained two components, namely theory presentation and demonstration. In this section the implementation of lesson study in the classrooms, is discussed. The implementation of lesson study contained three components, namely implementation of lesson study in classrooms, guidance and support and establishing organisational support (Joyce & Showers, 2002). The support of the knowledgeable-other is also embedded as a fourth component in the implementation of lesson study cycles in order to create a supportive environment. It is indicated in the literature that combining different components leads to effective learning by teachers and increases transfer of what they have learned into the classrooms (Joyce & Showers, 2002) (see Table 1.1 and Table 4.6).

4.3.4.1 Implementation of lesson study in the classrooms

The participating teachers implemented lesson study in their respective schools based on the information gained during the introductory and follow-up workshops. During this phase, the teachers worked in groups through the different stages of lesson study to plan, teach, observe and reflect on the research lessons (see Section 3.4.2). This practice started by the team members in each school identifying suitable topics, and was followed by the planning of the research lessons. The lesson plans were finalised after several meetings. When one of the team members taught the research lessons, others observed to collect evidence for later discussion on what students were doing. Following the teaching sessions, the team members convened for debriefing sessions, where the teachers commented on the research lessons and provided suggestions for improvement. The discussions focussed on the lessons and not the teachers who taught the lessons.

In each school, the teachers taught five to six lesson study cycles. These research lessons were taught using more student-centred teaching styles as agreed upon in the introductory workshop. In the lesson plan emphasis was put on at least five components: a) learning for understanding rather than rote learning and memorisation, b) making the lesson activity-based by minimising passive note taking by the students, c) using hands-on activities or resources that provide students with opportunities to touch and see things, d) relating science to the day-to-day life of the students, e) encouraging interaction among the students by arranging

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discussion sessions and f) as much as possible planning for homework (see Section 4.3.3.1-i). All the lessons were videotaped. However, due to power problems we were not able to play back the videos during the debriefing sessions. In addition to the power problem, the teachers did not have time for this purpose. The teachers had very tight schedules. Apart from teaching in the schools, they had other social obligations.

Overall, 29 lessons were taught in the three schools, namely 10 lessons in School 'A' (Table 4.3), 10 lessons in School 'B' (Table 4.4) and nine lessons in School 'C' (Table 4.5). Only the first research lessons from each school are discussed in Sections 4.3.4.1-i, 4.3.4.1-ii and 4.3.4.1-iii.

i. Lesson study cycles in School 'A'

Table 4.3: Research lessons taught in School 'A'

Semester	Cycle	Lesson	Date	Grade	Teacher	Observer	Absent	Guest
First	1st	Expansion of gases	29-Mar-13	Eight	SAT2	SAT1, SAT3, SAT4 & SAT5		
			05-Apr-13	Eight	SAT1	SAT2, SAT3, SAT4 & SAT5		
	2nd	Series & parallel circuits	12-Apr-13	Seven	SAT3	SAT1, SAT2, SAT4 & SAT5		1
			19-Apr-13	Seven	SAT5	SAT1, SAT2, SAT3 & SAT4		4
Second	3rd	Types of lever	22-Oct-13	Seven	SAT3	SAT1, SAT2 & SAT6		1
		Types of lever	29-Oct-13	Seven	SAT3	SAT1, SAT2 & SAT6		1
	4th	Types of joints	12-Nov-13	Eight	SAT2	SAT1, SAT3 & SAT6		2[5]
			13-Nov-13	Eight	SAT3	SAT1, SAT2 & SAT6		
	5th	Combining forces	26-Nov-13	Eight	SAT1	SAT3, SAT2 & SAT6		
			27-Nov-13	Eight	SAT2	SAT1, SAT3 & SAT6		

In Section 4.3.4.1-i the implementation of lesson study in School 'A' is presented. Five science teachers in the first semester and four in the second semester formed a lesson study team in this school. The teachers in this school started the lesson study cycles by identifying topics that they think are difficult for their students (Lewis,

[5] SAT5 observed this research lesson after her transfer to the English Department

2002b; Watanabe, 2002; Yoshida, 2002). Following the selection of topics, they planned student-centred lessons that allowed students to use hands-on resources and worksheets. Five lesson study cycles each with re-teachings were completed. Two of these lessons, expansion of gases and series and parallel circuits were taught during the first semester while the last-mentioned three lessons, namely types of lever, types of joints and combining forces were taught during the second semester (see Table 4.3). For the purpose of this study, only the first lesson study cycle was detailed.

a. The first lesson study cycle

In this school 'A', a lesson study team of five teachers, namely SAT1, SAT2, SAT3, SAT4 and SAT5 was formed. After forming the team and identifying topics, the teachers followed the steps specified in Section 3.4.2 (see also Figure 1.1) to teach all the research lessons. The first research lesson was taught on 29 March 2013 and the re-teaching took place on 05 April 2013. During the various steps of the lesson study cycle, the teachers worked collaboratively.

Planning

The teachers in School 'A' started the planning of the first research lesson after identifying a suitable topic. While preparing the lesson plan, they used a four-column format provided to them (see Figure 3.4, Appendix-N). Those teachers who teach grade eight, namely SAT1, SAT2 and SAT4 took the responsibility of preparing the lesson plan on expansion of gases. They included the sequence of learning activities, predicted students' responses, prepared their appropriate responses and ways of assessing students' understanding in the four columns (Mathews, et al., 2009). After producing the first draft, they arranged a general meeting and incorporated inputs obtained from other teachers, namely SAT3 and SAT5 and finalised the plan. Unlike in the conventional lesson plan format of the school that mainly focused on what the teachers do, this format encouraged the teachers to think about what their students do in relation to their activities. Finally, the researcher helped them by typing the lesson plan using Microsoft word and distributing a printed copy of the lesson plan to all the team members so that they could use it during the teaching session.

Teaching and observing

After the lesson planning process, SAT2 taught the lesson while SAT1, SAT3, SAT4 and SAT5 observed the research lesson. Firstly, the teachers identified a bright classroom and requested their students to shift to the newly identified classroom. After waiting in the shade for the classroom to be vacated, students lined up and entered the classroom. Because of this shifting, the lesson started a few minutes late. Once they were inside, the students were requested to sit in their respective groups. Students did not waste time looking for their groups. It seemed that they already knew their groups. Three big groups were formed, each with 11-12 students. After this arrangement, the other teachers, namely SAT1, SAT3 and SAT4 entered the classroom. When the teachers entered the classroom, all students stood to show respect for their teachers. In Eritrean

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schools, this is a common sign of respect paid to teachers and visitors. SAT2 greeted the students and that marked the official opening of the lesson.

The lesson was on the expansion of gases. SAT2 introduced the lesson by making a connection with earlier lessons. He then wrote the topic and some questions on the chalkboard. He asked the students to discuss the questions in their groups by referring to their textbooks. He emphasised on the "Let us discuss" part of the lesson in the textbook. He asked them to follow the procedures given in the textbook. While the students held discussions in groups, the other teachers recorded their observations on what the students were discussing, without interfering in the learning process. After the discussion session was over, some students were asked to come forward to answer the questions on the chalkboard. Students volunteered to come forward one after another to say the same thing repeatedly, until the teacher said it was enough. After this session, the teacher requested the students to inflate the balloons that they had brought and asked each group to observe and then explain what happened to the balloons and why it happened. After this question and answer session, the teacher instructed the students to read an activity on the expansion of gases from their textbook. Later on, the teacher called on three students, one from each group, to demonstrate an activity. The demonstration table was placed in the corner of the classroom next to the chalkboard. The students demonstrated the expansion of gases using the balloons fitted to two bottles containing cold water and hot water respectively. They used hot water from a thermos flask. The students observed that the balloon fitted to a bottle containing hot water got inflated while the other balloon remained unchanged. The students in the groups were instructed to carefully observe the demonstration and then write their observations. The three students explained the activity to the whole class i.e. they explained what happened and why it happened. During this lesson, the students participated actively in their groups, observed a demonstration and participated in hands-on activity. Finally, the teacher concluded the lesson by repeating the demonstration himself. He then wrote the expected answers to the questions posed on the chalkboard. The researcher also recorded his observations.

Debriefing, revising and re-teaching

After the teaching session, the teachers began the debriefing session. The debriefing session took place in the office of the pedagogic head. The researcher reminded the teachers that the reflections should focus on the research lesson and not on the teacher who taught the lesson (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007). Moreover, the teacher who taught the lesson should speak first by sharing his observations and thoughts while other teachers would then follow to share the data that they had collected by observing the lesson. Hence, SAT2 was the first to speak. He reflected on the implementation of the research lesson by detailing what parts of the lesson worked as planned and what part required improvement. He expressed his overall satisfaction with how the lesson had proceeded. After he had finished, other teachers followed and shared their ideas on what they had observed. They used their notes

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as points of discussion and shared them with the team members. The debriefing session lasted for 30 minutes. After conducting the debriefing session, the teachers revised the research lesson based on the discussions held during the debriefing session. Subsequently the revised lesson was taught by SAT1 to another class. SAT2, SAT3 and SAT5 observed the revised lesson (see Table 4.3).

b. Other lesson study cycles

The remaining four research lessons described in Table 4.3 were taught over the course of two semesters based on the procedures discussed in the first research lesson. The teachers met for the planning of each research lesson based on the topics identified. After planning, the teachers taught, observed and debriefed the research lessons. They also taught the revised lessons to different groups of students. In all the research lessons, the students worked in groups and participated actively in hands-on activities.

After they had gained experience on lesson study, the teachers in School 'A' invited interested colleagues to observe the research lessons. Firstly, they invited one observer during the second research lesson and then invited four others during the re-teaching session of that lesson. More observers were also invited to sit in on the third and fourth research lessons. The observers were enthusiastic about lesson study. Those who observed some of the research lessons wished to observe more, but time did not permit them to do so. SAT5 observed one research lesson after she had been transferred to the English department. The school director was also enthusiastic about lesson study. He observed some of the research lessons for very brief periods. He was very much interested and supportive. His enthusiasm influenced the teachers and encouraged them to participate in the lesson study process. Attendance was absolute (Table 4.3).

During and after each lesson study cycle, the teachers were requested to complete documents for generating research lesson events. In addition to these documents, the researcher conducted three focus group interviews with the teachers and one focus group interview with the school director and pedagogic head. The analysis of data generated during the lesson study cycles are presented in Section 5.6 in order to explore the effects of lesson study on teachers' learning and classroom practice.

In summary, teachers taught five lesson study cycles. They identified lessons that they feel are difficult for their students to understand or difficult for them to teach. By providing teachers the opportunity to choose topics that enhance their future professional development, the lesson study strategy can be seen to treat teachers as adult learners. In all the lessons, the teachers prepared hands-on activities. Their interest is also reflected by their punctuality and attendance (see Table 4.3). During the various steps of the lesson study cycles, the teachers worked collaboratively. In Section 4.3.4.1-ii the lesson study cycles in School 'B' are presented.

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ii. Lesson study cycles in School 'B'

In School 'B', four teachers, namely SBT1, SBT2, SBT3 and SBT4 formed a lesson study team. Similar to teachers in School 'A', the teachers in this school first examined the curricula and then selected six topics that they think are difficult for their students to understand (Lewis, 2002b; Watanabe, 2002; Yoshida, 2002; Cerbin & Kopp, 2006). Three of the topics, namely pollution, heart and actions of the heart and structure and function of flowers were identified during the introductory workshop. Three more topics were identified during the follow-up workshop, namely friction, types of joints and introduction to the periodic table. Overall, the teachers taught six research lessons, four lessons with re-teaching sessions and the remaining two lessons without re-teaching sessions. All the lessons were prepared in such a way that they allowed for the active participation of the students. For purpose of this study, only the first research from the lessons indicated in Table 4.4 was presented as discussed in subsequent section.

Table 4.4: Research lessons taught in School 'B'

Semester	Cycle	Lesson	Date	Grade	Teacher	Observer	Absent	Guest
First	1st	Pollution	27-Mar-13	Eight	SBT1	SBT3 & SBT4	SBT2	
			10-Apr-13	Eight	SBT3	SBT1, SBT2 & SBT4		
	2nd	Heart & actions of the heart	17-Apr-13	Eight	SBT4	SBT1, SBT2 & SBT3		
	3rd	Structure & function of flowers	20-May-13	Six	SBT2	SBT1	SBT4 & SBT3	
Second	4th	Friction	05-Nov-13	Six	SBT2	SBT3, SBT5 & SBT6		
			08-Nov-13	Six	SBT6	SBT2, SBT3 & SBT5		
	5th	Types of joints	22-Oct-13	Eight	SBT5	SBT2 & SBT3	SBT6	
			25-Oct-13	Eight	SBT3	SBT2 & SBT5	SBT6	
	6th	Introduction to the periodic table	17-Dec-13	Eight	SBT3	SBT2 & SBT5	SBT6	
			18-Dec-13	Eight	SBT5	SBT2, SBT3 & SBT6		1

a. The first lesson study cycle

Planning

After identifying suitable topics during the workshop, the teachers started planning the first research lesson. The researcher assisted them by providing sample lesson plans. SBT1, SAT3 and SBT4 were grade eight teachers and they took the initiative to prepare the first lesson plan. After producing the first draft, they

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arranged a general meeting including SBT2 to finalise the plan. The teachers indicated that this work was the first of its kind where the teachers planned a joint plan. During planning, the teachers used a four-column lesson plan format introduced to them during the workshop (see Figure 3.4, Appendix-N). This format requires the teachers to indicate the sequence of the learning activities, anticipated students' responses, their reactions to student responses and the ways of assessing students' understanding in the columns (Mathews, et al., 2009). Unlike in the traditional lesson plan format, this lesson plan encouraged the teachers to think about what their students would do in relation to their activities. After finalising the lesson plan, the researcher typed and distributed a printed copy of the lesson plan to all the team members so that they could use it as a guide during the teaching session.

Teaching and observing

SBT1 taught the first research lesson on 27 March 2013. SBT3 and SBT4 as observers occupied the desks at the back of the classroom whereas SBT2 was absent. When the teachers entered the classroom, the students stood in order to show respect for their teachers and the researcher. After the customary salutation, the teacher introduced the lesson. The lesson was on pollution. The teacher wrote the topic and some questions on the chalkboard. The questions were from the "Let us discuss" part of the textbook. The students were requested to answer the questions.

After a short introduction, the teacher placed some resources that are used for demonstrating the lesson on a table placed in a corner of the classroom next to the chalkboard. After the short question and answer session, the teacher instructed students to form groups by moving the desks around. The students struggled to move the desks for group activity because they were heavy and there was not enough space in classroom to move them around. There were 66 students in the class and six groups were formed each containing 10-12 students each. After the groups had been formed, the teacher distributed the resources and instructed the students to do Activity-9.2 from the textbook. While the students were doing the activity, SBT3 and SBT4 recorded their observations on how the students were learning. The observers supported the students, because some groups were not able to fix a candle in the bottom of a tin can. Some of the students used plastic plates that melted immediately when they covered the can containing the burning candle. The students were requested to answer the questions after doing the activity. The teacher asked the students one by one to check whether they could give the right answer or not. Finally, the teacher concluded the lesson.

Debriefing, revising and re-teaching

Immediately after the lesson, the teachers met in the library for a debriefing session. The researcher reminded them that their discussion should focus on the research lesson and not on the teacher who taught the lesson (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007). Moreover, he reminded them that the teacher who taught the lesson should speak first by sharing his

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observations and thoughts and the observing teachers would then follow to share the data that they had collected while observing the lesson. Hence, SBT1 was the first to speak. He reflected on the implementation of the research lesson by detailing what parts of the lesson worked as planned and what part required improvement. He expressed his overall satisfaction with how the lesson had proceeded. After he had spoken, other teachers shared their ideas of what they had observed. They used their notes as points of discussion and shared them with the team members. The debriefing session lasted for 20 minutes. Finally, the teachers revised the lesson based on the ideas shared during the debriefing session. On 10 April 2013, the revised lesson was subsequently taught to another class by SBT3. SBT1, SBT2 and SBT4 observed the revised lesson.

b. Other lesson study cycles

The remaining five research lessons described in Table 4.4 were taught, over a course of two semesters, based on the procedures followed in the first research lesson. The teachers met to plan each research lesson based on the topics identified during the workshops. After planning, the teachers taught, observed, debriefed and revised the research lessons. SBT6, who joined the lesson study team in second semester, was absent during most of the observation sessions. The researcher discovered that the irregularity of this teacher was mainly due to the fact that he was registered for a course in a private College. Finally, different teachers taught the revised lessons to different groups of students. In all the research lessons, the students worked in groups and participated actively in hands-on activities. The teachers were requested to complete documents for generating research lesson events during and after each lesson study cycle. In addition, the researcher conducted three focus group interviews with the teachers and one focus group interview with the school director and pedagogic head. The analyses of data generated during the lesson study cycles are presented in Section 5.6 in order to make it possible to explore the effects of lesson study on teachers' learning and classroom practice.

In summary, the teachers in School 'B' taught six lesson study cycles. They identified lessons that they think are difficult for their students to understand or difficult for them to teach. By providing the opportunity to choose topics that enhance their future professional development, teachers were treated as adult learners. During the various steps of the lesson study cycles, they worked collaboratively. They jointly selected topics that they think are difficult for their students to understand (Lewis, 2002b; Watanabe, 2002; Yoshida, 2002; Cerbin & Kopp, 2006). They simplified these topics by preparing lessons that allowed students to use hands-on activities. However, the lesson study team members in this school were not punctual or regular in their attendance (see Table 4.4). The researcher assumed that this irregularity could either be due to wanting to use their free periods for doing private work in order to earn some income to improve their living conditions or

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that the teachers lacked commitment. The lesson study cycles in School 'C' are presented in Section 4.3.4.1-iii.

iii. Lesson study cycles in School 'C'

In School 'C', three science teachers, namely SCT1, SCT2 and SCT3 teaching three different grades formed a lesson study team. After examining grade six, seven and eight textbooks, the teachers selected six topics, two for each grade. Like teachers in School 'B' and 'C' the participants in this school selected topics that they think are difficult for their students to understand (Lewis, 2002b; Watanabe, 2002; Yoshida, 2002; Cerbin & Kopp, 2006). Three of these topics, namely reflection of light, common crops in Eritrea and satellites and rockets were identified during the introductory workshop while types of levers, distance and speed, heart and actions of the heart were selected during the follow-up workshop. Following the selection of topics, the teachers planned, taught, observed and reflected and re-taught the research lessons based on the procedures specified in Section 3.4.2 (see also Figure 1.1). All the lessons were prepared in such a way that they allowed for the active participation of the students. The first three research lessons were taught only once whereas the last three lessons were re-taught to a different group of students. For the purpose of this study, only the first research lesson from the lessons indicated in Table 4.5 is discussed.

Table 4.5: Research lessons taught in School 'C'

Semester	Cycle	Lesson	Date	Grade	Teacher	Observer	Absent	Guest
First	1st	Common crops in Eritrea	19-Apr-13	Seven	SCT2	SCT1	SCT3	
	2nd	Satellites & rockets	26-Apr-13	Eight	SCT1	SCT2 & SCT3		
	3rd	Reflection of light	17-May-13	Six	SCT3	SCT2 & SCT1		
Second	4th	Types of levers	08-Oct-13	Seven	SCT2	SCT1 & SCT3		
			09-Oct-13	Seven	SCT2	SCT1 & SCT3		
	5th	Distance & speed	21-Oct-13	Six	SCT3	SCT1 & SCT2		1
			24-Oct-13	Six	SCT3	SCT2	SCT1	
	6th	Heart & actions of the heart	05-Nov-13	Eight	SCT1	SCT3 & SCT2		
			12-Nov-13	Eight	SCT1	SCT3 & SCT2		

a. The first lesson study cycle

Planning

Teachers SCT3, SCT2 and SCT1 taught grades six, seven and eight respectively. SCT2 planned the first research lesson immediately after the workshops. After he had prepared a draft, the other team members

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namely, SCT1 and SCT2 were called to comment on it and then finalise the lesson plan. The researcher also assisted them during the lesson planning process by providing them with sample lesson plans. They used a four-column lesson plan format that was introduced to them during the introductory workshop (see Figure 3.4, Appendix-N). After finalising the planning process, the researcher typed the lesson plan and distributed a printed copy to all the team members so that they could use it as a guide during the teaching and observation sessions.

Teaching and observing

Following the lesson planning process, SCT2 taught the first research lesson on common crops in Eritrea on 19 April 2013 while SCT1 observed it. SCT3 was absent both during the observation and the debriefing sessions. The teacher introduced the lesson by showing packets of seeds and asking the student whether or not they are familiar with them. Following this short introduction, she asked the students to name crops that are common in Eritrea. The questions were mainly factual that required recall. Some of the students were not able to give the names of the seeds in English. Following the short question and answer session, the teacher requested the student to form groups. She requested the students to classify the seeds that they had brought into different groups. The lesson was a hands-on activity that enabled the students to participate in the activity. They worked in their groups to classify the seeds. Some of the students were not sure about classifying maize, coconut and palm as they could be classified as oil or fibre crops. The teacher highlighted that classification should be made based on the Eritrean context. They discussed and talked to one another. While the students were doing the group work, SCT1 observed and listened to student conversations. He recorded his observations on students' learning to use it in the debriefing session. After the activity was over, each group presented its finding to the whole class. The teacher summarised the lesson by indicating that the crops in Eritrea are classified as cereals, pulses, oil seeds, vegetables, fibre crops and fruits.

Debriefing, revising and re-teaching

After teaching the research lesson, the teachers began the debriefing session. During the debriefing session, the teachers were reminded to focus their discussion on the research lesson and not on the teacher who taught the lesson (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007). They were also reminded that the teacher who taught the lesson should speak first followed by the teacher who observed the lesson. Hence, SCT2 was the first to speak. She reflected on the implementation of the research lesson by detailing what parts of the lesson worked as planned and what part required improvement. She expressed her satisfaction with the presentation of the lesson. Finally, SCT1 shared his ideas about his observation. He used his notes as points of discussion and shared them with SCT2. The debriefing session lasted for 20 minutes. After the debriefing session, the teachers revised the lesson. The revised lesson was not taught to another class of students.

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b. Other lesson study cycles

The remaining five research lessons described in Table 4.5 were taught over the course of two semesters based on procedures discussed in the first research lesson. The teachers met for the planning of each research lessons based on the topics identified during the workshops. After planning, the teachers taught, observed, debriefed and revised the research lessons. The same teacher who taught the first research lesson taught the revised research lesson to a different class of students. Due to the shortage of time, the revised lessons of the first three research lessons were not taught again.

During and after each lesson study cycle, the teachers were requested to complete documents for generating research lesson events. In addition to these documents, the researcher conducted three focus group interviews with the teachers and one focus group interview with the school director and pedagogic head. The analysis of data generated during the lesson study cycles were presented in Section 5.6 in order to explore the effects of lesson study on teacher learning and classroom practice.

In summary, the teachers in School 'C' taught six lesson study cycles. The teachers in this school taught lessons that they think are difficult for their students to understand or difficult for them to teach. By providing them with the opportunity to choose topics that enhance their future professional development, the teachers were treated as adult learners. The first three lessons were taught only once whilst the last three lessons were re-taught to different groups of students. During the various steps of the lesson study cycles, the teachers worked collaboratively. They jointly selected topics that they thought are difficult for their students to understand. They used hands-on activities in all of the lessons. Two of the three teachers were not regular. The researcher assumed that the reason for the irregularity was because the teachers were occupied with their private work from which they earn some income to improve their living conditions. In the subsequent sections the components embedded in the implementation of lesson study in the classrooms are discussed.

4.3.4.2 Providing guidance and support

Joyce and Showers (2002) indicate that teachers need guidance and support when they practise newly acquired techniques. This component was operationalised by creating platforms for teachers to come together to collaborate, share ideas, guide, provide feedback and coach one another. The head of departments and the more experienced teachers played an important role in supporting and guiding the other team members. During these processes, the teachers interacted with one another and shared successful practises. During the debriefing sessions they reflected on their practice in the spirit of improving teaching. Joyce and Showers (2002) indicate that teachers who work in teams for improving their practice and their school are more cohesive and work less in isolation.

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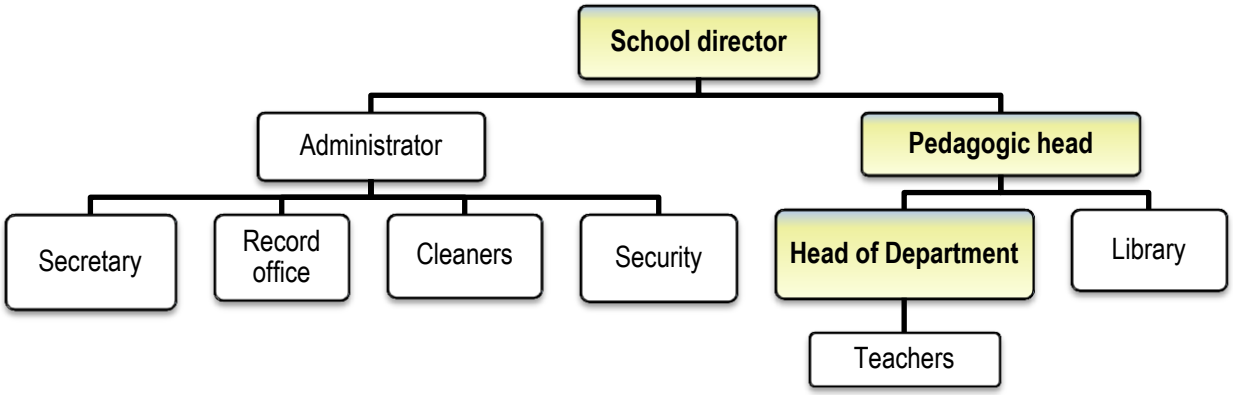
4.3.4.3 Establishing organisational support

Implementation of lesson study requires a supportive leadership in the schools that understands the importance of lesson study. Figure 4.2 indicates that school directors, pedagogic heads and heads of departments are important leadership figures in Eritrean schools. A school director is the leader of a school and usually assumes the role of administration whereas a pedagogic head being subordinate to a school director is concerned with academic matters. A pedagogic head is involved in most of the academic duties of the school such as overseeing teachers' weekly lesson plans, supervising classrooms and providing teachers with pedagogic support. A pedagogic head works closely with heads of departments. Heads of departments also perform administrative duties in addition to teaching.

Figure 4.2 Organisational chart of a typical middle school in Eritrea



According to Guskey (2000) success and implementation of any professional development initiative depends on the organisational support, advocacy, accommodation, facilitation and recognition of the change efforts. School leadership has a strong impact on all features of teacher development. Many change efforts fail because they do not receive the necessary support from the organisation. If important figures in an organisation are not convinced, they may hinder the implementation of the new ideas or practices (Guskey, 2000). Of the leadership figures, the school director is the key figure who determines the fate of any reform initiative (Guskey, 2000; Stepanek, et al., 2007). A school director who understands and values lesson study can provide participants with the necessary resources, support and encouragement (Stepanek, et al., 2007). Because of the potential contribution of school leadership, the researcher decided to involve the heads of science departments, the school directors and pedagogic heads right from the start (see also Section 3.2.5.7). In the following section the contributions of the knowledgeable-other (the researcher) in supporting lesson study is discussed.

4.3.4.4 Support of knowledgeable-other

Since participants do not have sufficient experience and knowledge to conduct lesson study effectively on their own, it was necessary for someone to facilitate the process by training them and guiding them through the

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process. According to Stepanek et al. (2007), the person who supports and facilitates the lesson study process is known as the knowledgeable-other. The knowledgeable-other works and supports lesson study team members with subject matter knowledge, pedagogical knowledge and lesson study practice (Stepanek, et al., 2007). Chokshi and Fernandez (2004) support the assignment of a knowledgeable-other that closely works with and provides information, guidance and feedback to lesson study groups in order for successful applications of lesson study to take place.

In this study, the researcher took on dual roles, namely the role of a researcher and the role of knowledgeable-other. Because of assuming the latter role, the researcher provided training on lesson study during the introductory and follow-up workshops. He also guided the teachers through the lesson study process during their practice in the schools. The rationale for assuming the role of knowledgeable-other was that the researcher had better teaching experience, content knowledge, pedagogical knowledge and expertise in lesson study than any other person who might be assigned either from the school or outside the school to act the role. The playing of these two roles by the same person was not without problems. There was always tension between the role of the researcher and the role of knowledgeable-other. One major problem was identifying the exact point of withdrawal and shifting from one role to another role. Another problem was maintaining objectivity. By not knowing the exact withdrawal point, the researcher might have affected the objectivity of the research. It can be argued that balancing these two roles requires experience. One cannot master them both and become an expert within a short period.

In summary, this study took place in two steps, namely lesson study training workshops and the implementation of lesson study at classroom level. The two components of the lesson study training workshops were the presentation of theory about lesson study and the demonstration of lesson study skills. The workshops equipped the participants with the necessary knowledge and skills on lesson study. The implementation of lesson study at classroom level consisted of three components, namely the practice of lesson study, providing guidance and support and creating organisational support. Moreover, support from the knowledgeable-other was embedded in this stage (see Table 1.1). The teacher development programme in this study was designed in such a way that it produces high acquisition of knowledge and skills and high transfer of the newly acquired techniques to the classroom level. According to Joyce and Showers (1988, 2002), high impact and high transfer can occur only when all the training components mentioned above are deployed.

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Table 4.6: The relationship between training components and the attainment of outcomes

Training components and combinations	Attainment of outcomes		
	Knowledge	Skill	Transfer
Theory	Low	Low	Nil
Theory and demonstration	Medium	Medium	Nil
Theory, demonstration and implementation	High	Medium	Nil
Theory, demonstration, implementation and feedback	High	Medium	Low
Theory, demonstration, implementation, feedback and coaching	High	High	High

Source: Joyce and Showers (1988; 2002) and Wallace (1996)

Table 4.6 shows that training that is composed of the presentation of theory alone raises the awareness of participants. The addition of demonstration to the theory enhances the conceptual understanding of the newly acquired knowledge and skill. The newly acquired knowledge and skills can be enhanced when they are implemented in the classroom. It is only when constructive feedback and coaching sessions are added to the training in addition to the earlier three components that the participants start to transfer the new techniques to their classrooms (Joyce & Showers, 1988, 2002). Joyce and Shower (1988, 2002) described these relationships in terms of percentages, but Wallace (1996) later replaced them with qualitative terms such as nil, low, medium and high.

The activities that took place during the whole teacher development programme are summarised in Table 4.7.

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Table 4.7: Summary of the activities, sources of data and information obtained

Period	Activities		Data source
Semester- I (23 Feb- 29 Jun, 2013)	Pre-workshop (07 Jan - 16 Feb, 2013)	Obtaining permission from MoE to conduct the research in the schools Identifying schools and participants Distributing and collecting of questionnaires Photocopying workshop materials and consent forms Arranging venue for the workshop Planning for the refreshment, lunch and stipends	Participant Background Information Questionnaire (Appendix-D)
	Conducting introductory workshop (23-24 February 2013)	Ensuring consent of the participants Power point presentation Demonstration of videos	Lesson Study Workshop Evaluation Questionnaire (Appendix-E)
	Implementing of lesson study in classrooms	Lesson study cycles	Interviews with the teachers, interviews with directors and pedagogic heads, documents designed for reporting lesson study events (Appendix F, G & L), observation, videos and photographs
Semester-II (02 Sep- 31 Dec 2013)	Preparing for the follow-up workshop	Collecting background information from the newly joined participants Photocopying materials needed for the workshop Arranging venue for the workshop Planning for the refreshment, lunch and stipends	Participant Background Information Questionnaire (Appendix-D)
	Conducting follow-up workshop (07 September 2013)	Ensuring consent of the new participants Power point presentation Demonstration of videos	Lesson Study Workshop Evaluation Questionnaire (Appendix-E)
	Implementing of lesson study in classrooms	Lesson study cycles	Interviews with the teachers, interviews with directors and pedagogic heads, documents designed for reporting lesson study events (Appendix F, G & L), observation, videos and photographs
	Concluding workshop (22 December 2013)	Distributing certificates of participation, closing remarks, payment of stipends and lunch	Videos and photographs

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4.3.5 Data generation

Data were generated between February 2013 and December 2013 using a combination of seven methods, namely questionnaires, semi-structured focus group interviews, observations, documents for generating research lesson events, video-recordings and photographs. In this study, data were generated from the science teachers and the leadership. Using multiple methods and sources ensured triangulation in this study, as indicated in the literature (Guba, 1981; Lincoln & Guba, 1985; Merriam, 1998; Patton, 2002; Cohen, et al., 2011). The advantages and limitations of the data generating methods used in this study are summarised in Table 4.8.

Table 4.8: Qualitative methods, advantages and limitations

Methods	Advantages	Limitations
Semi-structured focus group interview	Records feelings and thoughts that cannot easily be detected through observations. Participants can provide background information. Allows researcher to clarify questions	Provides indirect information filtered through informant's perspective. Takes place in contrived places rather than the real-life setting. Researcher's presence may bias responses. Respondents cannot express their thoughts equally.
Observation	Researcher gets first-hand account. Researcher better understands the situation. Takes place in its natural setting. Unusual aspects can be noticed. Useful in exploring topics that participants are not able to or willing to discuss.	Is subjective Researcher's presence may bias observation. Researcher may be seen as intrusive. Requires good attending and observing skills. Establishing rapport with some participants may be difficult.
Documents generated from lesson study events	The written information saves researcher's time for transcribing.	
Videos and photographs	May be an unobtrusive method of collecting data. Make behaviour patterns more visible A relatively holistic record can be made of the situation It can be re-visited to see things not noticed during the presentation	The presence of a photographer in a classroom can be disruptive Analysis takes much time and is technically demanding Data are partial and can be misleading as some elements are selectively included or excluded A video can be edited to represent the order of events in new ways

Source: Adapted from Altrichter et al. (1993) and Creswell (2009)

The data generating methods used in this study are further discussed in Sections 4.3.5.1, 4.3.5.2, 4.3.5.3, 4.3.5.4 and 4.3.5.5.

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4.3.5.1 Questionnaires

Although this study was a qualitative study, two types of questionnaires were administered in order to complement the other data generation techniques. The first questionnaire, the Participant Background Information Questionnaire (see Appendix-D), was distributed before the commencement of the lesson study process. The intention of this questionnaire was to obtain biographical and professional information of the teachers and their training needs. Information gained through this questionnaire helped the researcher to shape and make some changes in the design of the workshop which was intended to acquaint participants with lesson study. The summaries of data obtained through the Participant Background Information Questionnaire for Schools 'A', 'B' and 'C' are attached as Appendix-D-1, Appendix-D-2 and Appendix-D-3 respectively.

The second questionnaire, Lesson Study Workshop Evaluation Questionnaire (see Appendix-E), was administered at the end of the workshops. The purpose of this questionnaire was to evaluate the workshops and use the information to make amendments in future workshops. Through this questionnaire, it was possible to generate perspectives of the participants about the usefulness of the workshops, their satisfaction therewith and the strengths and weaknesses of the workshops. The summaries of data generated through the Lesson Study Workshop Evaluation Questionnaire for Schools 'A', 'B' and 'C' are attached as Appendix-E-1, Appendix-E-2 and Appendix-E-3 respectively. The information obtained using this questionnaire was used to make some changes in the follow-up workshop. The Lesson Study Workshop Evaluation Questionnaire was designed based on the work of Guskey (2000). It aims to identify the extent of teachers' satisfaction.

Both the questionnaires were designed in such a way that the closed questions were followed by open-ended questions. Including both types of questions increased the trustworthiness of the questionnaires and provided respondents with the opportunity to express their feelings and justify their answers to the closed questions. Through the open-ended questions, qualitative data were obtained which were later coded and analysed.

4.3.5.2 Semi-structured focus group interviews

Interviews are one of the commonly used data generating methods within qualitative research (Babbie & Mouton, 2001). Nieuwenhuis (2007b) describes an interview as "a two-way conversation in which the interviewer asks the participants questions to collect data and to learn about the ideas, beliefs, views, opinions and behaviours of the participant" (Nieuwenhuis, 2007b, p. 87). In the same vein, Patton (2002) indicates that the purpose of conducting interviews is to find out participants' perspectives, thoughts, interpretations, feelings and intentions that could not easily be detected through observation.

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However, the quality of information obtained from interviews depends on the interviewers' ability to ask probing questions (Merriam, 1998; Babbie & Mouton, 2001) in clear and understandable language (Patton, 2002). Skilled interviewers are good listeners, never criticise the logic of their respondents, never judge perspectives of their respondents and never push respondents to talk about topics that either upset, hurt, or humiliate them (Bogdan & Biklen, 2007; Nieuwenhuis, 2007b). Moreover, Merriam (1998) advises interviewers to avoid double questions, multiple-choice questions, leading questions and yes or no questions because such types of questions jeopardise the richness of information (Merriam, 1998). As far as possible these advice was adhered to while conducting interviews in this study.

Based on their degree of structure, interviews are classified into structured, semi-structured and unstructured categories (Merriam, 1998; Patton, 2002; Nieuwenhuis, 2007b). In this study, a semi-structured interview schedule was adopted, where the researcher prepared in advance a list of issues for the interview in the form of an outline as suggested in the literature (Merriam, 1998; Patton, 2002). The choice of a semi-structured interview was made for several reasons. Firstly, it allowed some flexibility in changing the wording and sequencing of questions depending on the answers given by participants. In fact, during the interview, some questions were asked as follow-up to the responses obtained from participants. Secondly, by asking similar questions to all respondents, comprehensive data could be generated. Thirdly, it prevented information from being overlooked as may occur when a structured interview or completely unstructured interview schedule is used. Finally, the researcher's assumption impacted on the methodological choice. He thought he could conduct a semi-structured interview more effectively than an unstructured interview.

The researcher used a focus group interview as a strategy rather than individual interviews because of the following reasons. Firstly, since lesson study is collaborative work, and the participants belonged to the same department, worked in groups and shared common experiences, a group interview is suitable for obtaining the collective experience of these teachers. Secondly, respondents resound to each other's experience, because when one comes up with an idea other members of the group express similar ideas in their own words. Finally, group interviews save time (Auerbach & Silverstein, 2003). The researcher was aware that in conducting a group interview there is a danger of losing some valuable information at the expense of the above advantages (Babbie & Mouton, 2001). It is argued that since the process of experimenting with lesson study in the schools was a collective work, the researcher thought it was important to get their collective views about their experience of lesson study. These collective views could only be obtained by conducting a focus group interview.

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In each school, the science teachers formed the lesson study teams and were interviewed as a group. In each school, three focus group interviews were conducted with the lesson study teams in the course of two semesters (Appendix-H1, H2 and H3). The first group interview was conducted after completing the first study cycle. The second was conducted at the end of the first semester. The third focus group interview was conducted at the end of the project. In one of the interviews, the teachers from Schools 'B' and 'C' did not come to the appointed place on time. Therefore, the researcher was obliged to interview them separately when they came to the venue. The interview questions were prepared based on the work of Guskey (2000).These interviews lasted for approximately 90-105 minutes depending on the number of participants in the groups. The interviews took place in free spaces such as lab rooms, classrooms and staff rooms.

The school directors and the pedagogic heads of each school were also interviewed once, at the end of the study (see Appendix-J). Although the school leaders were not part of lesson study team, they were interviewed in order to obtain information on the nature of organisational support. In Schools 'A' and 'C', the director and the pedagogic head were interviewed as a group, while in School 'B' they were interviewed separately. This is because the pedagogic head of School 'B' was transferred to another school, as director, towards the end of the project and it was not possible to fix time for a group interview. These interviews took place in the directors' offices and they lasted for approximately 30 minutes.

All the interviews were audio-recorded. Recording the interviews relieved the researcher to some extent of taking extensive note. This helped him to develop rapport with the respondents. All the interviews were conducted in *Tigrigna* (local language). It was assumed that the participants would express their ideas better in the local language than when using English. Babbie and Mouton (2001) suggest that the interviewer must be able to speak the language of the respondents. This condition was met because the researcher was able to speak the language of the respondents. The audio-recorded interviews were first transcribed and then translated into English. The translated interviews formed the text for data analysis. A detailed analysis of data is given in Chapter Five.

Seidman (1997) argues that interviews become more effective if they are used in combination with observation (Seidman, 1997). Hence, in this study observation was used to complement the other data generating methods.

4.3.5.3 Observation

Observation is the primary source of generating data in qualitative research (Merriam, 1998). Nieuwenhuis (2007b) describes observation as a "systematic process of recording the behavioural

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patterns of participants, objects and occurrences without necessarily questioning or communicating with them" (Nieuwenhuis, 2007b, pp. 83-84). Observation as used in research is different from observation in everyday life. Observation becomes a research method if the researcher takes notes on the observable behaviour patterns and activities of participants at the research site (Creswell, 2009). In addition to being an important source of data, observation is an integral part of lesson study processes (Fernandez, 2002). Nieuwenhuis (2007b) opines that the recording of data is the most important component of observation.

In this study, the researcher recorded field notes during observation, interviewing and discussions held with the participants. According to Patton (2002) field notes are descriptions of the researcher's feelings, reactions to what has been observed and what the researcher believes to be important. Depending on the time and place of recording, researchers could use different styles of taking field notes (Patton, 2002). The researcher recoded events during classroom observation on a format prepared for observation (Appendix-I). The observation format for the researcher was designed in such a way that it enables the researcher to note the description of what is actually observed and personal reflection of what is being observed simultaneously on the same page. Although the data obtained through this observation format were not coded for analysis, they formed an invaluable source of information during data analysis. The researcher used them to support other data.

In addition to observation notes, the lesson study cycles generated reports such as lesson plans, student worksheets and other invaluable documents, which are briefly discussed in the subsequent section.

4.3.5.4 Documents designed for reporting research lesson events

In addition to the above-mentioned methods, data were generated using formats designed to report lesson study events. Using Appendix-F the participants recorded their observation during the teaching of the research lessons. After the debriefing sessions, the teachers were requested to complete the Team Member Log (Appendix-L). Moreover, at the end of each lesson study cycle, the teachers were requested to complete the Lesson Study Report (Appendix-G). The questions included in Appendix-G overlapped with the questions in the semi-structured focus group interview schedules. The teachers were requested to give their responses to these data generating documents in either English or *Tigrigna*. Through these documents, the researcher was able to generate evidence about teachers' learning experience, knowledge gained, extent of collaboration, evidence of changes in their classroom practices and the benefits and challenges they encountered during lesson study process. In addition to

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textual information, data were also generated using visual media such as video-recordings and photographs as discussed subsequently.

4.3.5.5 Video-recordings and photographs

In addition to methods that generated textual data, videos and photographic media were used to capture the details of the natural settings and activities during the research. Altrichter, Posch and Somekh (1993) indicate that video-recordings make the context and causal relationships more accessible and behaviour patterns more visible than other methods of data generation. Patton (2002) indicates that videos can highlight significant facts if the researcher has skills that go beyond pressing the button (Patton, 2002). In this study, all research lessons were video-recorded and photographed. However, these data were neither coded nor analysed. The researcher used them as support in order to either watch or listen to the events that took place during the fieldwork. The videos and photographs were saved for further reference.

The procedures used to analyse the data in this research are discussed in Section 4.4.

4.4 DATA ANALYSIS

In the preceding section qualitative data generation and the instruments used were discussed. In Section 4.4 the procedures used to analyse the qualitative data are discussed. According to Bogdan and Biklen (2007, p. 159), analysis in qualitative research is the process of "working with the data, organising them, breaking them into manageable units, coding them, synthesising them and searching for patterns". In this study, the process of data analysis took place in two major steps, namely preparing and organising the data (Section 4.4.1) and coding the data into categories (Section 4.4.2).

4.4.1 Preparing and organising the data

The first task in data analysis is to make sure that data are in a form that can be easily analysed. Thus, the researcher transferred the audio-recorded interviews and data generated using documents designed for reporting lesson study events into word documents. All the interviews and more than half of the data generated using the documents designed for reporting lesson study events were in *Tigrigna* (a local language). The audio-recorded interviews were first transcribed verbatim using *Geez* script, translated into English and then typed. Typing the interviews using *Geez* script consumes time. To type

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one letter using *Geez* script multiple keys have to be pressed at a time [1]. The data generated using the documents designed for reporting lesson study events were first translated into English and then typed as word documents. The promoters of this study described the way the researcher transcribed and translated the data as drilling two tunnels at a time because it was an enormous amount of work. Translating the data into English even took more time than the transcribing process. One can question whether the translations were done correctly. The following two things helped the researcher to guess the most plausible meanings of what was said. Firstly, being a teacher helped the researcher to understand the expressions that the teachers made. Secondly, since the interviews were audio-recorded it was possible for the researcher to listen to the interview repeatedly until he captured the intended meaning. After the job of translation was over, all data were converted into electronic form and made available for coding. In Section 4.4.2 the coding procedure and the rationale for choosing grounded theory is discussed.

4.4.2 Coding data into categories

In this study, the grounded theory approach an approach that helps to build theory through successive conceptual analyses of data, was employed as analytical tool to analyse the data as suggested in the literature (Glaser & Strauss, 1967; Charmaz, 2000; Auerbach & Silverstein, 2003; Henning, et al., 2004). Unlike in the deductive approaches that test existing theories, the grounded theory is an inductive approach that develops theory (Auerbach & Silverstein, 2003). Influenced by an objectivist epistemology, the notion of building a theory through the grounded theory approach was originated by Glaser and Strauss (1967). However, in the course of time Strauss and Corbin (1990) made changes to the classical objectivist grounded theory, by elaborating and specifying the coding procedures with the intention of making them more explicit. Subsequently, a more pragmatic grounded theory with a constructivist underpinning emerged (Charmaz, 2000). Charmaz (2000) challenges the assertions of the classical objectivist grounded theory for: 1) detaching the relationship of a researcher from what is being researched, 2) assuming the emergence of theories from data independently without being influenced by the observers and the methods used to produce them and 3) being didactic, prescriptive and structured. However, the constructivist grounded theory asserts that theory emerges from data through interactions between the researcher and what is being researched and through interpretations

[1] In order to type the letter "ኽ", for example, one has to press shift, k, i and e in sequence.

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of data guided by flexible and emergent guidelines as opposed to structured and rigid prescriptions (Charmaz, 2000).

As these two versions of grounded theory follow contrasting epistemologies, the researcher had to choose the theory that best fits his research. A constructivist grounded theory was chosen as an analytical tool to analyse data and construct theory in this study. The choice of using grounded theory as an appropriate analytical framework was influenced by three factors. Firstly, grounded theory helps to conceptualise and build theory in an inductive way without being driven by theory, as there were no theories to be tested or verified. Secondly, the iterative nature that permits flexible movement back and forth in the data analysis process. Finally, because of the simplicity that the analytical tool offers during the data analysis process (Charmaz, 2000).

Coding is defined as a process of categorising segments of data and then assigning names or labels against pieces of data in order to attach meaning to the pieces of data (Punch, 2005). In this study, the data analysis was begun by reducing textual data that were obtained through the questionnaires, semi-structured focus group interviews, observation and documents generated from lesson study events into manageable units called codes and then categorising them into data sets in order to look for emerging patterns as suggested by Bogdan and Biklen (2007). Data generated through an observation format designed for the researcher, video-recordings and photographs were not coded. Three types of coding were used, namely open coding, axial coding and selective coding as suggested in the literature (Strauss, 1987; Strauss & Corbin, 1990; Henning, et al., 2004). Open coding was the first step in the coding process use to break the raw data into segments called codes and then sort similar codes into subcategories. This was done by listening to the interviews and reading the transcripts repeatedly sentence by sentence, line by line and word by word in order to generate codes inductively from the raw data in the tradition of grounded theory. This process helped the researcher to be familiar with the raw data and understand the concepts. Axial coding, the second step in the coding process was focused on the codes created during the open coding rather than on the raw data. This process coded the codes that were created during the open coding process (Strauss, 1987; Neuman, 2011). This process was an iterative process in which the initial codes were reviewed and examined again in order to enable the researcher to generate additional ideas and codes, merge closely related concepts into one or drop some of the ideas (Neuman, 2011). At this stage, the sub-categories created during open coding were compared to one another and then similar subcategories were grouped into higher order concepts to form generic categories. Selective coding was the final stage where the generic categories were matched to the research questions to form main categories that were mainly used to structure the presentation and discussion of data.

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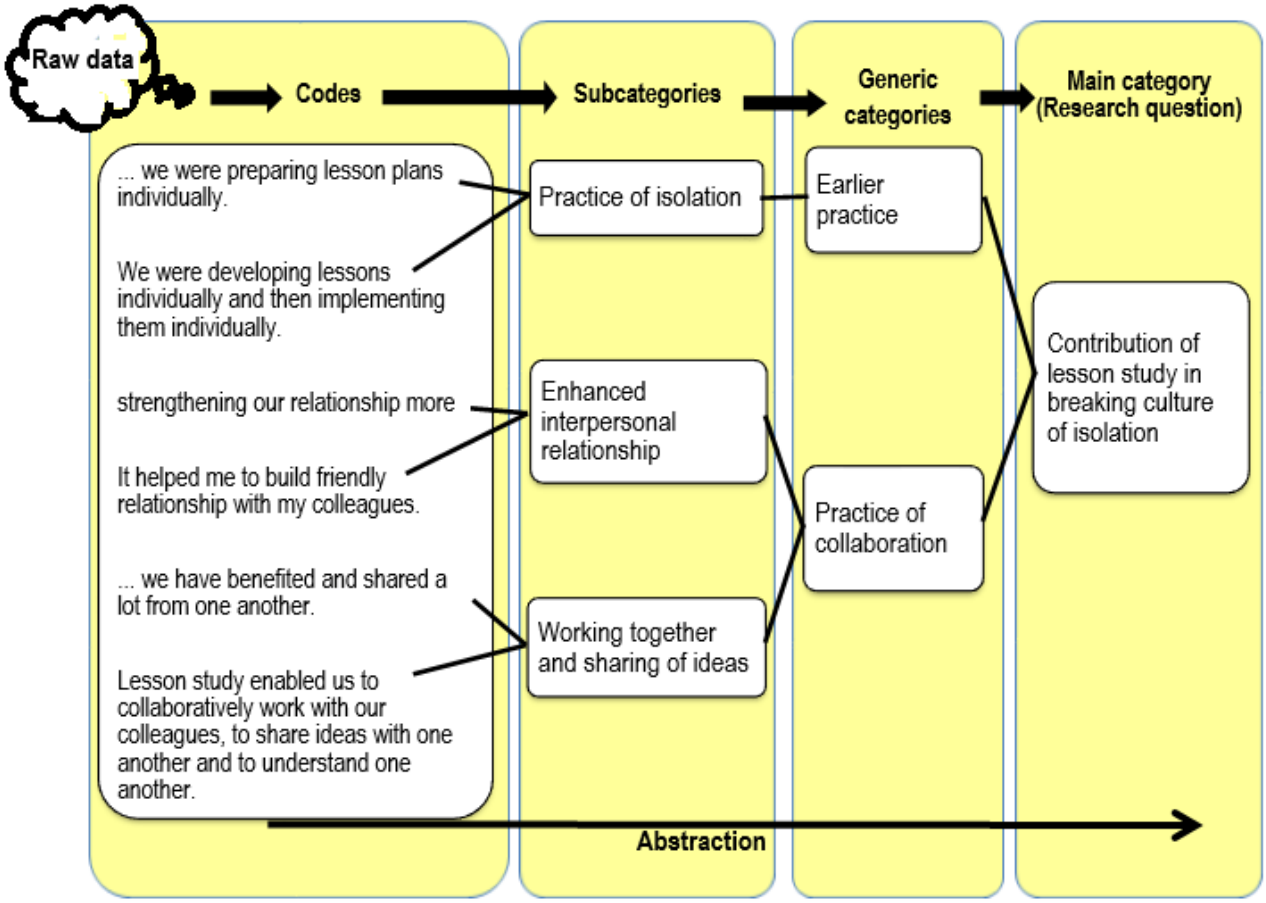
Figure 4.3: Example of categorisation and abstraction



Source: Elo and Kyngas (2008)

A diagrammatic representation of the coding process is presented in Figure 4.3. The procedures followed are: Raw data → Codes → Subcategories → Generic categories → Main categories (research questions). By following to these steps, the researcher started the coding process with the raw data and then moved from the ground up in small steps, where each step builds on the previous one, in order to answer the research questions. This process enabled the researcher to move inductively from lowest level concepts to a highest level of theorising and abstraction (Auerbach & Silverstein, 2003; Punch, 2005).

In Section 4.5 the procedures employed to ensure credibility and trustworthiness in this research are discussed.

4.5 CREDIBILITY AND TRUSTWORTHINESS

Merriam (1998) asserts that both quantitative and qualitative researches are "concerned with producing valid and reliable knowledge in an ethical manner" (Merriam, 1998, p. 198). It is the duty of any

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researcher to indicate that the information generated from the research is authentic and trustworthy (Mertens, 1998). In this study, appropriate measures were taken to ensure credibility and trustworthiness during the conducting of research and reporting of findings. Although there is general agreement on the importance of ensuring quality, the criteria used for assessing quality in qualitative research are different from those used for quantitative research (Creswell, 2009; Cohen, et al., 2011). Guba (1981) and Lincoln and Guba (1985) suggest that if researchers are concerned about the trustworthiness of their research they must answer the following four questions:

- How credible or believable are the findings?
- How applicable and transferable are the findings to other contexts or with other subjects?
- How can we be sure that the findings could be repeated if the study were to be conducted with the same (or similar) participants in the same (or similar) contexts?
- How can we be sure that the findings are reflective of the subjects and the conditions of the enquiry rather than a creation of the researcher? (Guba, 1981; Lincoln & Guba, 1985)

According to Guba (1981) and Lincoln and Guba (1985), these four questions establish truth-value, applicability, consistency and neutrality respectively. Initially, they matched these four concepts with four terms borrowed from the traditional positivist paradigm, namely internal validity, external validity, reliability and objectivity respectively. Soon after, they developed alternative constructs that ensure credibility and trustworthiness within a qualitative research epistemology and replaced them with qualitative parallels, namely credibility, transferability, dependability and conformability (Guba, 1981; Lincoln & Guba, 1985). These are summarised in Table 4.9.

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Table 4.9: Criteria for enhancing quality in qualitative research

Quantitative	Qualitative	Strategies used to enhance quality in this study
Internal validity	Credibility	Prolonged engagement in the research sites Triangulation using multiple sources & methods Collection of referential material Peer debriefing Clarifying researcher's position
External validity	Transferability	Thick description of data Detailed description of context and research process
Reliability	Dependability	Clarifying researcher's position Triangulation Establishing audit trail
Objectivity	Conformability	Detailed description of context and research process Corroboration with literature

Source: Guba (1981) and Lincoln and Guba (1985)The four aspects of credibility and trustworthiness used to ensure quality in this study are discussed in the subsequent sections.

4.5.1 Credibility

According to Guba (1981) and Lincoln and Guba (1985), credibility refers to the truth of data and its interpretations. Strategies that could enhance credibility are prolonged engagement at study site, triangulation, collection of referential adequacy materials and peer debriefing (Guba, 1981; Lincoln & Guba, 1985). Merriam (1998) and Mertens (1998) echo the same idea. Creswell (2009) also proposes clarifying researcher's bias or reflectivity as a viable strategy to enhance credibility. All these strategies were employed in this study to enhance credibility. Firstly, the researcher ensured credibility by spending extended periods at the research sites (Guba, 1981; Lincoln & Guba, 1985; Patton, 2002). This study was conducted for the course of one year, from January 2013 to December 2013. During this period, the participants in each school were able to practise six lesson study cycles. Working at research sites for an extended period also enabled the researcher to establish rapport with the participants and understand the culture of the school, which is believed to have enhanced the credibility of the research. Secondly, the researcher used multiple sources and multiple methods in order to satisfy triangulation (Guba, 1981; Lincoln & Guba, 1985; Merriam, 1998; Patton, 2002; Cohen, et al., 2011). Data were generated from the science teachers, school directors and pedagogic heads by using multiple techniques. The rationale behind triangulation is that using multiple sources of data and methods are better than using a single source of data and method. Patton (2002) reminds us that "Studies that use only one method are more vulnerable to errors linked to that particular method […] than studies that use multiple methods in which different types of data provide cross-data consistency checks" (Patton, 2002, p. 556). Moreover, this study satisfies the rationale of replication suggested by

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Yin (1984; 1993) which is assumed to enhance its quality, because the study was conducted in three different middle schools by following similar procedures in each school. Collection of referential materials is the third strategy for ensuring credibility (Guba, 1981; Lincoln & Guba, 1985). To ensure credibility of this study, the documentation of data was done in such a way that they would be accessible when a need arise. All interviews and their transcriptions were appropriately documented. Data that emerged from lesson study cycles were appropriately documented and archived. Peer debriefing is the fourth strategy for ensuring credibility (Guba, 1981; Lincoln & Guba, 1985). Peer debriefing involves asking colleagues to comment on the data and findings (Merriam, 1998). Consulting with peers was consistent part of this study. Colleagues provided the researcher with the necessary input during proposal writing, data generation and data analysis. They helped the researcher in reading the drafts before submitting his work to the promoters. The constant meeting with promoters, their comments and critiques were a consistent part of the research process that enhanced the researcher's interpretations and thinking. Presenting the research framework and findings in a seminar organised by the Department of Curriculum Studies at Stellenbosch University helped him to clarify and shape his thoughts. Finally, the researcher ensured credibility by indicating his position in relation to the phenomena being studied, for example, by indicating the rationale for selecting methodology, methods, participants and research sites. Moreover, the researcher included in the report his personal and professional experiences that might have affected the research process (see Section 6.6).

4.5.2 Transferability

Transferability in qualitative research parallels generalisability in quantitative research (Guba, 1981; Lincoln & Guba, 1985). But generalisability is of little importance in qualitative research (Creswell, 2007) as the sampling techniques are not designed to enable the researcher to generalise the findings to a larger population (Merriam, 1998; Patton, 2002). So transferability is not about whether a study includes a representative sample or not, but it is about how well the study provides a rich description of the context within which it occurred (Guba, 1981) in order to enable readers to determine the extent of similarity to their own situations (Mertens, 1998). In this study, the issue of transferability was addressed by providing a detailed description of the context and working conditions of the informants so that readers could make their own judgments about how well this fitted in with their situations.

4.5.3 Dependability

Dependability in qualitative research parallels reliability in quantitative research (Guba, 1981; Lincoln & Guba, 1985). From the perspectives of quantitative research reliability refers to the extent of replication of a study in order to produce same result (Merriam, 1998). This is because quantitative researchers

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assume that there is a single reality and studying that reality repeatedly produces the same results. On the contrary, qualitative researchers believe in multiple realities that make the logic of replication a "misfit" (Merriam, 1998, p. 206) because different people interpret reality differently. Echoing the same view Bogdan and Biklen (2007, p. 40) describe reliability as "fit between what [is] record as data and what actually occurs in the setting under study, rather than the literal consistency across different observations". Therefore, what is important in qualitative research is not whether the results can be replicated, "but whether the results are consistent with the data collected" (Merriam, 1998, p. 206). Strategies that can be used to enhance dependability in qualitative research are indicating researcher's position, triangulation and audit trail (Merriam, 1998). These three strategies were employed in this study. Firstly, the researcher ensured dependability by describing his position in relation to the phenomenon being studied (see Section 6.6). Secondly, the researcher used multiple sources and multiple methods in order to satisfy triangulation (Guba, 1981; Lincoln & Guba, 1985; Merriam, 1998; Patton, 2002; Cohen, et al., 2011). Finally, the researcher attached as appendixes the instruments used to conduct the research and sample transcriptions of interviews to provide the reader with background information about the procedures followed in this study. This documenting process also provides readers with opportunities to track the whole process, and attests to the quality and appropriateness of the study (Mertens, 1998).

4.5.4 Confirmability

Confirmability in qualitative research is comparable to objectivity or neutrality in quantitative research (Guba, 1981; Lincoln & Guba, 1985). In qualitative research confirmability is concerned with ensuring that the researcher has acted in good faith and requires the researcher to ensure that his personal values and biases are addressed and monitored (Bryman, 2008). To establish confirmability, the researcher provided characteristics of the respondents and methods of data generation, analysis and interpretation used to show that the research findings are the result of the research and not the researcher's assumptions and preconceptions. Moreover, the promoters of this study through questioning various aspects of the research enabled the researcher to reflect on his personal biases and values in terms of how he was conducting the research process. Confirmability also refers to the degree to which the results could be corroborated by others. Confirmability in this study was established by substantiating the findings of this study with perspectives found in the literature.

In the following section 4.6 is a discussion of ethical considerations undertaken in this research.

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4.6 ETHICAL CONSIDERATIONS

When human subjects are involved in any kind of research, researchers have the obligation to be ethical towards their research subjects while conducting the research and towards the scientific community while analysing and reporting the findings (Neuman, 2011). They have a responsibility to protect the participants from harm (Babbie & Mouton, 2001). A researcher has both "moral and professional obligation to be ethical even when research subjects are unaware of or unconcerned about ethics" (Neuman, 2011, p. 143). Therefore, this researcher employed the necessary ethical procedures in the planning and implementation of the study. In this research, five ethical issues were addressed, namely obtaining permission from the MoE to conduct this study in selected middle schools of Eritrea, obtaining informed consent from the research participants, protecting anonymity and confidentiality of the participants, avoiding harm or damage to the participants and being honest during the analysing and reporting of the study. These issues are briefly discussed in the subsequent sections.

4.6.1 Obtaining permission

After the research proposal had been approved by the Research Committee of the Department of Curriculum Studies of the Faculty of Education at Stellenbosch University, on 14 May 2012, the researcher worked towards obtaining permission from the MoE to conduct the research in selected middle schools of Eritrea. Subsequently, the MoE granted him permission to conduct the research in the schools (see Appendix-A1, A2 and A3).

4.6.2 Informed consent and voluntary participation

According to Neuman (2011), research subjects must agree voluntarily to participate in research without any coercion. They must decide to participate in the research after obtaining full information about the nature of the research and any possible dangers that may arise (Babbie & Mouton, 2001; Patton, 2002; Neuman, 2011). There is abundant information on ensuring the voluntary participation of research subjects. This researcher ensured the voluntary participation of the research subjects before the commencement of the study, as suggested in the literature (Babbie & Mouton, 2001; Patton, 2002; Bogdan & Biklen, 2007; Neuman, 2011). All the participants signed consent forms to indicate that their participation was voluntary and a copy of the signed consent forms was given to each of them (see Appendix-C).The participants were fully informed about the purpose, and nature of the study and the commitments involved before signing the consent paper so that they could make informed decisions to participate or not to participate in the study. They were informed that they are free to withdraw from the research at any stage without any consequences. Moreover, the participants were also assured of

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anonymity. Pseudo names were given to protect their privacy and the confidentiality of data (Babbie & Mouton, 2001; Patton, 2002; Bogdan & Biklen, 2007; Neuman, 2011). All the participants who were selected for the study were willing to participate in this study hoping that they would develop their professional skills and gain some knowledge.

4.6.3 Anonymity and confidentiality

According to Neuman (2011), anonymity is protecting the privacy of participants in such a way that the identity of the participants cannot be traced. For Cohen et al. (2011), anonymity is achieved when "the researcher or another person cannot identify the participant or subject from the information provided" (Cohen, et al., 2011, p. 91). Although it was possible for the researcher to identify the participants and their schools from the information given, confidentiality was maintained by presenting the data in such a way that the identities of the participants and their schools could not be traced by others. The identity of the schools and participants were protected by giving pseudo names (Babbie & Mouton, 2001; Patton, 2002; Neuman, 2011). Protecting the identity and confidentiality gave the participants confidence in order to participate in the research without fear. Data were kept in places not accessible to anybody.

4.6.4 Avoiding harm to participants and schools

According to Babbie and Mouton (2001), it is imperative that a research should never cause emotional, psychological, or physical harm to the research subjects, regardless of whether they have volunteered for the study or not. They added that researchers should be careful not to reveal information that would cause harm to the research subjects (Babbie & Mouton, 2001). In this study, the research subjects were protected from any damage and harm by protecting their identity (see Section 4.6.3). Moreover, the researcher tried to minimise harm to the school by minimising disruptions in the schools (Creswell, 2009).

4.6.5 Honesty during analysis and reporting

In addition to being ethical to research subjects, researchers are ethically obliged to be honest and open when they analyse and report the findings of their research (Babbie & Mouton, 2001). In this research, the researcher was as much as possible honest and open while conducting and reporting the findings. He reported on his personal limitations and the limitations and strengths of the study openly and honestly.

A summary of this chapter is provided in Section 4.7.

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4.7 CHAPTER SUMMARY

In this chapter, the purpose, research design, research paradigm and research methodology for this study were discussed. The purpose of this study was to use lesson study as professional development strategy in schools and then explore changes in teachers' learning, classroom practice, extent of collaboration, nature of organisational support and benefits and challenges the participants encountered during lesson study process were sought.

This is a qualitative study that used the interpretive case study approach. Case study was found to be appropriate because it enables the researcher to generate in-depth information regarding the effectiveness of lesson study in assisting teacher development. The interpretative methodology provides a framework to understand, describe and interpret the experiences of middle school science teachers and explores the meaning that they give to lesson study.

This study took place in three purposefully selected middle schools of Eritrea for the duration of one academic year, which enhanced its credibility. Triangulation was realised by using multiple sources of data and multiple of methods of data generation. Triangulation also enhanced the credibility of the study. Finally, the data generated through multiple techniques will be categorised into themes in order to find answers to the research questions. Chapter Five presents and discusses the results of the research study.

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CHAPTER FIVE
DATA ANALYSIS AND DISCUSSION OF THE FINDINGS

5.1 INTRODUCTION

In this chapter the analysis of data and the discussion of the research findings of the study are presented. This chapter contains eight sections. It begins by providing highlights of the chapter in Section 5.1. In Section 5.2 the procedures for presenting the findings are discussed. In Section 5.3 the context of the three schools are presented and in Section 5.4 the background information and training needs of the three schools are provided. The initial reaction of the participants towards the workshops can be found in Section 5.5. In Section 5.6 the effects of lesson study on the teachers' learning and classroom practice is explored and in Section 5.7 the key learning dimensions of lesson study are presented. Finally, a summary of the chapter is provided in Section 5.8.

5.2 PROCEDURES FOR PRESENTING THE FINDINGS

This study is categorised as an exploratory collective case study. As discussed in Section 4.3.2.3-i, a small-scale sample that would generate thick and descriptive information was considered relevant, instead of using a large scale, representative and randomly selected sample that could generate a large amount of superficial information. Subsequently, three schools were purposefully selected, from the schools in Asmara in the *Zoba Maakel* region of Eritrea, to use lesson study as a teacher development strategy in order to answer the research questions stated in Sections 1.4 and 4.2. Since the context of each school is unique, the researcher decided to present the results for the three schools separately, followed by an interpretive summary that is considered as the cross-case analysis. According to Patton (2002, p. 440), cross-case analysis is the process of "grouping together answers from different people to common questions or analysing different perspectives on central issues". The presentation of data is done based on the following four items:

1. Context of the schools (Section 5.3)
2. Background information of the participants and their training needs (Section 5.4)
3. Reactions to lesson study training workshops (Section 5.5)
4. Exploring the effects of the lesson study process on teachers' learning and classroom practice (Section 5.6)

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After providing the contexts of each school and background information of the participants, the presentation for items three and four of the above-list is structured according to the research questions. The first research sub-question guides the result obtained from the workshops (Section 5.5) while the remaining six research sub-questions guide the results obtained from the actual implementation of the lesson study cycles at classroom level (Section 5.6).

To ensure anonymity and protect the identity of the three schools and the participants, codes were used. The schools were named as School 'A', 'B' and 'C'. The teachers in each school were named T1, T2, T3, T4, T5 and T6. D and PH denoted the directors and pedagogic heads respectively. The first, second and third focus group interviews conducted with the science teachers' were abbreviated as H1, H2 and H3 respectively. The directors and pedagogic heads' focus interview was abbreviated as J1. The data generated through various appendixes D, E, F, G and L were abbreviated as D, E, F, G and L respectively.

When describing the source of information, first the abbreviated names of the schools were indicated, followed by abbreviated names of the participants and then by abbreviated names of the instruments. For example, in SAT3-D the SA stands for School 'A', T3 stands for the third teacher in the school and D indicates that the source of data is from the instrument designated by Appendix-D. In SBD-E the SB stands for School 'B', D stands for the Director of the school and E indicates that the source of data is from the instrument designated by Appendix-E. In SCPH-J the SC stands for School 'C', PH stands for the pedagogic head of the school, the letter J indicates that the source of data is from instrument designated by Appendix-J. Throughout this chapter, the words teacher, participant and respondent were used interchangeably to denote the teachers who participated in this study. Moreover, lesson study cycle and lesson study process were interchangeably used to indicate the teacher development programme.

In Section 5.3 the context of the schools is presented.

5.3 CONTEXT OF THE SCHOOLS

In this section, first the contexts of each school are presented separately and then a summary of the contexts are provided.

5.3.1 School 'A' context

School 'A' is a government school on the outskirts of Asmara, Eritrea. It was built in 1947 on an area of about 11,618 square metres. It is one of the oldest and biggest middle schools in Eritrea in terms of

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area and number of students. The school has a library that contains several books for both teachers and students and a computer room with several desktop computers. There was no science laboratory in the school. The school has 26 classrooms, some of which were created by subdividing a big hall into several classrooms. These modified classrooms were narrower and longer than the standard classrooms. All the classrooms, including the standard ones, were dark as the surrounding trees cast their shadow on them. Usually the desks in the classrooms were arranged in rows facing the chalkboards. Some of the classrooms lacked teachers' desks. Many hand-painted posters decorated the buildings on the outside. These posters were related to sciences, social sciences and mathematics. There were no teaching-learning resources displayed inside the classrooms.

School 'A' receives students from seven surrounding elementary schools. Four of these elementary schools are from urban settings while three are from rural areas. Thus, the school caters for students from urban and rural backgrounds. The school operates a shift system, which means that the teachers are required to teach separate groups of students during the morning and afternoon shifts. As of 2013, the school had a population of 1,681 students subdivided into 33 classes. Some of these students attend class in the morning shift and others in the afternoon shift. The average number of students in a class was 51 students. The total number of teachers in the school was 60, making a ratio of one teacher to 28 students. More than 60% of the teachers were males (see Table 5.1). The total number of science teachers in this school was 13 of which six participated in this study.

Table 5.1: Number of teachers, students and class-size in School 'A'

Level	Grade	Students			Teachers			Number of classes	Class-size	Average class-size	Ratio
		F	M	Total	F	M	Total				
	Six	303	323	**626**				12	52		
Middle	Seven	253	245	**498**	23	37	**60**	9	55	**51**	**1:28**
	Eight	288	269	**557**				12	46		
Total		**844**	**837**	**1681**	**23**	**37**	**60**	**33**			

5.3.2 School 'B' context

Like School 'A', School 'B' is a government school located in the North West of Asmara, Eritrea. The school was built in 1987. It is among the big middle schools in Eritrea, in terms of area and number of students. The total area of the school is about 14,770 square metres (bigger than School 'A'). The school has 14 standard classrooms with desks arranged in rows facing the chalkboards. The school has a library and computer room with several desktop computers. There is no science laboratory in this school.

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As was the case with School 'A', School 'B' also receives its student in-take from both urban and rural elementary schools within its catchment area. Three of these elementary schools are from urban settings while one is from a surrounding village. This school serves communities that are mainly of the middle to low income families. The school also operates a shift system. The teachers teach separate groups of students in morning and afternoon sessions. As of 2013, the school had a population of 1,217 students divided into 23 classes. Some of these students attend class in the morning shift and others in the afternoon shift. The average class-size in this school was 53 students. The total number of teachers was 39, making a ratio of one teacher to 31 students. More than 80% of the teachers were males (see Table 5.2). The total number of science teachers in this school was seven of which six participated in this study.

Table 5.2: Number of teachers, students and class-size in School 'B'

Level	Grade	Students			Teachers			Number of classes	Class-size	Average class-size	Ratio
		F	M	Total	F	M	Total				
	Six	221	248	**469**				9	52		
Middle	Seven	170	200	**370**	7	32	**39**	6	62	**53**	**1:31**
	Eight	203	175	**378**				8	47		
Total		**594**	**623**	**1217**	**7**	**32**	**39**	**23**			

5.3.3 School 'C' context

School 'C' is also a government school but it is administered by a community of board. Like all government schools, this school follows the national curriculum and is governed by the rules and regulations of the MoE. Even though the teachers are allocated by the MoE, the school has the liberty to hire additional teachers independently and the community pays the teachers additional salary on top of the basic salary allocated by the MoE.

This school is located in the South West of Asmara. It was constructed, in 1997, in an area of about 3,309 square metres. The students come from a neighbourhood inhabited mainly by middle to high-income families. Top government officials and wealthy families living outside the neighbourhood also send their children to this school, a situation that privileges it over the other schools.

Unlike in other government schools, teachers in this school work either during the morning or afternoon sessions, which means that they are free at the time when their colleagues in the shift-based schools teach the second session. As of 2013, the school had 526 students. The average class-size in this school was 44 students. Student desks are arranged in rows facing the chalkboards. Teachers' desks are situated in the corner of the classrooms next to the chalkboard. The total number of teachers was

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16, making a ratio of one teacher to 33 students. In terms of distribution in gender, 75% of these teachers were males (see Table 5.3). The total number of science teachers in this school were three and all of them participated in this study.

Table 5.3: Number of teachers, students and class-size in School 'C'

Level	Grade	Students			Teachers			Number of classes	Class-size	Average class-size	Ratio
		F	M	Total	F	M	Total				
Middle	Six	93	92	**185**	4	12	**16**	4	46	**44**	**1:33**
	Seven	87	87	**174**				4	44		
	Eight	84	83	**167**				4	42		
Total		**264**	**262**	**526**	**4**	**12**	**16**	**12**			

5.3.4 Summary of the school contexts

In Section 5.3, the context of the three schools was presented. The location of the schools, the classrooms, socio-economic conditions of the students and resources which might have effects on the professional development of the teachers were mentioned. All three schools are government schools. They all follow the same national curriculum and are governed by the rules and regulations of the MoE. Although every school is unique, Schools 'A' and 'B' were similar in terms of their social and cultural setting. Both schools get their student intake from nearby urban and rural elementary schools. However, in School 'C' the students mainly come from high income urban settings. This could have implications on student behaviour and learning during the implementation of lesson study cycles, as the background of the students in the schools differed. School 'C' was found to be more resourced than Schools 'A' and 'B'. Unlike Schools 'A' and 'B', School 'C' is administered by a community of board. This community of board has the liberty to hire teachers besides the ones assigned by the MoE and pay salaries to the teachers on top of the basic salary allocated to them by the MoE. This results in School 'C' being able to attract better teachers than the other two schools. In all the schools, the desks in classrooms were arranged in rows facing to the front and the chalkboards. This type of arrangement may not promote student-centred learning, because of the difficulty of moving the desks in order to suit group work and other related student-centred activities. There were no charts and other teaching-learning resources displayed inside the classrooms of any of the schools. From the researcher's personal experience as teacher the reasons why teachers do not display teaching-learning resources in the classrooms could be that the students destroy or spoil them. However, some painted posters related to sciences, social sciences and mathematics were visible on the outside walls of School 'A'. Besides their aesthetic functions, these posters can also constantly remind students of their subjects of

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study. The average class sizes were 51, 53 and 44 for Schools 'A', 'B' and 'C' respectively (see Table 5.1, Table 5.2 and Table 5.3).

In the next section the background information of the participants and their training needs are discussed.

5.4 BACKGROUND INFORMATION OF THE PARTICIPANTS AND THEIR TRAINING NEEDS

In this section, Section 5.4, the background information and training needs of the participants from the three schools are discussed. Before the commencement of the workshops, the science teachers who were identified for this study were asked to complete the Participants Background Information Questionnaire (see Appendix-D). Although the school directors and the pedagogic heads participated in the workshops, they were not requested to complete this questionnaire because the focus of the study was on science teachers. The summaries of the Participant Background Information for Schools 'A', 'B' and 'C' are attached as Appendix-D-1, D-2 and D-3. The profiles of these teachers obtained from the questionnaire is summarised in Table 5.4 with respect to school, gender, age, level of qualification, teaching experience, teachers' workload and professional development experience.

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Table 5.4: School 'A', 'B' and 'C' science teachers' profile

Characteristics	Profile	School 'A' (N=6)	School 'B' (N=6)	School 'C' (N=3)
Gender	Female	2	1	1
	Male	4	5	2
Age	20-29	2	2	-
	30-39	-	2	1
	40-49	1	-	1
	50-59	1	1	1
	≥ 60	2	1	-
Level of qualification	12+TTI[2]	1	-	-
	12+1[3]	1	-	1
	Diploma[4]	4	6	2
Number of years in teaching	≤5	2	2	-
	6-10	-	1	-
	11-15	-	1	1
	16-25	-	-	1
	26-35	2	-	1
	>35	2	2	-
Teachers' workload (periods per week)	18	4	5	-
	21	1	1	-
	24	1	-	2
	28	-	-	1
Had professional development opportunities	Yes	6	3	3
	No	-	3	-

5.4.1 Background information and training needs of the participants in School 'A'

In School 'A', this investigation was begun with five participating science teachers. After one semester, two of them dropped out; one teacher resigned and travelled abroad whilst the other was transferred to the English department. However, the director insisted that the teacher transferred to the English department still participate in the study. The teacher under discussion was also willing to continue participating in the study; nonetheless, since the focus of the study was on science teachers, the researcher replaced her with another science teacher. The teacher who resigned was not replaced. Thus, the total number of science teachers who participated in this study was six. Three of them

[2] 12+TTI stands for a candidate who attended the one-year certification programme at the Teacher Training Institute (TTI) after completion of secondary school level. Such teachers are trained to teach at elementary school level. Hence they are unqualified to teach at middle school level.

[3] 12+1 stands for one year university level education after completion of secondary school. Such teachers are not trained to be teachers. Hence, they are unqualified to teach at middle school level.

[4] Diploma is the minimum qualification requirement for teaching at middle school level.

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participated in the study for two semesters while the other three participated for one semester. The withdrawal of the two teachers after one semester did not affect the study negatively, because they stayed in the study until the semester ended.

Table 5.4 shows the background information of the teachers who participated in the study. Regarding gender composition, two of the participants were females while four were males[5]. They differed with respect to age, level of qualification, teaching experience, teachers' workload and professional development experience. In terms of age and teaching experience, two of the teachers were relatively young with fewer than ten years of teaching experience. The other four were experienced teachers each with more than 25 years of teaching experience. Regarding qualifications, four of the teachers were qualified to teach in middle schools. The other two were unqualified because they lacked a diploma, the minimum requirement to teach at middle school level. Their teaching workload ranged from 18 to 24 periods per week[6]. In terms of participation in professional development processes, all the teachers indicated that they had participated in some form of professional development. The professional development opportunities they attended focused on methods of teaching, student-centred and interactive pedagogy, lesson planning and new assessment techniques.

In addition to the profiles described in Table 5.4, the Participants Background Information Questionnaire required the teachers to respond to open-ended questions to indicate their training needs. The teachers indicated their feelings and experiences on collaboration, observing a colleague and being observed, reasons for participating in this study and expectations from the study as discussed in subsequent paragraphs. Accompanying the descriptive text, selected quotes, in italics, are used in the presentation of the research findings in order to illustrate the voices of the teachers.

On the matter of their training needs, there were questions in the questionnaire about whether they had ever participated in collaborative activities with their colleagues. All the participant teachers answered in the affirmative. Five of them viewed collaboration as very important while one indicated it as important. All of them agreed that collaboration would help them to share experiences with their colleagues. Their participation in collaborative activities ranged from "*sharing of experiences among new and experienced teachers*" to participating in "*lesson planning*", "*observe and reflect on lessons*", "*evaluation of teaching material*", discussions on "*teacher centred and interactive pedagogy*" and setting "*exams*". When asked about their experiences and feelings concerning observing a colleague, half of the

[5] The majority of teachers in Eritrean schools are males (see Table 2.1).
[6] The duration of one period is 40 minutes.

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teachers indicated that they had observed a colleague before and had felt comfortable with it. One teacher (SAT1-D) appreciated observing colleagues because it enabled him to observe "*strengths*" of a teacher that he could possibly "*adopt [in] his teaching*". Another teacher (SAT6-D) also indicated that he was comfortable observing a colleague because such observation would enable him "*get new ideas, concepts, sharing of experience, know deeply about the lesson and the learners' behaviour and nature of the lesson*". When asked about their feelings with regard to being observed, all of them responded they were comfortable with it. However, one of the teachers (SAT1-D) substantiated his position by indicating that he feels more at ease when observed by a colleague than when observed by a supervisor, because the former is an arrangement between equals and thus creates less "*pressure*" and allows him to "*express* [his] *feelings freely*. Another teacher (SAT4-D) indicated that she felt comfortable being observed by a colleague, because she expected her colleague to give her "*constructive feedback*" that could be useful to "*identify* [her] *strengths and weaknesses*".

When asked to give reasons for agreeing to participate in this research, the participants provided various responses. They indicated that they agreed to participate in this study in order to "*improve the teaching-learning process*", "*share* […] *experience with others and gain best practices from others*" and "*develop collaborating skills*". However, one teacher (SAT1-D) indicated that he was participating in this study because he was "*invited to do so*", which suggests that he had no immediate expectation from the study beyond agreeing to participate. There were also questions about what the teachers' expectations were with regard to the study. The responses varied from getting "*better teaching-learning activities*", to "*improve classroom management*" and to observe and to being "*observed*" by a colleague

5.4.2 Background information and training needs of the participants in School 'B'

In School 'B', this study was begun with four science teachers. After one semester, two of them dropped out[7] and got replaced by two other science teachers. Thus, the total number of science teachers who participated in the study was six. Two of them participated throughout the study, two discontinued after participating for one semester and two new ones joined in the second semester. Thus, two of the teachers participated in the study for two semesters while the remaining four participated for one semester.

Table 5.4 shows the background information of the participant teachers. It indicates that one female and five male teachers participated in the study. The participants differed with respect to age, teaching

[7] One teacher was transferred to another school and another took leave as she got married.

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experience, teachers' workload and professional development experiences. In terms of age and teaching experience, three of the teachers were relatively young with fewer than ten years of teaching experience. The other three had teaching experience of more than ten years. Regarding qualifications, all the teachers held a diploma that qualifies them to teach in middle schools. Their teaching workload ranged from 18 to 21 periods per week. In terms of participation in professional development processes, half of the teachers had participated in some form of professional development while the others had not had any opportunities to participate in professional development processes. This indicates that professional development opportunities are rare in Eritrea. Those who participated indicated that the professional development processes focused on lesson planning, student-centred teaching, classroom management, utilisation of science laboratories and continuous assessment.

In addition to the profiles described in Table 5.4, the Participants Background Information Questionnaire provided extra information as the teachers were required to respond to open-ended questions to indicate their training needs. The teachers indicated their feelings and experiences on collaboration, observing a colleague and being observed, reasons for participating in this study and expectations from the study as discussed in subsequent paragraphs. While describing the findings, selected quotations, in italics, are used to illustrate the voices of the teachers and to accompany the descriptive text.

Regarding their feelings about collaborating with colleagues, all the teachers agreed on its importance. They unanimously affirmed that collaborating with one another helps in sharing of ideas and experiences because *two heads are better than one*. When enquired about their experiences of participating in collaborative activities, half of the teachers indicated that they have worked collaboratively with colleagues in activities such as lesson planning, lesson note preparation and the setting of examinations. The teachers who provided affirmative responses indicated that the collaboration that they had experienced helped them to solve problems and improve the teaching-learning process. Regarding their feelings concerning observing a colleague, only half of the teachers responded to the question and indicated that they were comfortable with it because observing colleagues would provide an opportunity for the observer teacher to "*learn a lot of things*" and the observed to get "*constructive feedback*". Regarding their feelings about being observed, one teacher did not respond to the question whilst the other five teachers indicated that they were comfortable with being observed because they would receive benefits that could help them to develop "*confidence in* [their] *language* and identify their "*weaknesses and improve* [their] *teaching-learning methods*". Regarding the reasons for participating in this research, one of the teachers indicated that he was participating because he was "*simply selected*" whilst others indicated that they participated in order to gain "*knowledge about lesson study*" and "*improve the methods of teaching and learning activities and*

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produce best citizens equivalent [to citizens in] other countries." When asked about their expectations with regard to participating in this research, the majority of the teachers replied that they expected to gain some knowledge about lesson study and share their experience with other teachers. However, one teacher indicated that he expected "*certification*".

5.4.3 Background information and training needs of the participants in School 'C'

In School 'C', one female and two male teachers participated in this study (see Table 5.4). Like in the other schools, these teachers differed with respect to age, teaching experience, teachers' workload and professional development experiences. In terms of teaching experience, all were experienced teachers with more than 10 years of teaching experience. Regarding qualifications, two held a diploma that qualifies them to teach in middle schools while the third teacher is not qualified to teach in middle schools. Their teaching workload ranged from 24 to 28 periods per week. In terms of participation in professional development processes, all of the teachers had participated in some form of professional development. They indicated that the professional development programmes they had participated in focused on orientations about lesson planning, student-centred teaching, classroom management, utilisation of science laboratories and continuous assessment.

In addition to the profiles described in Table 5.4, the Participants Background Information Questionnaire provided extra information as teachers were requested to write their responses to open-ended questions and indicate their feelings and experiences on collaboration and observation. The questionnaire also included questions about their expectations of this study, as discussed in the subsequent paragraphs. While presenting the findings, a few selected quotations in italics were integrated with the descriptive text to illustrate the voices of the teachers. Regarding their feelings about collaboration, the teachers unanimously affirmed the importance of collaborating with one another. They indicated that collaboration helps teachers to share ideas and experiences regarding teaching methods, assessment and classroom management with colleagues. When asked about their experiences of collaboration, two teachers indicated that the collaboration that they had practised helped them to exchange ideas on teaching methods, engaging students in learning and means of solving student problems. Moreover, they indicated that they had received "*constructive feedback*" from colleagues. When asked about their feelings regarding observing a colleague, two of the teachers indicated that they are comfortable with observing colleagues because it enables them to gain teaching experience that "*improves the shortcoming of* [their] *teaching methods*". The teachers also indicated that they felt comfortable with being observed by their colleagues. One teacher, for example, indicated that she felt comfortable because she expected to receive feedback from colleagues that would help

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her to "*correct [her] weaknesses*". The participants also indicated that their motivations for participating in this study were to "*gain new knowledge and experience*", "*bring about changes in the teaching-learning process*" and "*have better understanding and knowledge about teaching*". When asked about their expectations from participating in this research, all the teachers expected to gain new knowledge. One teacher said: "*participating in this [research] will help me to improve my job as a teacher*". Another teachers also expected to "*improve* [his] *career and to have better knowledge*".

5.4.4 Summary of the background information of the participants and their training needs

In Section 5.4 the background information of the participants in terms of their gender, age, teaching experience, levels of qualification, teachers' workload and professional development experiences is presented because these factors might influence the learning process. With regard to gender, four out of the 15 participants were females. In terms of age, the teachers in Schools 'A' and 'C' were more mature than those in School 'B'. Two thirds of the teachers in Schools 'A' and 'C' and one third of those in School 'B' were more than 40 years of age. Another background variable is the teaching experience of the teachers in the three schools. The teachers in Schools 'A' and 'C' were more experienced than those in School 'B'. Four of the six teachers in School 'A', all the teachers in School 'C' and half of those in School 'B' had more than ten years of experience. On the other hand, three of the six teachers in School 'B' and two of the six in School 'A' were beginners (meaning they had one to ten years of experience) (see Table 5.4).

Table 5.4 further describes qualification of the teachers. All the teachers in School 'B' were qualified to teach in middle schools. One third of the teachers in Schools 'A' and 'C' were not qualified to teach at middle school level because they lacked a teaching diploma, a minimum qualification required to teach in middle schools in Eritrea. In terms of teaching workload, the teachers in School 'C' had higher teaching workloads than teachers in Schools 'A' and 'B'. It is assumed that teachers might not be able to carry out their duties effectively when they are overloaded with work. In Schools 'A' and 'B', the teachers worked both morning and afternoon shifts, whereas in School 'C' teachers worked only one shift, either the morning shift or the afternoon shift. Despite working only one shift and having more free time, the researcher found it more difficult to schedule appointments with School 'C' teachers when compared to Schools 'A' and 'B' teachers. This challenge is further discussed in Section 5.6.6 of this chapter.

In terms of participation in professional development processes, all the teachers in Schools 'A' and 'C' indicated that they had participated in some form of professional development programmes. However, half of the teachers in School 'B' had not had any chance of participating in professional development

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processes. Those teachers who had attended indicated that the workshops focussed on issues such as methods of teaching, student-centred and interactive pedagogy, questioning skills, special needs, lesson planning, classroom management, orientations on the new curriculum, utilisation of science laboratories and continuous assessment. Moreover, all the teachers from the three schools valued collaborative engagement with their colleagues. They indicated that collaboration had helped them to share experiences. Regarding observing a colleague, about half of the teachers indicated that they had observed their colleagues teaching and also felt comfortable about being observed by their colleagues because they felt such engagements could yield mutual benefits.

In Section 5.5 the reaction of the participants to lesson study training workshops is presented.

5.5 REACTIONS TO THE LESSON STUDY TRAINING WORKSHOPS

Three workshops were conducted in the course of this project (see Section 4.3.3). But in this section, the results of only the first two workshops will be presented. No data were generated from the last workshop, as it was a concluding workshop. Information sought from respondents was guided by the first research sub-question. This question was: "*What are teachers' reactions to the professional development arrangement?"* The participants' initial reactions to the organisation of the workshops, the organisers, the usefulness of the reading materials and the experience they gained from the workshops is investigated. According to Guskey (2000), initial reactions of teachers to a teacher development initiative are prerequisites to higher level learning. The premise is that if participants develop positive feelings at the first level, they will reap benefits from the teacher development programme at higher levels.

To obtain the participants' reactions to the workshops, the participants were requested to complete the Lesson Study Workshop Evaluation Questionnaire immediately after the workshops (Appendix-E)[8]. The questionnaire was designed in such a way that the participants were requested to tick either "Yes" or "No" options and subsequently to motivate their choices in an open-ended fashion. Only the qualitative data were analysed. These data were coded and categorised using the process discussed in Section 4.4.2. Hence, four generic categories, each with two or more sub-categories reflecting different aspects of the teachers' reactions were identified. The result for each school is structured based on the categories conceptualised in Figure 5.1 and Table 5.5.

[8] The participants completed this questionnaire once either during the introductory or follow-up workshops.

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Figure 5.1: Participants' reactions to the lesson study training workshops

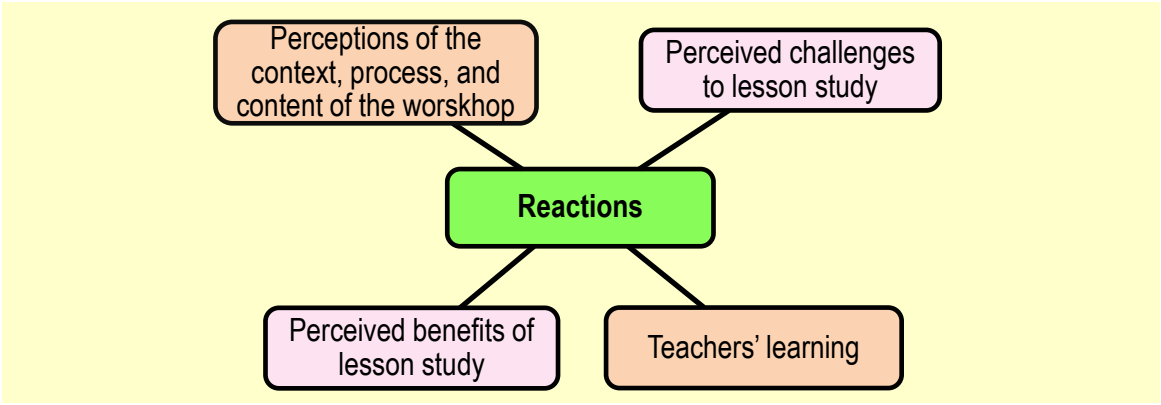

Table 5.5: Participants' reactions to lesson study training workshops

Main categories	Generic categories	Subcategories
Participants' reactions	Context, process and content of workshop	Context of workshop Process of workshop Content of workshop
	Teachers' learning	Enhance knowledge and understanding Enhance teaching methods
	Perceived benefits of lesson study	Promote collegiality among teachers Enhance teacher confidence Identify difficult topics Identify teacher weaknesses and strengths Enhance motivation of students Promote student participation and learning Promote sharing of ideas and experiences Promote teaching methods Promote observing one another
	Perceived challenges of lesson study	Large class-size Poor living conditions of teachers Curriculum overload Lack of suitable environment for implementation Students' lack of interest

5.5.1 Reactions to the lesson study training workshops in School 'A'

5.5.1.1 Reactions to the context, process and content of the lesson study training workshops

According to Guskey (2000), teachers' reactions to professional development programmes can be classified in three categories, namely reactions towards context, process and content. Context refers to the setting in which the professional development experience took place (Guskey, 2000). In School 'A',

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the participants valued the contexts in which the workshops were conducted. Despite initial hitches such as unreliable electricity and the absence of a sound system, the majority of the participants described the setting of the workshops as suitable. Due the lack of electricity the researcher could not do a power point presentation. The participants described the venues as well-lit, quiet and within travelling distance. They also appreciated the food and drinks served during the workshops as indicated below:

> *The place was suitable because there were nothing to be seen through the windows and it was quiet place and there was no sound that distracts us. (SAT1-E)*
>
> *It was suitable because it has enough tables, chairs and even light was good. (SAT3-E)*
>
> *[…] distance of the venue was suitable. (SAT6-E)*
>
> *It was enjoyable because there was enough time to break, enough water and good lunch (SAT3-E)*

Process deals with the delivery and organisation of the workshops (Guskey, 2000). All the participants in this school appreciated the nature of presentation, the timing and time management, and the expertise of the workshop facilitators. They described the workshops as well-presented, well-organised and effective, as indicated below:

> *[…] it was well-organised workshop. (SAD-E)*
>
> *I found the methods helpful. (SAT1-E)*
>
> *It was convenient because it took place outside the school schedule. (SAT1-E)*
>
> *[…] the workshop was completed effectively within specified time. (SAT6-E)*

In contrast to the above comments, the director of the school indicated that the timing of the first workshop interfered with their Saturday teaching schedule. Although the participants did not indicate this in their responses to the questionnaire, the researcher discovered that Saturday classes were in place from which the teachers earn some extra income. Therefore, the director would have preferred the workshops to have been conducted at another time.

Content refers to participants' prior knowledge about lesson study, their reactions to the theory presentation, the usefulness of the reading materials and their confidence when implementing lesson study in their school. All the participants stated that the concept of lesson study was new to them and that they had never heard of it prior to attending the first workshop. In this school, the participants found the content of the workshops enjoyable, helpful, informative, relevant and valuable. Many opined that they obtained valuable information about the lesson study process and in sufficient detail.

> *[…] it provided us sufficient information on how to implement lesson study. (SAT4-E)*

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However, the participants felt that workshops of longer duration would have been more beneficial. For instance, they posited that the theory part was not presented in sufficient detail due to the hasty nature of the presentation. Some of their comments are given below:

> *Rushing was observed in order to cover all the topics within the two days of workshop. I would consider this as a deficiency. (SAT3-E)*
>
> *It is not sufficient but it is enough for starting the work. (SAD-E)*

When asked to indicate the sessions which were most successful, the participants in this school indicated that they found the reading materials and the video sessions most effective. Some of their comments are given below:

> *Provision of printed papers and explanation were much clearer than any workshop that I have taken. (SAT5-E)*
>
> *The video session […] enabled us to see lesson study practically. (SAT4-E)*

In summary, the above responses indicate that the teachers were left with a good impression of the workshops. They felt that the workshops were successful in terms of equipping them with the necessary knowledge and skills that would enable them to implement lesson study in their school. As a result, the participants expressed their confidence and commitment to implement lesson study in their school. They stated:

> *I want to implement what I have learned in my school. (SAT1-E)*
>
> *I am confident that I will be able to implement what I have learned, but I am not sure of what would happen in reality. (SAT3-E)*

In the subsequent section the teachers' learning experiences gained from the workshops are discussed.

5.5.1.2 Learning from the lesson study training workshops

In addition to valuing the context, process and content, the participants from School 'A' were also of the opinion that they had learned from the workshops. The majority of the participants indicated that they had acquired new knowledge and improved their skills due to their participation in the workshops.

> *We came to know new knowledge that we did not know it before. (SAD-E)*
>
> *I have gained a lot from this lesson study because my understanding was limited. (SAT5-E)*

As a result of the new knowledge acquired during the workshops, the participants felt that they would now be able to teach, with confidence, some of the topics that are perceived to be difficult. One teacher, for example, provided the following comment:

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> *[…] we have learned two things, namely, how to teach easy lessons and what means to use while teaching difficult content. (SAT1-E)*

In contrast to the affirmative responses mentioned above, others indicated that they did not acquire any new knowledge during the training. However, they acknowledged that they had acquired new ideas that would support their earlier ideas. Their comments are as follows:

> *It is difficult for me to say that the workshop has increased my understanding, but it served as a reference for me. (SAD-E)*
>
> *I did not get new information, but I got some additional ideas that support my earlier ideas. (SAT1-E)*

In summary, although some of the participants doubted whether they had obtained new knowledge, the workshops appear to have been effective in providing the participants with the necessary knowledge and skills on lesson study.

In the following section, the perceived benefits that the participants can reap by participating in lesson study are dealt with.

5.5.1.3 Perceived benefits of lesson study

The participants in this school anticipated to get several benefits for themselves and their students. They indicated that participation in the lesson study cycles would enhance their confidence, help them identify and teach difficult topics, identify their weaknesses and strengths, reduce their burden and promote their collegiality as captured in the statements below:

> *Because it helped us how to teach, plan a lesson, identify student problems and how to identify difficult topics. (SAT3-E)*
>
> *[…] it helps us to identify our weaknesses and strengths. (SAT6-E)*
>
> *Because it involves ideas that originate from many heads, it helps us to work collaboratively and learn from one another. (SAD-E)*

To further express their satisfaction, all the participants wished for similar training opportunities for themselves and for their colleagues.

> *I would recommend similar lesson study to all my colleagues. Because as teachers we all have different skills and knowledge such workshops would help us to collaborate and come to similar understanding. (SAT5-E)*
>
> *[…] this kind or workshop is very interesting and very important for all Eritrean teachers who are using the traditional way. (SAT3-E)*

Regarding its impact on their students, the participants in this school believed that the lesson study cycles would motivate and promote the participation of their students. Some of their comments are given below:

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> *[…] it helps teachers to assess the status of their students and it initiates active participation of students, initiates competition of students among themselves and motivates students to study more. (SAT6-E)*

Based on the above responses it seems that the workshops enhanced the capacity of the participants and thus puts them in a good stead to anticipate benefits for themselves and their students. Nonetheless, the participants also anticipated some challenges as discussed in the following section.

5.5.1.4 Perceived challenges from lesson study

Although the teachers had affirmative expectation from their participation in the lesson study cycles, they also predicted some challenges that would hinder lesson study. They indicated that large class-sizes, their poor living conditions, curriculum overload, lack of suitable environment and students' lack of interest as possible challenges to the implementation of lesson study in their school.

> *[…] it is difficult to implement it with the available situation in our country where we have about 56 students in a class. Moreover, the lack of interest and motivation of the students will make it difficult to implement it. (SAT6-E)*
>
> *[…] large number of students in a class and the lack of motivation and interest of the students might be hindrance for its implementation. (SAT6-E)*
>
> *I would say the teachers would implement lesson study if […] their salaries are improved. (SAT6-E)*

The above responses reveal concerns that the participants harboured regarding the implementation of lesson study in their school. To be able to identify the possible challenges in advance is a good sign, because it would enable the participants to work towards minimising the challenge or solving the problem.

In summary, the majority of the participants in School 'A' valued the context, content and process of the workshops. They appreciated the venues, organisation and presentation of the workshops. Even though the director indicated that the introductory workshop interfered with the Saturday schedule where, they could earn some extra income, they found the time management effective. They indicated that participation in lesson study cycles would enhance their confidence, help them identify and teach topics that are difficult for students, identify their weaknesses and strengths, reduce their burden and promote collegiality. Although the teachers expected to reap benefits from lesson study, they also anticipated some challenges such as class-sizes, their poor living conditions, curriculum overload, lack of suitable environment and students' lack of interest that would affect the implementation of lesson study in classrooms. Exposure of the participants to the lesson study training workshops appears to have enhanced their confidence to implement lesson study in their schools and make positive contributions towards students' learning.

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5.5.2 Reactions to the lesson study training workshops in School 'B'

5.5.2.1 Reactions to the context, process and content of the lesson study training workshops

Context refers to the setting in which the professional development experience takes place (Guskey, 2000). The majority of the participants found the setting of the workshops suitable. They appreciated the venue because it was located at the centre of the city and within a suitable travel distance. They found the atmosphere of the conference hall conducive. However, the pedagogic head found it unsuitable for group discussion as the noise made by one group disturbed other groups as the groups were in hearing distance of one another. The director of the school was also not comfortable with climbing up and down the stairs. These comments are quoted below:

> *To be [conducted] in the Ministry that is okay because it is at centre. But to climb up, it is time wasting. (SBD-E)*
>
> *Narrow to discuss freely without noise. (SBPH-E)*

According to Guskey (2000), process deals with the conduct and organisation of a professional development experience. Three subcategories that describe the process emerged from the data, namely organisation of the workshops, time management and the expertise of the workshop facilitators. Regarding the organisation of the workshops, the participants expressed their satisfaction. They particularly found the technical organisation and methods used to be effective. Their comments are given below:

> *It was effectively organised. (SBD-E)*
>
> *[…] all the sessions were effective. (SBT3-E)*

The participants also found the pedagogical quality of the facilitators helpful. They indicated that the workshops were conducted at a convenient time and did not clash with their daily activities. They opined that time was effectively utilised and all the sessions were implemented based on the schedule. However, they felt the workshop to be too short to equip them with the necessary knowledge and skills. Hence, they suggested allotting sufficient time for similar workshops in the future. One of the comments is given below:

> *This workshop was relevant and very good. However, sufficient time was not allocated to it. It is difficult to transmit the required knowledge within this limited time. I would suggest that more time should be allocated to it in the future. (SBT3-E)*

Four subcategories that described the content of the workshops emerged from the data, namely participants' prior knowledge about lesson study, their reactions to the theory presentation, the usefulness of the reading materials and their confidence when implementing lesson study in their

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school. Regarding their prior knowledge about lesson study, the participants indicated that the concept of lesson study was new to them. They indicated that the various activities of the workshops met with their expectations and hence they found the workshops enjoyable, helpful, informative, relevant and valuable. Many of the participants were of the opinion that the workshops provided them with sufficient information. However, some of them felt otherwise and stated that due to the time limitation the topics were not addressed in sufficient detail. The majority of the participants found the workshop materials useful. They also appreciated the video session. Some of their comments are given below:

> *No doubt they are good materials to develop my knowledge for the future. (SBPH-E)*
>
> *The hand-outs and the video that we have observed (that of Lewis) were effective. (SBT1-E)*

Based on the above responses, it appeared that the participants valued the setting, content and organisation of the workshops. It seems that the workshops provided the participants with the necessary knowledge and skills for lesson study. As a result, they indicated having confidence in their ability to implement lesson study in their school, as indicated in the following comment.

> *Since two heads are better than one head, working collaboratively is more productive than working individually. Therefore, I am confident that we will work like this with teachers in our department and with our students. (SBT3-E)*

In the subsequent section what teachers learnt in the workshops is discussed.

5.5.2.2 Learning from the lesson study training workshops

In School 'B', the participants did not only value the context, process and content of the workshops but also indicated that they had learned from the workshops. In their view, they had acquired new knowledge on lesson study, lesson planning and teaching methods. All the participants indicated that they had developed positive attitudes towards lesson study and that they supported the idea behind lesson study. Some of their comments are given below:

> *The workshop was very useful because I got new information and knowledge; I shared instructions and teaching methods or knowledge in my work. (SBT2-E)*
>
> *It helped us [with] how to prepare the lesson plan and how to apply it. (SBT6-E)*
>
> *[…] it helped us [regarding] how to apply the different type of teaching-learning activity at one time. (SBT6-E)*

From the above responses, it appears that the workshops were effective in equipping the participants with the necessary knowledge and skills on lesson study. From these statements, it seems that the participants obtained sound knowledge and skills and would be able to implement lesson study in their school.

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In the following section the benefits that the participants expected to acquire from implementing lesson study in their school, are dealt with.

5.5.2.3 Perceived benefits of lesson study

In School 'B', the participants anticipated reaping several benefits by implementing lesson study in their classrooms. They were optimistic that lesson study would enable them to observe one another's lessons, promote collegiality among themselves and promote the sharing of ideas and experiences. Some of their comments are given below:

> *The lesson study helps to cooperate among the teachers, to share experiences and also to share ideas on the lesson study. (SBT6-E)*
>
> *Observation will be done by all teachers teaching science. It helps share experience and share ideas. (SBT5-E)*
>
> *The significance is to the idea about working together collaboratively. (SBT4-E)*

It is evident from the above that the participants valued lesson study and they wished for more training opportunities for themselves and for their colleagues. Their satisfaction is expressed in the following responses:

> *It was good and attractive workshop. I can only say to have such kind of workshop for other members of our staff if there is possibility. (SBD-E)*
>
> *We have to be given like this workshop another time. (SBT2-E)*

In summary, the majority of the participants appreciated the choice of venue of the workshops and described them as well-lit, quiet and within travelling distance, even though some thought the venue was not conducive to discussion. They found the technical organisation and methods of the workshops effective. In addition to valuing the context, content and process of the workshops, the teachers indicated that they had acquired new knowledge on lesson study, lesson planning and teaching methods and had developed positive attitudes towards lesson study. Moreover, the teachers expected that lesson study would enable them to observe one another's lessons, promote collegiality and enhance the sharing of ideas and experiences. Overall, it seems that the lesson study training workshops enhanced the participants' confidence in their ability to implement lesson study in their school.

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5.5.3 Reactions to the lesson study training workshops in School 'C'

5.5.3.1 Reactions to the context, process and content of the lesson study training workshops

The participants in School 'C' unanimously appreciated the pedagogical quality of workshop organisers. They also found the setting of the workshops suitable. However, one participant indicated that he struggled to find the venue within the MoE building as there were no physical directions to the workshop venue. The responses of the participants regarding the process of the workshops were categorised into the nature of the organisation of the workshops, time management and the expertise of the organisers. The participants appreciated the technical organisation of the workshops. When asked to indicate the most effective and the least effective sessions of the workshops, the participants provided varied responses. One participant found all sessions of the workshops effective while the majority of the participants appreciated the video session. However, one participant described the theory presentation session as least effective.

> *I think the least effective session of this workshop was the time between 8:00 AM up to 12:00 PM of Saturday in which instead of showing us the exact video that shows, the real implementation of lesson study, we were given an explanation of how to conduct it. So I think for the future it shouldn't be like this. (SCT3-E)*

Moreover, the participants in School 'C' indicated that the timing of the introductory workshop was not convenient. Although the participants themselves did not give a hint about any clash in their schedule, the researcher discovered that the teachers in school 'C' had Saturday classes from which they earn some extra income. In addition, the majority of the teachers felt the workshop was too short to equip them with the necessary knowledge and skills and suggested the allocation of more time in the future. Their comments are given below:

> *The time given for the workshop was very short. (SCT1-E)*
>
> *More time is needed to know more about the discussion. (SCT2-E)*

Regarding the content of the workshops, the responses are organised as participants' prior knowledge about lesson study, their reactions to the content presentation, the usefulness of the reading materials and their confidence in their ability to implement lesson study in their school. The majority of the participants indicated that the concept or theory behind lesson study was familiar to them. However, one indicated that she had not had any prior knowledge about lesson study. Regarding content presentation, all the participants indicated that the workshops were informative, relevant, enjoyable, helpful and valuable. Moreover, the participants in this school unanimously appreciated the reading materials that were distributed before and during the workshops. Some comments are given below:

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It refreshes me that can help or makes me powerful. (SCT2-E)

[…] I understand that it [the workshop] was very helpful and enjoyable. (SCPH-E)

Based on the above responses, it appears that the participants in this school valued the setting, content and organisation of the workshops in equipping them with the necessary knowledge and skills on lesson study. As a result, they indicated that they had confidence in their ability to implement lesson study in their school. One of such comments is given below:

Because it is constructive, make you to be well organised with your lesson and your student. Since the school culture is convenient so I am confident to implement. (SCT1-E)

In the subsequent section teachers' learning is dealt with.

5.5.3.2 Learning from the lesson study training workshops

In addition to valuing the context, process and content of the workshops, the participants in this school perceived that they had learned from the workshops. In their view, the workshops enhanced their knowledge and understanding about lesson study and changed their attitudes and beliefs towards students' learning. The teachers indicated that they support the idea behind lesson study because lesson study enhances teamwork, improves teaching and enhances students' learning. Some of the comments reflecting these suggestions are given below:

[…] I got idea and shared ideas. (SCT1-E)

Our teachers get more information of lesson study so that they can implement in their respective schools. (SCPH-E)

On the basis of these statements it is evident that the participants obtained sound knowledge and skills that would enable them to implement lesson study in their schools.

In the following section the anticipated benefits that the teachers will reap by participating in lesson study, are dealt with.

5.5.3.3 Perceived benefits of lesson study

The teachers in School 'C' anticipate that they will gain several benefits by implementing lesson study in their classrooms. They expect that lesson study will enhance their learning, confidence, teaching methods, collaborative work, the sharing of ideas and experiences and students' learning. Some of their comments are given below:

Give supportive ideas. Makes you to be confident in the lesson (SCT1-E)

It helps me on my teaching. (SCT2-E)

[…] it is helpful in making the students understand the lesson […]. (SCT3-E)

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Finally, the participants wished for similar training opportunities for themselves and their colleagues. One teacher provided the following comment.

> *[…] it would be even better if all the teachers could participate in a workshop like this […] I think by all means a workshop like this must be given in the future that could involve all the teachers. (SCT3-E)*

In summary, the teachers in School 'C' appreciated the setting, organisation, time management and expertise of the organisers. The teachers indicated that they had learned from the workshops. Moreover, they expected that lesson study would enhance their learning, confidence, teaching methods, collaborative work, the sharing of ideas and experiences and students' learning.

5.5.4 Interpretive summary of reactions to the lesson study training workshops

In Section 5.5 the first research sub-question that is based on Guskey's (2000) first level, is answered. This question focuses on the participants' initial reactions to the workshops. In this study it was necessary to explore the initial reactions and satisfaction of the teachers because of its direct effect on the teachers' learning at higher levels (Guskey, 2000). According to Guskey (2000), initial reactions can be analysed in terms of context, process and content. Context deals with whether the participants were satisfied with the food and drinks and comfort of the workshop settings (Guskey, 2000). The results revealed that the majority of the participants appreciated the contexts in which the workshops were conducted. They appreciated the food and drinks served during the workshops. They appreciated the venues of the workshops and described them as well-lit, quiet and within travelling distance. However, a pedagogic head from School 'B', found one venue unsuitable for group discussion as the noise of one group created distraction to the other groups as the groups were within hearing distance of one another. Process refers to whether the organisation of the workshops made sense and whether the organisers were knowledgeable and helpful (Guskey, 2000). All the teachers appreciated the overall organisation of the workshops. Apart from power shedding experienced during the introductory workshop, all the participants appreciated the theory presentation and video demonstration sessions. They found both the time management and expertise of the organisers effective. However, the introductory workshop interfered with the Saturday schedule of Schools 'A' and 'C' from which they could earn some extra income. The teachers unanimously indicated that they would have preferred longer workshops as these workshops were too short to fully equip them with the necessary knowledge and skills. They recommended longer duration in the future when similar workshops are conducted.

Finally, content refers to the usefulness of the materials and the presentations (Guskey, 2000). The results regarding content were presented in terms of participants' prior knowledge about lesson study, their reactions to the content presentation, the usefulness of the reading materials and their confidence

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in their ability to implement lesson study in their school. The majority of the participants indicated that the concept of lesson study was unfamiliar to them. Exposure of the teachers to such new concepts and ideas fits in with the professional dimension of Bell and Gilberts' (1996) teacher development model. Regarding content, all the participants found the workshops informative and relevant. Many appreciated the reading materials and video session. However, some of them felt otherwise and indicated that due to the limited time the topics were not addressed in sufficient detail. Regarding their readiness to implement lesson study in their schools, the participants exhibited mixed reactions with the majority showing enthusiasm and willingness to implement lesson study in their classrooms while few seemed to doubt its applicability to the Eritrean context (see Sections 5.5.1.1, 5.5.2.1 and 5.5.3.1).

In addition to appreciating the context, process and content, the teachers indicated that they had learned from the workshops. The majority of them indicated that they had gained new subject knowledge, acquired new skills and developed a positive attitude towards lesson study and students' learning. All the teachers seem to have appreciated the idea behind lesson study because they expected lesson study to enhance teamwork, improve teaching and boost students' learning. These initial feelings, in the opinion of Bell and Gilbert (1996), highlight development of teachers in the professional dimension (Bell & Gilbert, 1996) (see Sections 5.5.1.2, 5.5.2.2 and 5.5.3.2).

Regarding positive expectations, all the teachers expected to acquire benefits by participating in lesson study. They indicated that lesson study would enhance their confidence, teaching methods, collegiality and collaboration, and the sharing of ideas and experiences. The teachers also indicated that lesson study would enable them to identify topics that are difficult for students, identify their weaknesses and strengths and observe one another's lessons. Moreover, they wished for more training opportunities for themselves and recommended similar workshops for their colleagues. The participants from School 'A' perceived that lesson study would enhance student motivation, participation and learning (for perceived benefits see Sections 5.5.1.3, 5.5.2.3 and 5.5.3.3).

Although most of the teachers from the three schools had strong positive expectations from lesson study, only participants from School 'A' anticipated potential problems. They predicted that problems such as class-size, their poor living conditions, curriculum overload, lack of suitable environment and students' lack of interest would hinder their implementation of lesson study at classroom level (see Section 5.5.1.4). The ability to identify concerns implies that the participants in School 'A' have conceptualised lesson study. Guskey (2000) considers the ability of teachers to identify concerns as an important affective dimension in the change process. He notes that concerns evolve when individuals

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are faced with demands for improvement and change and when they become familiar with the change and related practices (Guskey, 2000).

Although the teachers who participated in this study described the workshops as effective and helpful, much of the literature show scepticism about the effectiveness of such one-shot workshops (Guskey, 1994; Lieberman, 1995; Feiman-Nemser, 2001; Kennedy, 2005; Fullan, 2007; Guskey & Yoon, 2009; Loucks-Horsley, et al., 2010). The reason the teachers who participated in this study appreciated and described the workshops as effective could be due to three reasons. Firstly, teachers in Eritrea rarely participate in such professional development strategies. They might have considered participating in the lesson study workshops as a privilege. Thus, they found it to be valuable and effective. Secondly, the activities of the workshop were organised on the basis of an effective professional development model that allowed for the active participation of the teachers (Garet, et al., 2001); they were relevant to the day-to-day practice of teachers (Guskey, 2000) and organised based on teachers' identified needs (Spark, 2002; Loucks-Horsley, et al., 2010). Lastly, since the researcher was aware that using workshops alone will not contribute to the achievement of the intended outcomes, i.e. enhancing teachers' learning and classroom practices, he designed a professional development strategy that combined workshops with classroom practice (see also 3.5.2). The strategy of combining two or more professional development models is supported in the literature (Kennedy, 2005; Loucks-Horsley, et al., 2010). This arrangement provided the teachers with the opportunity to practise in their classrooms what they had learned at the workshops. Hence, they reported their satisfaction with the arrangement and organisation of the workshops and indicated that the workshops helped them to gain new knowledge and skills. Likewise, these perceptions with regard to satisfaction and learning corroborates Joyce and Showers' (2002) statement that a systematic combination of different training components leads to effective learning and increases transfer of what teachers have learned into their classrooms. Moreover, teachers indicated that participation in the workshops enabled them to network with colleagues from different schools.

In summary, all the participants reacted positively towards the workshops. Several elements ensured the satisfaction of the participants. They found the setting, content and organisation of the workshops useful, enjoyable, helpful, informative, relevant and valuable. They indicated that the theory presentation and demonstration sessions equipped them with the necessary knowledge and skills to implement lesson study in their schools. The participants were also able to identify the possible benefits from lesson study and the elements that would challenge them in the implementation of lesson study. In addition to indicating their satisfaction, the participants indicated their readiness and confidence in their ability to implement lesson study in their schools. Guskey's (2000) assertion, that teachers' initial

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satisfaction with the context, content and process of professional development confirms its quality is clearly supported by these findings.

In Section 5.6, the effects of lesson study cycles on teachers' learning and classroom practice is discussed.

5.6 EXPLORING THE EFFECTS OF LESSON STUDY ON TEACHERS' LEARNING AND CLASSROOM PRACTICE

In Section 5.5 the reactions of the participants towards the lesson study training workshops was reported. In this Section 5.6 the effects of lesson study on the participating teachers' learning and classroom practices is discussed. During the lesson study cycles, the teachers were requested to complete the Research Lesson Observation Forms (Appendix-F), the Lesson Study Report (administered at the end of lesson study cycle) (Appendix-G), and the post-debriefing Team Member Log (Appendix-L). The teachers were requested to give their responses to these documents in either English or *Tigrigna*. The researcher also recorded his observations using a format developed for it (Appendix-I). Additionally, focus group interviews were conducted with the teachers (Appendix-H1, H2 and H3) and school directors and pedagogic heads (Appendix-J). The data generated through these instruments (except Appendix-I) were coded and categorised using the processes discussed in Section 4.4.2.

The six research sub-questions were used to categorise the data and structure the presentation of the result, and their interconnectedness is represented in Figure 5.2.

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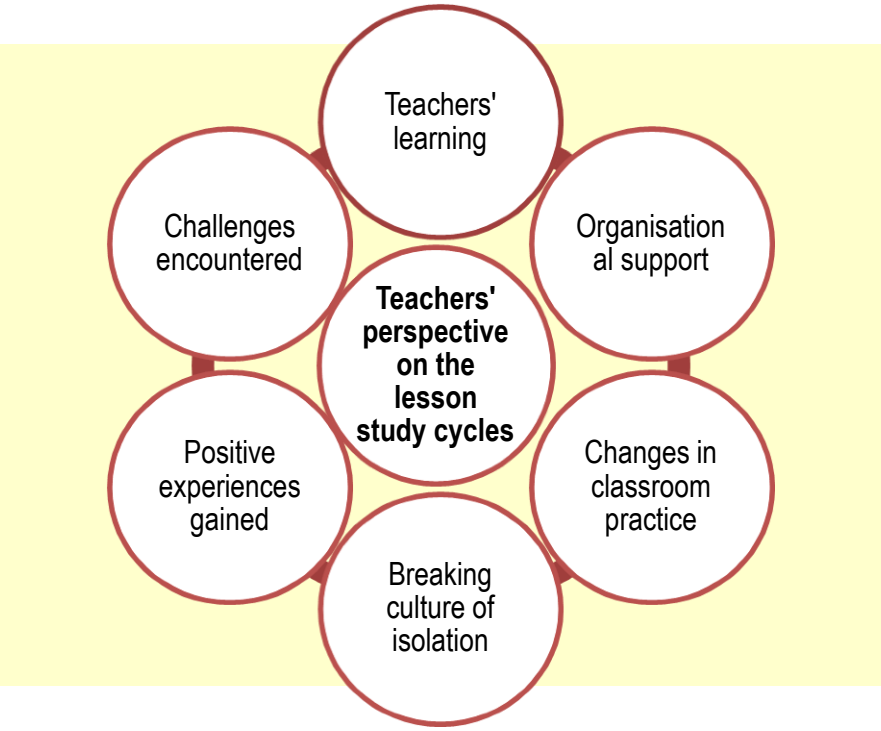
Figure 5.2: Teachers' perspective on the lesson study cycles



5.6.1 Teachers' learning

In this section the results that answer the second research sub-question are presented. What teachers perceived to have learned from the lesson study cycles is explored. The question posed was: "*What are teachers' perceptions about their knowledge and skill gain due to their participation in lesson study?*" The information regarding teachers' learning was organised in three categories, namely enhanced knowledge and understanding, improved teaching-related skills, and changes in attitudes and beliefs. These three categories are discussed for each school, based on the information given in Table 5.6.

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Table 5.6: Teachers' perspectives on learning

Main categories	Generic categories	Sub-categories
Teachers' learning	Enhanced knowledge and understanding	Enhanced reading Gain of knowledge
	Improved teaching-related skills	Pedagogic knowledge Lesson planning skills Observation skills Reflection skills
	Changes in attitudes and beliefs	Feeling towards lesson study Feeling towards new lesson planning Feeling towards collaboration Feeling towards observation and feedback Feeling of professional empowerment

5.6.1.1 Teachers' learning in School 'A'

The results regarding teachers' learning in School 'A' were organised into three categories, namely enhanced knowledge and understanding, improved teaching-related skills, and changes in attitudes and beliefs (Table 5.6).

In the first category, regarding the effects of the lesson study cycles in enhancing knowledge and understanding of subject matter, all the teachers in School 'A' indicated that participation in the lesson study cycles deepened the extent of their content knowledge and their understanding. They claimed that participation in the lesson study cycles enabled them to refer to several books which broadened their knowledge and understanding of the subject that they are teaching. They also acknowledged that they gained new knowledge about lesson study. Some of the general comments are given below:

> *Lesson study helped me to have deep knowledge about the subject matter […] because […] I referred to several books in order to prepare for the lessons. (SAT3-G3)*
>
> *I have understood about parallel and series circuits after participating in lesson study. […] We were simply explaining what we find in the textbooks. It is only now that I have learned how the wires are arranged in parallel and series circuits. My earlier knowledge about the circuits was limited to theory. (SAT1-H2-00:21:40)*
>
> *This [lesson study] has enabled me to increase the knowledge of the subject that I am teaching. (SAT1-G4)*

For another teacher, who is usually assigned to teach grade seven classes, participation in the lesson study cycles provided him with the opportunity to read and be acquainted with the grade eight textbook. His comment reads:

> *I did not have much acquaintance with the grade eight textbook before participating in lesson study. In order to help me observe the research lessons taught in grade eight, I had a chance of reading the textbook. (SAT3-H2-00:28:30)*

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In the second category, regarding the effects of lesson study in improving teaching-related skills, the teachers in School 'A' agreed that participation in the lesson study cycles enabled them to develop skills in lesson planning, pedagogical knowledge, observation and reflection (see Table 5.6). Regarding planning, the teachers expressed their dissatisfaction with their old ways of preparing lesson plans. They indicated that they were not spending time in preparing lesson plans. As a result, their lesson plans were short and sketchy plans. One teacher described their old ways of preparing lesson plans as fooling one's self. However, after participating in the lesson study cycles they claimed that they had started to be serious and were able to prepare improved and detailed lesson plans. Some of the responses that reflect these views are provided below.

> *[…] our earlier lesson preparation process can be considered as fooling yourself. (SAT1-H2-00:10:03)*
>
> *I am preparing a detailed lesson plan in collaboration with other teachers. (SAT3-G3)*

The school director also observed that the teachers had developed lesson planning skills. He observed that the teachers were valuing and spending time on lesson planning. The director's view is given below:

> *Another indication of their development is that they spend time in planning. In ordinary lessons, they would use shortcuts. However, in lesson study they give more time to lesson planning. (SAD-J-00:21:38)*

In contrast to the above opinions, one teacher indicated that he has not made any changes in his lesson planning apart from using a different format of lesson planning. His comment is given below:

> *There are not many changes in lesson planning. The only difference is that we were not using table format. (SAT1-G4)*

The teachers in School 'A' also indicated that their frequent use of student-centred methods have enhanced their pedagogical knowledge. They used hands-on activities that allowed all students to participate, including the weak ones. The teachers indicated that in ordinary lessons they used to focus their attention on outstanding students only. The director also observed that the teaching methods used provided opportunities for students to talk to one another. Some of the responses that reflect these views are provided below:

> *Now, after participating in lesson study, even though the content of the lesson which we taught is similar to the earlier content, during lesson study we taught them by giving short content followed by activity. This means all the students were engaged one way or another in the activities. This is one advantage. All students participated in the lesson, even the ones who lacked experience got opportunity to learn from their colleagues. (SAT6-H3-00:48:12)*

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> *The method used in lesson study is student-centred approach that gives more chances for the students to talk. This method supports the policy of the Ministry of Education. The method used has links to the student-centred way of teaching. First it gives students the opportunity to talk. Secondly, it was new to the students. (SAD-J-00:24:57)*

The teachers indicated that participation in the lesson study cycles enhanced their observation skills and boosted their experience as a result of observing one another or observing students. They claimed that observing one another helped them to improve their classroom practices. The positive impact of lesson study on the participants also included their ability to identify their strengths and weaknesses. They added that they were also able to observe new behaviours of their students. They said that whenever they provide students with group activities, the students formed subgroups within a group. They were also able to identify the cause of this subgroup formation and minimise it by making changes in the sitting arrangements. They said that the desks hindered the students from conducting whole group discussion. The following responses describe some of these comments.

> *I have never focused my observation to what students were doing. (SAT4-H1-00:06:58)*
>
> *I have never thought about creation of subgroups. After providing a task as a group work, we were assuming that all students are discussing as a single group. (SAT5-H1-00:16:54)*
>
> *In the groups that we have established, sub-groupings were observed, where some students formed their own small group within the large group. At the end [of the project], however, all the students were participating as a single group. (SAT2-H2-00:16:15)*

Moreover, the teachers believed that observing one another contributed towards improving classroom discipline by enabling them to control the students and focus their attention on the lessons. One teacher indicated that the students had less chance of playing around during the lesson study process when compared to the conventional lessons taught individually, as indicated below:

> *When we teach them together, that is, when one teacher teaches the research lesson the others were observing them. They did not misbehave because we were totally controlling them. When one of the teachers approaches them, they would stop playing around. […] The students' attention was totally drawn towards the lesson. (SAT2-H3-00:11:33)*

The results also revealed that the lesson study cycles enabled the teachers to reflect on their action and provide constructive feedback to one another. The teachers appreciated the process because it enabled them to identify and reflect on and speak about their weaknesses and strengths publicly. The reflections and feedback ranged from simple teaching procedures such as use of the chalkboard, the use of teaching-learning resources and the arrangement of desks to more demanding skills such as student safety to be considered while demonstrating an activity, teaching strategy, design of learning activity and student participation. Some of the reflections of the teachers are illustrated in the following quotations.

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The worksheet should have been marked and given them back. (SAT6-L7)

The students participated well even though only clever students answered questions and reported. (SAT1-F2)

[…] there were problems in handling the teaching and learning activities. For example, students kept the wire in the socket. This was not safe. (SAT1-F2)

In order for the students to master the topic […] I would suggest the teachers to repeat the lesson again. (SAT6-L8)

The content of the lesson matched the ability of the outstanding students but it was difficult for the weak students. (SAT2-F8)

In the last category, the teachers in School 'A' indicated that participation in the lesson study cycles brought about changes in their attitude and beliefs. They expressed their feelings and emotions, as well as their beliefs with regard to: lesson study, the lesson planning process, collaboration, observation and feedback, and their feeling of professional empowerment (see Table 5.6). The results revealed that all the teachers had developed positive attitudes towards lesson study. This is because by enhancing their subject matter knowledge and pedagogical skills, the lesson study cycles enabled them to implement student-centred teaching. Participation in the lesson study cycles enabled them to change their negative perceptions about student-centred teaching, large class-sizes and student participation. Prior to participation in the lesson study cycles, they thought it was impossible to teach large classes using a student-centred approach, but after participation in the lesson study cycles they are convinced that it is possible to teach large classes in a student-centred way. Some of their feelings with regard to lesson study are given below:

In lesson study, we planned collaboratively. When one teacher taught the lesson, the others observed the lesson and provided feedback to the teacher who taught the lesson. When teachers reflect on their actions, it is useful for the students. Things improved from the first day to the next day. This type of procedure [lesson study] is very important. (SAT2-H2-00:04:28)

We were saying that class size is a hindrance to implement a student-centred teaching. We were also saying that 40 minutes are not sufficient for such type of teaching. Now, we used the same 40 minutes for teaching student-centred way. (SAT3-H1-00:05:41)

However, one teacher indicated that the change so far is limited to changes in thinking and not yet transformed into actions.

I can say there is change to some extent, but much of the change is at attitude level. It is in the mind. (SAT1-H2-00:40:20)

Regarding attitude towards the new lesson planning process, all the teachers appreciated the collaborative lesson planning and the new four-column lesson plan format (Figure 3.4, Appendix-N). They said that they had enjoyed the collaborative planning process because it enabled them to work and share ideas with one another and prepare better lesson plans. They also valued the four-column

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lesson plan format because it enabled them to stick to what had been planned while executing the plan. Some of these comments are:

> *[…] we were preparing lesson plan individually but now we are planning in groups collaboratively. Therefore, the new plans became better than old plans. (SAT1-G5)*
>
> *Since we prepared the lesson plan in the form of table, it helped us in facilitating the teaching-learning process. (SAT6-G4)*
>
> *The lesson plan […] helped us to stick to what we have planned. This makes the lesson plan format ideal for preparing teaching-learning activity. (SAT1-G1)*

All the teachers placed a high value on the collaboration that they had experienced during the lesson study cycles. They found collaboration with colleagues more effective than working alone because working with colleagues allowed them to share ideas and experiences and thus produce better lessons and improve their teaching. Collaboration also enabled them to improve their weaknesses. Excerpts that substantiate these claims are given below:

> *Working in collaboration is better than working individually. During lesson study, we taught the research lessons using ideas obtained from the different members and our own ideas. We taught an enriched lesson. (SAT2-H3-00:29:37)*
>
> *Working in collaboration is beneficial because it helps you to improve your weaknesses in the future. (SAT6-G4)*

All the teachers also expressed their positive feeling towards observing one another's lessons and providing feedback to one another. During the lesson study cycles they were engaged in rich professional dialogues around topic selection, lesson planning as well as the identification and preparation of teaching-learning resources. During these dialogues, the teachers exchanged feedback openly. The intention with providing of feedback was not to criticise the teacher who taught the research lessons nor to evaluate the performance of the teacher, but to assess their teaching. This understanding made the teachers feel comfortable. With time, the teachers were encouraged to express their opinions freely and discuss matters for the betterment of the research lessons. They considered feedback as a tool for examining and improving their teaching. Such comments are indicated below.

> *At this time, no one is afraid of being observed and no one is concerned about the feedbacks. […] The evaluation focused on how the students are reacting to the lesson. Therefore, I do not feel bad when an external observer comes to observe my lesson. When we observed one another, we felt nothing. (SAT2-H2-01:21:15)*
>
> *All comments were taken as family issues. In one of the lessons, for example, we raised why we were not able to give short notes. Such types of feedbacks were useful. The feedbacks were not many but we were giving some for improvement. Everyone was accepting these comments positively thinking that it is for improvement of the lesson and self. No one took the comments as personal insult. (SAT6-H3-00:24:58)*

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> *The feedbacks were aimed at improving the practice of teaching in the future. I feel that a teacher should accept the feedbacks given to him either during lesson study or other times, because they sharpen the teacher. When feedbacks are given to a teacher, it means that some issues that are not visible to that teacher are visible to the other teachers who are observing the lesson. Therefore, accepting feedbacks positively makes a teacher better. If feedbacks are not given to a teacher, the teacher carries the problems with him all the time. During debriefing, there should not be any bad reactions to the feedbacks and there were not any bad feelings in our case. (SAT2-H3-00:21:18)*

After participating in the lesson study cycles, the teachers felt that they were professionally changed, developed and empowered. They felt that participation in the lesson study cycles enhanced their learning. They felt also that lesson study enhanced their ability to work collaboratively and share ideas with colleagues. Because of these positive feelings, the teachers expressed their willingness to continue with lesson study if their loads are reduced, living conditions improved, class sizes reduced, a special coordinator assigned, additional training provided and support of the school leadership and MoE available. Some of the teachers' statements that demonstrate these feelings are given below:

> *I would say that I have learned a lot from lesson study because earlier I was teaching the way I understood it and the way I feel it right. Now, I am using a teaching method that has been developed and evaluated by all of us. Therefore, I feel that I have changed (SAT1-G1).*
>
> *[…] we have improved many things after participating in lesson study. For example, we have improved our teaching, our planning, working together, planning collaboratively and teaching collaboratively. All these changes came after our participation in lesson study. (SAT2-H3-00:38:16)*

However, even though they support the innovation, the school director and pedagogic head indicated that they could not practice it in their school unless it is endorsed by the MoE. They said the following:

> *Since the Ministry of Education has not included lesson study into its curriculum, we cannot practice it in our school. This is only a sample for your study. To implement it in our school we have to be guided by the curriculum of the Ministry of Education. We cannot introduce what has not been approved by the curriculum of the Ministry of Education. (SAD-J-00:27:46)*
>
> *I support introduction of lesson study in all the subjects. To introduce it, however, instruction should come from the curriculum department of Ministry of Education (SAPH-J-00:29:58)*

From the above responses it appears that participation in the lesson study cycles deepened the content knowledge and pedagogical knowledge of the participants. Lesson study also provided the teachers with an opportunity to engage in professional dialogue with their colleagues to share ideas and learn from one another. Participation in the lesson study cycle has also enabled the participants to develop positive attitudes towards lesson study, lesson planning, the student-centred teaching method and

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working collaboratively. In short, participation in lesson study seems to have made the participants feel that they are now more professionally developed and empowered.

5.6.1.2 Teachers' learning in School 'B'

The results regarding the teachers' learning in School 'B' were organised in three categories, namely enhanced knowledge and understanding, improved teaching-related skills and changes in attitudes and beliefs (see Table 5.6).

In the first category regarding the effects of lesson study in enhancing knowledge and understanding of subject matter, the teachers provided contrasting views. Most of the participating teachers indicated that participation in the lesson study cycles enhanced the extent of their content knowledge. They claimed that they had referred to several books in order to prepare the research lessons. These readings enhanced their knowledge on subject matter. Moreover, they claimed that they were able to discover the hidden potential of their students and better understood a student-centred way of teaching. Some of the opinions are given below:

> *The content knowledge was always present but when we practically worked with lesson study, the depth of our knowledge increased. We can only say that it deepened our knowledge. (SBT1-H2-00:05:20)*
>
> *Now, in terms of obtaining new content knowledge, the lesson study enabled us to read and deepen our understanding of the subject matter. This means, in order to teach the students effectively it was required from us to go deep into the subject. (SBT6-H3-00:06:56)*

In contrast, some of the participants thought that participating in the lesson study cycles did not improve their subject matter knowledge:

> *Regarding content knowledge and pedagogic knowledge I have not gained anything new. (SBT1-H1-00:01:18)*
>
> *[I have experienced] no changes in the knowledge of subject matter. (SBT4-G1)*

In the second category regarding the effect of lesson study on the improvement of teaching-related skills, the teachers in School 'B' agreed that participation in the lesson study cycles enabled them to develop skills in lesson planning, pedagogical knowledge, observation and reflection (see Table 5.6). Although it is mandatory in their school for teachers to prepare lesson plans, the procedures and format used during the lesson study cycles were different to those to which they were accustomed. The teachers intimated that they were not paying much attention to lesson plans. As a result, they used to prepare the same type of lesson plan every year. This was also because the supervisors were more interested in how they teach the lessons than what they write in the lesson plans. Once submitted to the authorities, they taught the lessons without consulting the lesson plans. Therefore, what they

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usually taught in classrooms was different from what was presented in the lesson plans. However, after participation in the lesson study cycles the teachers claimed they had started reviewing their lesson planning procedures. Unlike in the earlier practices, the teachers prepared detailed lesson plans after participating in the lesson study cycles. They appreciated the collaborative lesson planning process and the four-column lesson plan format. This lesson plan enabled them to forecast students' reactions and plan for appropriate responses. Moreover, they used the lesson plans to guide the enactment of the lessons. Some of the responses that reflect these views are provided below.

> *The lesson plan format that we use in our ordinary teaching is a very short one. […] Moreover, the supervisors mainly observe and evaluate what we teach rather than what we have written on the paper. (SBT2-H2-00:04:43)*
>
> *Once we prepared the lesson plan, we throw it to the office and we do not refer to it again. What we teach in the class may be different from what is written on the lesson plan. (SBT3-H2-00:06:16)*
>
> *I have benefited from the lesson plan. We have never planned for reaction of students before. Now, this lesson plan helped me to predict students' reactions and compare it to the teachers' activities. (SBT4-H2: 00:12:20)*
>
> *… this lesson plan helped us to stick to what is written on the plan. (SBT4-H1-00:03:23)*

The teachers also indicated that observing one another was not common in their school. However, participation in the lesson study cycles provided them with the new experience of observing one another's lessons, which enhanced their observation skills.

> *I have worked for several years, but we have never observed one another. (SBT1-H1-00:01:18)*
>
> *I have also developed observation skill. I was able to develop a skill of explaining my observations. (SBT2-G2)*
>
> *During observation, I have learned what to observe. I have also learned what to record. (SBT5-H3-00:25:16)*

In addition, the teachers indicated that by participating in the debriefing sessions they were able to give and obtain constructive feedback and reflect on their teaching. They were also able to speak about their weaknesses and strengths publicly. Some of the reflections are mentioned in the following quotations.

> *The instructional decisions that contributed to the achievement of goals were that the lesson was supported with real teaching aids and model e.g. car, ball and shoes and majority of the students participated in the lesson. (SBT2-L8)*
>
> *They [students] were not given enough time of discussion. (SBT5-L9)*

In the final category, the results from this school reveal that the teachers expressed different feelings, emotions and beliefs with regard to the process. These feelings were categorised as feelings towards: lesson study, new lesson planning, collaboration, observation and feedback and feelings of

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professional empowerment (see Table 5.6). Regarding feelings towards lesson study, the teachers generally described the lesson study cycles as supportive, enjoyable and good. These positive impressions of the teachers towards the lesson study cycles were influenced by three factors. Firstly, the lesson study cycles allowed them to come together, collaborate and share ideas with one another. Secondly, the lesson study cycles enabled the active engagement of students in the learning process. Finally, participation in the lesson study cycles enabled the teachers to implement student-centred and interactive pedagogy. A respondent describes this in the comment given below:

> *Lesson study is supportive. It helps teachers to exchange experiences. […] It encourages student-centred way of teaching, which is also necessary at this time. (SBT1-H2-00:29:55)*

Regarding attitude towards the new four-column lesson plan format and the new lesson planning process, the teachers expressed positive feelings. They described the new lesson plan format as good, useful and helpful because it enabled them to predict students' reactions in advance and plan for appropriate responses accordingly. The positive feeling towards the new lesson planning process was also due to the fact that it enabled them to work, share ideas and collaborate with one another. Some of the positive comments are:

> *It is a good format. (SBT3-H2-00:06:16)*
>
> *The new lesson plan enabled us to write our duty and the duty of the students. (SBT2-H2-00:44:28)*

Despite these positive feelings, the teachers expressed their concerns about the lesson planning process. They considered that this lesson planning process takes time and space when viewed against contextual constraints such as lack of time, large class-sizes and heavy teaching load. Some of the comments are given below:

> *Now, using the new plan would be a challenge for us taking the amount of our workload we have into consideration. (SBT2-H1-00:52:24)*
>
> *This lesson plan does not go with all our load and number of student. (SBT3-H2-00:06:16)*
>
> *Preparing for one lesson takes a lot of space and time. (SBT4-H1-00:54:40)*

The teachers also appreciated the collaborative nature of lesson study especially the experience they gained from the practical collaboration among themselves during the lesson study cycles. Collaboration helped them share ideas and learn from one another. The following quotations reflect the respondents' claim in this regard.

> *[…] there is nothing [more beneficial than] working together – because we were able to learn from one another. (SBT3-H2-00:45:23)*
>
> *I feel that it is important for us to work collaboratively in all our activities in addition to our collaboration in lesson study. (SBT6-H3-00:02:28)*

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The teachers also indicated their comfort with observing one another and providing feedback to one another. They considered feedback as a tool for professional development because it helps them to improve their weaknesses. One such comment is given below:

> *When they gave me feedback, I did not feel demeaned or inferior to the person. In fact, I was happy. It means that by listening to my feedback I am correcting my weaknesses. When a colleague corrects me from my mistakes, I feel happy. (SBT2-H2-00:11:36)*

Overall, the teachers felt that participation in the lesson study cycles empowered them professionally and they expressed their confidence and willingness to continue using lesson study. They also wished for similar professional development programmes for teachers in their school and other schools. Excerpts from the responses that demonstrate these feelings are given below:

> *Because of observing one another's lesson, I would say we are changing. We are noticing things that we have never given attention. Therefore, the benefits that we have obtained through working together during planning, teaching and observing one another's classroom have brought many changes in our teaching. (SBT3-H3-00:29:28)*
>
> *[…] I have a plan to continue using lesson study in the future because I found the lesson plan and the sharing of idea with colleagues very useful. I hope I will implement it in the future. (SBT4-H2-00:18:40)*
>
> *I would recommend lesson study not only for science teachers, but also for all teachers in the country. (SBT3-H3-01:31:00)*

From the above responses it appears that the participants had mixed feelings about lesson study. The results revealed that the participants were comfortable about indicating that they had gained new teaching-related skills but too shy to indicate that had acquired new knowledge related to the subject they teach. The researcher is of the opinion that the reason that some of the participants were reluctant to indicate that they had gained subject matter knowledge may be because they did not want to be perceived by their colleagues as less competent. Participation in the lesson study cycles provided the teachers with an opportunity to engage in professional dialogue with their colleagues and share ideas and learn from them. It also enabled them to develop positive attitudes towards lesson study, lesson planning, the student-centred teaching method and working collaboratively. Participation in the lesson study cycle seems to have made the participants feel more developed and empowered professionally. In the following section teachers' learning in School 'C' is presented.

5.6.1.3 Teachers' learning in School 'C'

As was the case for Schools 'A' and 'B', the results regarding the teachers' learning in School 'C' were organised into three categories, namely enhanced knowledge and understanding, improved teaching-related skills, and changes in attitudes and beliefs (see Table 5.6).

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In the first category the teachers in this school perceived that participation in the lesson study cycles enhanced their knowledge of subject matter. They indicated the collaborative nature of lesson study that enabled them to work together to plan, teach, observe lessons and participate in debriefing discussions. They claimed that these activities provided them with the opportunity to share ideas and experiences with one another. In addition to the sharing of ideas, participation in the lesson study cycles provided them with an opportunity to read. Their views regarding obtaining knowledge are given below:

> *Truly speaking, it helped us in raising our subject matter knowledge, because we have combined the ideas of three heads and we are sharing experiences and knowledge with one another. (SCT2-G2)*
>
> *After participating in lesson study, we were able to broaden our experience and content knowledge by reading books. We consulted several books in order to prepare for the research lesson. (SCT1-H1-00:01:31)*

The school director asserts that the teachers had gained knowledge because he observed them reading and working for longer hours. His opinion is given below:

> *They shared ideas with colleagues because they were working in teams. They were continuously reading and working longer in order to change their teaching approach. Therefore, I would say they have learned. (SCD-J-00:20:14)*

Moreover, the teachers claimed that they have discovered the hidden potential of students' learning. They were convinced that students could contribute to the learning process if they were allowed to participate. Thus, they began noticing the strengths and weaknesses of their students and started to think about how to allow students' engagement. Examples of such opinions are given below:

> *Now, I understood that students could contribute if they are fully involved in the teaching-learning process. […] I understood that students learn best if they are allowed to actively participate instead of being told by the teacher. (SCT2-H1-00:21:08)*

In the second category regarding the effects of lesson study in improving teaching-related skills, the teachers in School 'C' agreed that participation in the lesson study cycles enabled them to develop several skills. The results reveal that the teachers have developed skills in lesson planning, pedagogical knowledge, observation and reflection (see Table 5.6). Traditionally the teachers prepare lesson plans individually. However, participation in the lesson study cycles offered them the opportunity to prepare lesson plans jointly. They acknowledged that this collaborative planning process enabled them to share experiences and produce improved lessons. They were also able to plan lessons that focused on students' learning rather than on provision of content. Consequently, they improved their lesson planning skills. The following excerpt may serve as illustration:

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> *[…] preparing lesson plans together enabled us to produce more effective lesson plans because during planning we focused on how to teach rather than what to teach in relation to time. We have taken time, topics to be taught and methods into consideration. The lessons were products of our discussion on how best we could prepare and present them. As a result, we were able to prepare effective lesson plans. We have learned a lot from this process and it helped us a lot. We were able to synchronise time and with the material that we were teaching. (SCT2-H3-00:09:00)*

The teachers indicated that participation in the lesson study cycles enabled them to plan lessons that allow students to participate in group discussions, hands-on activities and question and answer sessions. They also planned for activity-oriented lessons that utilise worksheets and hands-on teaching-learning resources more frequently. Such increased use of teaching-learning resources enhanced student participation and learning. The following statements exemplify these ideas:

> *The lessons were better than the earlier lessons because we used better methods and resources. We can say that the students were taught the best way. The students were able to use the best teaching-learning resources when compared to the earlier lessons. For example, they were able to work worksheets. In ordinary lessons, we do not give worksheets to students. If we see the research lesson that I taught, I used ants as teaching-learning resources. I did not use ants as teaching-learning resources, last year, while teaching the same topic. (SCT3-H3-00:54:00)*

The results also revealed that participating in the lesson study cycles provided the teachers with new opportunities of opening their classrooms to their colleagues and being able to observe their colleagues' teaching practices. They claimed that they have developed observation skills in the process. Moreover, they have publicly reflected on their lessons and exchanged feedback during the debriefing sessions. Excerpts that demonstrate these illustrations are given below:

> *[…] a unique experience that we have practiced during lesson study was peer observation, an experience that appeared to us like climbing a mountain. We got an opportunity to observe lessons of one another. (SCT2-H2-00:21:18)*
>
> *I have also learned how to observe lessons […] I have developed observation skill. (SCT3-H3-00:28:02)*
>
> *I have also learned from the debriefing sessions how to criticise (critique) the weakness and how to keep the strengths. (SCT3-H3-00:28:02)*

The teachers also indicated that participation in the lesson study cycles enabled them to improve their pedagogical skills. Through discussions and the sharing of ideas, the teachers were able to teach topics that were perceived to be difficult for the students to understand, using improved methods as described below:

> *I think I have gained more on the methodological aspect of teaching rather than the subject matter. (SCT3-G4)*

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> *It helped us to discuss on how to teach difficult topic in an easy way. I want to stress on that point. I have learned from lesson study on how to teach difficult topics using easy ways. We have a textbook that prescribes easy way. We have also teachers' guide. But solving the problem through discussion is the best way. Therefore, lesson study was supportive and helpful (SCT2-H2-00:13:18)*

The teachers also indicated that participation in the lesson study cycles enabled them to develop reflective skills. They were able to speak about their weaknesses and strengths publicly. Their reflections ranged from the use of teaching-learning resources and the appropriateness of teaching strategies used to achieving the set goals regarding student participation and understanding. Some of the reflections are mentioned in the following quotations:

> *This lesson was better than the previous lesson. The lesson was interesting lesson. The students were doing the calculations by following the steps. Unlike the earlier lesson, in this lesson students were familiarised with the SI unit. It was beyond the expectation because the students came to the class with ants. The students were solving the problem by following the steps. That is what I appreciated most. However, among the majority of the students there were some students who were not able to understand what the others were doing. That was also beyond my anticipation. (SCT2-L6)*

> *The goal of the lesson is achieved. First they were doing in a whole together with their teacher give answer and identify raised any question from their teachers. They engage in the learning process group discussion, group work with their classmate. During the group discussion some students were not actively participating. The teaching material helps them to classify and identify the types of crops with their groups. Teacher and students have interacted in a very good way. It was also correct some errors that rise in the class. (SCT1-F1)*

In the last category, the teachers in School 'C' indicated that participation in the lesson study cycle has enhanced their attitude and beliefs towards: lesson study, the lesson planning process, collaboration, observation and feedback and their professional empowerment (see Table 5.6). The results revealed that all participants in School 'C' viewed lesson study positively. These positive feelings were indicated in their statements by words such as useful, helpful, supportive, productive, good and creative. However, they expressed concerns regarding its application in Eritrea given some contextual constraints. The excerpts below revealed their pessimistic feelings.

> *Lesson study was helpful in working together, identifying problems together and then solving the problems together. However, it is difficult to implement because it takes a lot of time and we are overloaded. Otherwise, it is a very useful process. (SCT2-H2-00:13:18)*

> *[…] lesson study is a very constructive process that leads to learning. However, conducting lesson study with students ranging from 40-50 and bulky load is a little bit difficult. It is more convenient in standardised classes with students ranging from 20-25. […] As in our case where a teacher teaches very long hours that ranges from 30-40 periods per week, conducting lesson study would be problematic. Otherwise, lesson study is constructive and productive process. (SCT1-H2-00:14:05)*

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> *Actually, lesson study is good. We have changed a lot by participating in lesson study. Nevertheless, its implementation requires time. Lesson study brings radical changes in the teaching-learning process. It revolutionises everything. However, in order to implement lesson study several things should be fulfilled. […] in order for a teacher to get time and participate in lesson study, class size, load and other additional duties assigned to teachers should be reduced. (SCT3-H1-00:34:46)*

The teachers expressed positive feelings towards the new collaborative lesson planning process and the new lesson plan format. According to them, participation in the lesson study cycles enabled them to prepare better lesson plans than the ones they prepared individually, because they were able to work collaboratively and shared ideas. They also appreciated the four-column lesson plan format because it allowed them to predict students' responses to the lesson activities in advance and plan for responses to the anticipated students' reactions. The following statements illustrate these comments:

> *Planning collaboratively is better than planning individually because one can obtain support from colleagues in topics that are not clear and difficult to understand. Because of working together, one would be able to prepare a better plan. (SCT1-H2-00:03:27)*
>
> *By participation in the lesson study skill, I have gained a new skill on planning which shows all the steps of lesson integrated. Meaning it helped me to acquire a new way of planning that shows the learning and learner activities, reactions, responses, goals and new methods of evaluation. (SCT3-G2)*

The teachers also valued the collaboration that they have practised while participating in the lesson study cycles. Their responses revealed that the teachers experienced positive feelings towards collaboration and working with colleagues. They found collaboration with colleagues more enjoyable and helpful when compared to working individually because it allowed them to share ideas.

> *From working alone working in pairs is better. From working in pairs, working in threes is better, because a rope made up of three threads does not break easily. From lesson study, we have learned that collaborating with one another gives strength. (SCT2-H1-00:12:59)*

The teachers indicated that participation in the lesson study cycles enabled them to develop positive attitude towards observing and being observed as well as the exchange of feedback. They considered observing one another and providing feedback as learning opportunities. A quotation is presented below to support this view:

> *If you ask me about my feeling of being observed by a colleague, I feel nothing, even I feel happy. Since I do not know my weaknesses and my strengths, I would learn from the one who observes my lesson. (SCT1-H3-00:07:05)*

In general, the teachers felt professionally empowered after participation in the lesson study cycles. They felt that participation in the lesson study cycles enhanced their professional competence by enhancing their subject matter knowledge and pedagogical knowledge. They said that lesson study had

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provided them with a platform to share ideas through participation and collaboration with colleagues. As a result of these positive feelings of empowerment, the teachers enthusiastically expressed their willingness to continue in this study or participate in similar teacher development programmes. They also wished that other teachers could be given the same opportunities. The director and pedagogic head also expressed similar feelings. Excerpts of the participants' views regarding the above claims are presented below:

> *[…] working in groups enabled us to share ideas with one another. […] preparing lesson plans together enabled us to produce more effective lesson plans […] we have learned and have obtained many ideas that will be able to influence our individual planning in the future. (SCT2-H3-00:09:00)*
>
> *I am voluntary to continue either in this research or in other, if this research is not continuing. (SCT1-H1-01:03:44)*
>
> *I recommend lesson study not only for teachers in one school, but also for teachers from many schools teaching the same subject. (SCT2-H1-01:06:37)*
>
> *Lesson study was useful, because it enhanced student participation, enabled them to think critically and enabled them to know and speak to one another. It also helped the teachers to do their job effectively. Therefore, I recommend for its spread in other schools. (SCPH-J-00:28:32)*

From the above responses it appears that participation in the lesson study cycles deepened the content knowledge and pedagogical knowledge of the participants. Lesson study also provided the teachers with an opportunity to engage in professional dialogue with their colleagues, to share ideas and to learn from one another. Participation in the lesson study cycle also enabled the participants to develop positive attitudes towards lesson study, lesson planning, the student-centred teaching method and working collaboratively. Overall, participation in the lesson study cycle seems to have made the participants feel that they are now more professionally developed and empowered.

5.6.1.4 Interpretive summary of teachers' learning

In Section 5.6.1.4, a reflective summary of teachers' learning is provided. According to the constructivist point of view, teachers as adult learners, learn better when they actively engaged in the construction of knowledge as opposed to the passive absorption of information (Little, 1993; Carl, 2008; Loucks-Horsley, et al., 2010). The findings of this study have also shown that participation in lesson study cycles helped teachers to take an active role in the teacher development process. This active learning process enhanced teachers' knowledge, skills and attitudes, and this corroborated what was said in the literature (Bell & Gilbert, 1996; Guskey, 2000; Feiman-Nemser, 2001; Garet, et al., 2001).

Regarding knowledge gains, all the teachers from Schools 'A' and 'C' and the majority of the teachers from School 'B', reported that participating in the lesson study cycles has improved their understanding

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of content knowledge. Similar findings have been reported in the literature (Lewis, 2002a; Lee, 2008; Lewis, et al., 2009). The participants stated that participating in the lesson study cycles provided them with the opportunities to read books, observe lessons, work collaboratively and share ideas. They mentioned that the reading of books in particular has enhanced the extent of their content knowledge. As highlighted by Villegas-Reimers (2003), meaningful interaction and conversation enables the teachers to share ideas and experiences, and thus learn from one another. Teachers' learning was achieved by observing one another's lessons and participating in the debriefing discussions. As stated in the literature, participation in the lesson study cycles has also enhanced the participant teachers' knowledge of lesson planning, student-centred methods and students' learning and participation (Fernandez, 2002; Lewis, 2002a; Rock & Wilson, 2005; Lee, 2008). These changes in subject matter knowledge and pedagogical skills indicate teachers' development in the professional dimension, as described by Bell and Gilbert (1996). The teachers from School 'C' discovered hidden potential in their students. They were able to discover that when students are allowed to participate in the learning process, they play an active role and contribute to the teaching-learning process. As a result, they claimed that they have started thinking about how to enhance student participation in the teaching-learning process. This seems to provide support to the argument that suggests that professional development programmes that make extensive use of collaboration are essential in supporting teacher-learning and bringing about changes in classroom practice (Borko, 2004; Borko, et al., 2010).

The results also indicate that the majority of the teachers considered themselves as learners and acknowledged that they had learned more by participating in the lesson study cycles. However, two teachers from School 'B' indicated that they did not gain new knowledge by participating in the lesson study cycles, but they were in the minority. Unlike those who claimed to have benefited from the process, these teachers seem to view themselves as complete professionals who do not require additional knowledge. It was observed that they did not want to be perceived as learners. In other words, they did not want to admit having gained from participation in lesson study cycles. This implies that those teachers wanted to maintain their self-esteem by not openly admitting to have gained any knowledge like their colleagues did. Unlike the teachers who sought new knowledge and skills, such teachers are prone to work in isolation and maintain their old attitudes and practices (Lortie, 1975). Even though some teachers where shy to admit that they had gained new knowledge related to the subject they teach, all the participating teachers in the three schools were observed to speak confidently about their students' gain of knowledge or weaknesses in understanding certain concepts.

Regarding skills, analysis of the teachers' responses revealed that the lesson study cycles helped them to develop various skills in lesson planning, teaching methods, observation and reflection. Traditionally,

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teachers prepared lesson plans individually and were not serious about the process as they spent little time on and paid little attention to the process. As a result, they prepared sketchy lesson plans that were submitted to pedagogic heads only in order to comply with the formalities. In essence, they considered submitting the plans as an end rather than a means to better teaching. Hence, their practical teaching in class was different from what was written on the lesson plans. However, the teachers seem to have questioned their earlier practice of lesson planning. They indicated their dissatisfactions with the old approach and resolved to take lesson planning more seriously and to spend more time on it. Subsequently, they were able to prepare more detailed lesson plans and use them. They prepared lesson plans that focused on how students learn rather than on what they learn. This finding supports the argument of progression in personal development put forward by Bell and Gilbert (1996). The authors indicate that personal development progresses from the teachers identifying loopholes in certain aspects of their teaching, to dealing with the problems by using appropriate strategies and to feeling empowered after addressing to that problem (Bell & Gilbert, 1996). This implies that the teachers in this study first identified that their earlier lesson planning was problematic or had deficiencies and then collaboratively worked to produce appropriate lesson plans that addressed the problems. Finally, they indicated their satisfaction with the production of improved lesson plans that facilitated students' learning, as also highlighted by Taylor et al., (2005). In contrast to the above opinion, one teacher from School 'A' indicated that he had not made any changes in his lesson planning apart from using a format that is different from the traditional one used at their school. This unique assertion conforms to the one given in previous paragraph where some teachers indicated that they have not gained any new knowledge by participating in the lesson study cycles. Apart from this unique perspective, the majority of the teachers seem to have developed their lesson planning skills and were able to prepare better lesson plans after participating in the lesson study cycles.

Although the new curriculum advocates that teachers use teaching-learning resources, the teachers indicated that they were not using them as required due to a shortage of resources and lack of place to store the resources once they have prepared them. During this study, the teachers intensified the use of teaching-learning resources by either developing the resources themselves or requesting their students to bring them or using their environment as a source. This increased frequency of using resources can be compared to Bell and Gilbert's (1996) first level of professional development where teachers try new activities.

One of the main roles in the process of lesson study is to carefully observe students' learning, participation and behaviour (Lewis, 2002a, 2002b), and the teachers in this study claimed that they had developed observation skills. They also opined that in order to be able to give their comments during

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debriefing sessions, they had to conduct and record their observations carefully, a practice that helped them to improve their observation skills. Lewis (2002a, 2002b) reports that Japanese teachers also developed their observation skills when they observed students' learning, engagement and behaviour during lesson study cycles. The teachers from School 'B' appreciated the experience of observing one another, because the practice was not common in their school. The teachers from School 'A' also indicated that lesson study provided them with an opportunity to observe students' learning, a finding which confirms what is said in reports from other studies (Lewis, 2002a; Lewis, 2002b; Chokshi & Fernandez, 2004). Another outcome of teacher learning is that the lesson study process enabled the teachers to see students' learning in a new way, as observed by Murata (2011). During the lesson study cycles, teachers from School 'A' observed subgroup formation as a problem and then through discussion they devised a means of minimising the problem by changing the sitting arrangement of the students. Bell and Gilbert (1996) describe participation in such new activities of observing one another and observing students' learning as evidence of professional development. The teachers who participated in this study observed improvements in students' learning, motivation, discipline and attentiveness as the result of lesson study. Thus, this study confirmed the goal of lesson study as the process of promoting teachers' capacity of observing students' learning, motivation and behaviour as highlighted in the literature (Lewis, 2002a; Lewis, 2002b; Chokshi & Fernandez, 2004).

Participation in the lesson study cycles also enabled the teachers to participate in professional discussions. For the first time they were able to speak publicly about their own weaknesses and strengths and give and receive constructive feedback. During debriefing sessions, the teachers spoke publicly on several issues including the use of the chalkboard, the use of teaching-learning resources, the arrangement of desks, the designing of learning activity and student participation. Participating in such new activities i.e. publicly speaking about own weaknesses and strengths are evidence of professional development as described by Bell and Gilbert (1996).

Regarding changes in attitudes and beliefs, the participants expressed their positive feeling towards lesson study, new lesson planning, collaboration, observation and feedback and professional development. The teachers described the lesson study cycles as supportive, enjoyable, good, useful, helpful, productive and creative because they allowed them to come together to collaborate, share ideas, prepare a more participatory learning process for their students and use teaching-learning resources more frequently. In agreement with what Guskey (2000) claims, the teachers developed positive attitudes as they saw their students benefiting from the lesson study cycles.

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The participants also expressed their positive feeling towards opening their classrooms to outside observers, observing others and providing feedback to colleagues. They indicated that they were comfortable with peer observation and the exchange of feedback. They intimated that participating in the lesson study cycles enabled them to engage in open and rich professional discussions around topic selection, lesson planning, teaching method selection and the preparation of teaching-learning resources. Since the intention with providing feedback was neither to criticise the teachers who taught the research lessons nor to evaluate their performances, the teachers trusted one another. They considered the feedback sessions as opportunities for learning because they were able to examine their weaknesses and strengths for the betterment of the lessons. This confirms what was observed by Joyce and Showers (2002).

Largely, the teachers appreciated the collaboration they have practised during the lesson study cycles. They enjoyed the collaborative planning and teaching because it allowed them to share ideas and learn from colleagues. Starting to see the value of collaborating with colleagues fits in with Bell and Gilbert's (1996) second level of social development. The teachers linked their experience of collaboration to a local proverb that says *two heads are better than one*. This idea is also mentioned in the literature (Fernandez & Chokshi, 2002). Through collaborative work they were able to produce better lesson plans than the ones prepared individually. Thus, this study confirms Matthews, et al.'s (2009) argument that joint planning of teachers during lesson study cycles enhances their collaboration and the quality of the lesson plans produced. This study employed a four-column lesson plan format, a format that was different from the conventional lesson plan format the teachers used in their schools. Notwithstanding their unfamiliarity with the new lesson plan format, the participants valued it so much because it enabled them to think and predict the possible reaction by the students to the content of the lesson plans and that further enabled them to prepare themselves adequately to address to the anticipated student reactions. This finding is in agreement with findings reported in the literature (Chokshi & Fernandez, 2004; Mathew, et al., 2009). This process of predicting students' responses ahead of the actual teaching made the teachers stick to what had been planned. Although the teachers appreciated the collaborative lesson planning process and the four-column lesson plan format, they found the meticulous planning processes required for every single lesson to be unsuitable to Eritrean schools due to several contextual constraints, such as lack of time, large class-sizes and heavy teaching load.

In agreement with the claims of Bell and Gilbert (1996) and Carl (2009), the teachers who participated in this study felt that lesson study empowered them professionally. Firstly, it enabled them to construct knowledge and develop teaching and learning skills. Secondly, it enhanced their ability to work collaboratively and share ideas with colleagues. Finally, lesson study enabled them to observe and

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provide feedback to one another which contributed positively towards building their confidence in teaching lessons that were observed by their colleagues. As a result, all the teachers enthusiastically expressed their willingness to continue with this study or to participate in similar teacher development programmes. Similar findings have been documented by Rock and Wilson (2005) where teachers who participated in lesson study sensed increased confidence and professional growth and thus expressed their desire for continued collaborative planning. The teachers in this study also expressed the opinion that similar teacher development programmes should be organised for their colleagues. The desire of the teachers to continue in the lesson study process provides a strong indication that they appreciated its contribution in assisting them gain knowledge and improve upon their classroom practices. In spite of their positive ratings, the teachers hinted that their participation in similar future activities would depend on certain factors including reduction in their teaching workload, improvement in their living conditions as well as reduction in the class-sizes. Moreover, they require additional training, the assignment of a coordinator who facilitates and guides them in the process and support in their schools. This finding corroborates the finding of Rock and Wilson (2005) who report the importance of having a facilitator who organises resources, and guides and supports teachers if lesson study is to be effective.

In Section 5.6.2 the nature of organisational support provided to the participants is discussed.

5.6.2 Nature of organisational support

In this section, Section 5.6.2, the findings that address the third research sub-question are presented. The focus is on the organisational support that either helped or hindered teachers' participation in the lesson study cycles. The research sub-question posed was: "*What is the nature of organisational support available to teachers*?" In the three schools, the results regarding the nature of organisational support were categorised into four, namely reaction and extent of collegial support, support of the school leadership, contributions of the head of department and contributions of the knowledgeable-other (the researcher) (see Table 5.7). At the end of this section, a comparative discussion is presented.

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Table 5.7: Teachers' perspectives on organisational support

Main categories	Generic categories
Organisational support	Reaction and extent of collegial support Support of the school leadership Contribution of the head of department[9] Contribution of the knowledgeable-other

5.6.2.1 Organisational support in School 'A'

The organisational support is categorised in terms of reaction and extent of collegial support, support of the school leadership, contributions of the head of department and contributions of the knowledgeable-other (the researcher) (see Table 5.7).

Regarding the reaction and extent of collegial support, the participants indicated that the awareness that the school community had about lesson study determined their reactions towards them, which in turn affected the nature of support provided. They indicated that, at first, the school community members were either unaware of what was happening in the school or considered it as less important. However, when their understanding increased they started to react to it and discussed it when they gathered in the staffroom. The majority of the teachers reacted positively and honoured the teachers who participated in the lesson study programme to the extent that some even wished to participate in a similar process. However, some reacted negatively and tried to challenge them by teasing and mocking them. Comments indicating the awareness and reactions are given below:

> *In general, the school community knows about what we are doing. This [lesson study] has become very famous. Every member of the community, from top to bottom, knows it. (SAT1-H2-01:18:11)*
>
> *… they [school community] acknowledged lesson study and they started to value what we are doing. (SAT4-H1-00:57:16)*
>
> *I heard them saying that they wished they had participated in lesson study. (SAT3-H2-00:28:30)*
>
> *In a form of joke, some teachers say you are going to bring into our schools some demanding ways of doing things. We are doing our job comfortably using shortcuts. (SAT3-H3-01:18:22)*

Even though some challenged them, the participants described the school community members as supportive. Their support increased with an increase in their awareness about the lesson study process. They provided the participants with resources and even swapped classes with them.

[9] This information is obtained from observation by the researcher.

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> *They were voluntary to engage our classes or leave their classes for us to use it. Their support was great. They provided us materials […]. (SAT6-H3-00:12:38)*
>
> *They [school community members] were cooperating in exchanging periods with them. (SAD-J-00:12:04)*

In order to facilitate the establishment of organisational support, the school director and pedagogic head were allowed to participate in the workshops (see Section 4.3.4.3). The teachers indicated that the school leadership was supportive in terms of making adjustments to the timetable to accommodate the lesson study cycles, allowing the teachers to exchange their periods with other subject teachers to enable them create common meeting time, identifying suitable classrooms for teaching research lessons, providing resources and meeting places, facilitating connection with the researcher by providing telephone services and telling members of the school community to cooperate with them. Excerpts from their responses that demonstrate these ideas are given below:

> *The school administration was supportive. […] they were allowing us to make changes in the timetable. […] they were coming to the classrooms to demonstrate their support. (SAT3-G3)*
>
> *They [school leadership] supported us in (1) providing teaching aids, (2) in preparing and choosing suitable classrooms for teaching the research lessons. (SAT1-G1)*
>
> *They [school leadership] were providing us their offices to conduct the debriefing sessions and interviews. (SAT2-H3-01:14:18)*
>
> *They [school leadership] were providing us telephone service to connect with you [researcher]. Therefore, they were supportive. (SAT2-H2-01:14:48)*

In an interview, the director and pedagogic head indicated that they had provided the participants with both moral and material support. A director's comment is given below:

> *[…] we made arrangement of periods in a way it is convenient for the study. […] Meaning we changed the timetable so that the science teachers find common time for practicing lesson study. […] we provided them free telephone line so that they could communicate with you without any problem. […] the school administration and other staff members were cooperating with them. […] We were providing them stationery materials such as A-4 size paper, chart etc. free. When they inform us that they have spent some money to buy resources, we paid them back that money. The expenses were from us. (SAD-J-00:07:58)*

In order to establish of organisational support, the head of department was selected as a member of the lesson study team from the beginning of the study (see Section 4.3.4.3). The researcher observed that the head of department played a vital leadership role during the lesson study cycles. He always led the lesson study team. He coordinated the meetings, facilitated communication among the team members and the researcher and led the team in all aspects. Although the head of department had the primary responsibility to play a leadership role during the discussions and other lesson study activities, other team members had to perform the specific roles assigned to them, which were equally important. For

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example, SAT1, SAT2 and SAT4 were responsible for writing the lesson plan, preparing teaching-learning resources and teaching grade eight lessons while SAT3 and SAT5 were responsible for grade seven lessons. The activities of both subgroups were coordinated by the head of department.

The participants also found the contribution of the knowledgeable-other (the researcher) to be useful. Apart from organising the workshops, the researcher (as knowledgeable-other) guided them through the lesson study process, shared ideas with them, supported them during lesson planning processes and supplied them with resources (see Section 4.3.4.4). The participants acknowledged this as follows:

> *I assume that this work is for you, but we have also benefited from it. You did not waste our time. You have done what you were supposed to do. You have supported us in typing, drawing, giving ideas and editing. I would like to appreciate you for that, because it [lesson study] helped us in our teaching. (SAT6-H3-01:22:50)*

In summary, the results revealed that the school community members reacted differently towards the participants. Some wished to participate in similar programmes while others criticised and made jokes about the participants. The researcher is of the opinion that these reactions are acceptable because whenever change is introduced, some people support it while others oppose it. It appears from the responses that even those who were making jokes provided the participants with the necessary support they needed. The responses also highlight that the support of the school director and pedagogic head was helpful in the positive outcome of the lesson study process. In the first place, the school leadership granted permission for the study to take place in their school, an indication of their support for the process. The director of this school was enthusiastic about the lesson study process. The researcher could identify direct correlation of the school director's interest to the participants' level of interest and to the reaction and support of the school community. Moreover, the head of department played an important role in coordinating the meetings during the lesson study cycles. Finally, the researcher (as knowledgeable-other) provided training during the workshops, guided the participants through the lesson study process, provided support during planning, facilitated debriefing discussions and provided resources. The support of the researcher (as knowledgeable-other), however, decreased when the participants gained more knowledge and skills. In Section 5.6.2.2 the organisational support in School 'B' is discussed.

5.6.2.2 Organisational support in School 'B'

In School 'B', the organisational support is categorised in terms of reaction and extent of collegial support, support of the school leadership, contributions of the head of department and contributions of the knowledgeable-other (the researcher) (see Table 5.7).

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The participants indicated that whenever they gathered in the staffroom, the school community members asked what they were doing and how they were selected to participate in the programme. When they were told what the programme was about, the majority of them reacted positively and wished to participate in similar initiatives. Comments that depict these ideas are given below:

> *They were discussing about lesson study in the tearoom and staff rooms. (SBPH-J-00:05:48)*
>
> *[…] what we were doing has attracted the attention of the staff and many of them were enthusiastic about it (SBT2-H3-01:08:19).*
>
> *As I heard it from them, they were positive towards it. They liked the process of observing the lesson of one another. They wished to do the same thing. I heard some saying why the process is practiced in science and not in others departments. (SBT4-H1-00:47:53)*

Regarding support, the participants revealed that the school community members honoured them for their participation in the lesson study cycle and provided them with the necessary support. They exchanged periods with the participants, kept their classes busy when necessary and supplied them with meeting places. The director and pedagogic head also observed that the school community members provided the participants with resources and cooperated in the exchange of periods. Some of the comments read as follows:

> *The school community was supportive. They were positively responding to our requests. The only things that we have requested from them were for exchange of periods and using library for meetings. (SBT1-H2-00:22:10)*
>
> *The staff members were cooperative. When we request them to engage our classes, they were accepting our requests (SBT2-H3-01:08:19)*
>
> *The storekeeper provided them with charts […]. (SBPH-J-00:05:48)*

In order to facilitate the establishment of organisational support, the school director and pedagogic head were allowed to participate in the workshops (see Section 4.3.4.2). Subsequently, the participants acknowledged that the school leadership supported them by adjusting the timetable to accommodate the lesson study cycles, allowing them to exchange periods with other subject teachers, providing them with meeting places, facilitating communication with the researcher and providing them with resources. The director of the school and the pedagogic head corroborated the participants' account of the support given to them by indicating that they contributed to the management of the classes left unattended as a result of the teachers' participation in the lesson study cycles. The following statements elaborate on this:

> *The school administration was helpful in arranging timetable, provided us teaching aid materials based on our request and provided us telephone service in order to make appointments. (SBT2-G3)*

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> *Regarding time, we gave them permission to use the slots of the non-academic subject such as life skill. Moreover, we requested the physical education teachers instead of taking the students to the football field to cooperate with science teachers to use some of the periods for lesson study. We made this arrangement because we did not want to see the annual plan gets affected. (SBD-J-00:02:46)*
>
> *[…] our support mainly focussed on organising the timetable. Especially when all the teachers go for observing the research lessons we try to manage the classes left without teachers and calm down the students. Our role helped the teachers to participate in the lesson study without any worry. […] When they asked us for resources, we provided them. […] We facilitated the connection between you and the teachers. […] In general, I would say we have played our role in synchronising the whole process. (SBPH-J-00:03:35)*

Although the participants acknowledged the support of the school leadership, they also blamed them for becoming distant observers and for not observing and supervising the research lessons. However, the pedagogic head explained that the reason for distancing themselves was merely not to interfere and influence the research. They indicated that their role was to provide the necessary support and synchronise the process.

In order to facilitate the establishment of organisational support, the head of department was selected as a member of the lesson study team from the beginning of the study (see Section 4.3.4.3). The head of department was assigned to lead the lesson study team. He played a vital leadership role during the lesson study cycles until he was transferred to another school and replaced by a new head. The role of the head of department was to coordinate the meetings, facilitate communication among the team members and the researcher and lead the team in all aspects.

The participants also appreciated the support of the researcher (as knowledgeable-other). In addition to organising the workshops, the researcher guided them through the lesson study process, shared ideas with them, supported them during the lesson planning and provided them with some resources (see Section 4.3.4.4). A respondent notes this:

> *You were assisting in lesson planning. You were giving us ideas about the narrowness and extensiveness of lesson plan. You were discussing with us during lesson planning. You helped us to enrich the lessons. You had played a role in this regard. (SBT2-H3-01: 18:52)*

In summary, the above responses illustrate the extent of support provided to the participants. The results revealed that the participants were honoured and given sufficient support by the school community members. The head of department also played an important leadership role in facilitating the lesson study processes. The school director and pedagogic head were instrumental in creating a supportive school environment. As first step, they allowed the research to take place in their school. Specifically, the pedagogic head in this school played an important role in managing the classes that

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were left without teachers. Finally, the researcher (as knowledgeable-other) provided training during the workshops, guided the participants through the lesson study process, provided support during lesson planning, facilitated debriefing discussions and provided resources. However, the support of the researcher (as knowledgeable-other) decreased when the participants gained more knowledge and skills.

In Section 5.6.2.3 the organisational support in School 'C' is discussed.

5.6.2.3 Organisational support in School 'C'

As in the cases of Schools 'A' and 'B', the organisational support in School 'C', is categorised in terms of reaction and extent of collegial support, support of the school leadership, contributions of the head of department and contributions of the knowledgeable-other (the researcher) (see Table 5.7).

Regarding the reaction and extent of collegial support, the participants indicated that the majority of the community members of School 'C' reacted negatively towards the lesson study process. Despite the negative feelings, they provided the necessary support by exchanging periods with the participants and engaging their classes when they left them unattended during observation or debriefing sessions. Statements that demonstrate these feelings are given below:

> *About 90% of them have negative attitude and the remaining 10% have positive attitude. (SCT1-H2-00:40:55)*
>
> *When we leave the classrooms unattended, the physical education teachers and others participate in calming down the students. This indicates that they were supporting us and standing on our side because they have understood it. I would like to indicate that their support was good. (SCT2-H3-00:55:55)*
>
> *At this time in order for me to come to this interview, one of my colleagues is engaging my class. (SCT3-H1-00:52:55)*

As in Schools 'A' and 'B', the director and pedagogic head of School 'C' were allowed to participate in the workshops in order to facilitate the creation a supportive school environment, (see Section 4.3.4.2). The participants indicated that the school leadership was supportive in creating suitable timetables, allowing them to exchange periods with other subject teachers, providing meeting places and providing them both moral and material support. The views of the school director and the pedagogic head corroborate the teachers' claims. Examples of such responses are given below:

> *[…] if we ask them for some resources or a meeting place, they positively cooperated with us. The leadership did not speak to us about the lost periods. […] They even requested other members to cooperate with us. I would say there was good spirit of cooperation in the school community. (SCT1-H1-00:53:33)*
>
> *[…] since we were satisfied and accepted it from our heart, we were obliged to provide them with necessary support. We have supported them in arranging the timetable. […] we*

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> *have also provided them the resources that they have requested. Largely, we were encouraging them because we wanted them to work in the research efficiently and to grasp necessary knowledge so that they would be able to work in lesson study in the future. I would say we have supported it fully. […] Therefore, the school was on their side to support, encourage and create conducive environment for them in order to do their work with enthusiasm. We have never been an obstacle to them. (SCD-J-00:05:26)*

The head of department was selected as a member of the lesson study team from the beginning of the study in order to facilitate and create a supportive school environment (see Section 4.3.4.3). In this school, the head of department was assigned to lead the lesson study team. He played a vital leadership role in coordinating the meetings, led the team in all aspects and facilitated communication among the team members and the researcher.

Finally, the participants valued the support provided by the knowledgeable-other (researcher). According to them, the support provided by the researcher (as knowledgeable-other) included organising and conducting of the workshops, guiding them through the lesson study process and providing them with resources (see Section 4.3.4.4). The response given below testifies the above claim:

> *You [researcher] showed us the way and we have worked the details. […] You assisted us with what we were doing by providing us resources. You printed the lesson plans and worksheets. You provided us good support. You were good knowledgeable-other. You did not bias us. You gave as only a clue or a way of doing it and based on that we have done what we could. (SCT1-H3-01:11:44)*

In summary, the above quotations indicate the nature of organisational support provided to the participants. The results revealed that the majority of the school community reacted negatively towards lesson study. The researcher is of the opinion that these negative reactions and resistance from the school community members may be because they were afraid of any changes coming into the system that may demand them more work. In such situations where the school community reacts negatively, one would expect the working climate to be uncomfortable. However, the real situation was otherwise. Despite their negative reactions, the participants indicated that the school community members supported them. As a result, they were able to implement the lesson study cycles in a suitable environment. The school leadership including the head of department and the knowledgeable-other (the researcher) were instrumental in creating a supportive school environment for the participants. The director and pedagogic head seemed to support the initiative and permitted the research to take place in their school. The head of department played an important role in coordinating the meetings during the lesson study cycles. Finally, the researcher (as knowledgeable-other) provided training during the workshops, guided the participants through the lesson study process, provided support during planning,

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facilitated debriefing discussions and provided resources. However, the support of the researcher (as knowledgeable-other) decreased when the participants gained more knowledge and skills.

In the following section the nature of organisational support in the three schools is summarised.

5.6.2.4 Interpretive summary of the nature of the organisational support

Unlike in the traditional approaches where limited support and follow-up is offered to participants, this study was organised so that the participants would obtain the necessary support from the school leadership and community while implementing lesson study in their classrooms, as recommended by Guskey and Yoon (2009). In this section, Section 5.6.2.4, the discussion regarding the nature of organisational support and follow-up is organised as reaction and extent of collegial support, support by the school leadership, contributions of the head of department and contributions of the knowledgeable-other (the researcher) (see Table 5.7).

In the three schools, the awareness of lesson study influenced the extent of community members' reactions towards the participants. The degree of awareness affected the reactions, which in turn affected the extent of support they provided to the participants. Community members in the three schools frequently asked about what the participants were doing, how they were selected, whether or not they were getting financial benefits and if it was also possible for them to participate in the programme. Once they got information about these questions, they started reacting to lesson study by discussing about it in the staffroom during break time. In all the schools lesson study became a point of discussion among the staff members.

The majority of the school community members in Schools 'A' and 'B' reacted positively, whilst in School 'C' the majority reacted negatively. It was expected that members of a community in a more resourced school, as in School 'C', would react positively to the initiative compared to members in less resourced schools. But that was not the case in School 'C'. In Schools 'A' and 'B', it was observed that some teachers who were not part of the lesson study team wished to participate in similar processes. Although the participants in School 'A' were honoured for their participation in lesson study, some colleagues made jokes about them. Regardless of some negative feelings, community members in the three schools encouraged and supported the participants in their respective schools by exchanging periods, covering up for them in their classes and providing them both moral and material support.

School leadership plays a key role in determining the success or failure of any professional development programme, including lesson study (Fullan, 2007; Loucks-Horsley, et al., 2010). Taylor et al. (2005) and Stepanek et al. (2007) identified the importance of school leadership's support to lesson

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study. Obtaining leadership support is a mechanism through which support from other members of the school can be obtained. In this study, the support of school directors and pedagogic heads differed to various degrees. In a school where the leadership showed interest in lesson study, the participants were more committed and the school community members were more cooperative. In School 'A', for example, the leadership seemed to be more enthusiastic and interested in lesson study than the leaders of the Schools 'B' and 'C'. As a result, school community members of School 'A' seemed to be more supportive and cooperative than the school community members of Schools 'B' and 'C'. Moreover, the leaders of Schools 'B' and 'C' were distant observers. They said that they did not want to influence the objectivity of the research by interfering in it.

Although there was variation in schools leaders' interest in the lesson study process, two reasons can be provided to support the claim that they were supportive. Firstly, they granted permission for the study to take place in their schools. Secondly, they supported the teachers in several aspects including creating suitable timetables by either making changes on the timetable or allowing them to exchange periods with other subject teachers in order to find common meeting time as suggested by Lee (2008). Moreover, they supported the teachers by identifying suitable classrooms, providing resources, providing meeting place, facilitating connection with the researcher by providing telephone services, managing classes left unattended and requesting members of the school community to cooperate with them. The willingness of the leaders to provide all these supports is an indication of their interest in lesson study as potential teacher development strategy for their schools. Similar findings were made by Coe (2010) and Coe et al. (2010) where the school leadership expressed enthusiasm about lesson study because of the benefits it provides with regard to teacher development. The leaders of the three schools also expressed the wish that lesson study could be introduced in all Eritrean schools.

In this study, the heads of departments played an important supportive role. Heads of departments are leaders of departments who work closely with teachers and school leadership to ensure a high quality of teaching and learning (see Figure 4.2). In this study, the heads of science departments were selected as members of the lesson study team, from the beginning of the study, in order to establish a supportive school environment (see Sections 3.2.5.7 and 4.3.4.3). As a result, the heads of the science departments in the three schools played important leadership roles in coordinating the meetings, facilitating communication among the team members and the researcher and leading the lesson study team in all aspects.

The researcher also played an important supportive role. The researcher played dual roles, the role of a researcher and the role of the knowledgeable-other. A knowledgeable-other is an individual who works

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with and supports a lesson study team with subject matter, pedagogical knowledge and lesson study cycles (Stepanek, et al., 2007). The importance of assigning a knowledgeable-other during lesson study cycles for the purpose of providing information, guidance and feedback is supported by Chokshi and Fernandez (2004). In this study, the researcher trained the teachers on lesson study. During the lesson study cycles, the researcher (as knowledgeable-other) guided and supported the teachers through the lesson study process. The teachers in the three schools found the contribution of the knowledgeable-other valuable. Apart from organising training workshops and guiding them through the lesson study cycles, the researcher (as knowledgeable-other) supported them by sharing ideas with them during lesson planning and provided them with resources. The support of the researcher (as knowledgeable-other) decreased towards the end of the programme as the teachers gained more knowledge and skills. This study confirms the report by Fernandez, et al., (2003) that lesson study contributes to improved teaching and learning if teachers receive adequate support during the process. Overall, the school community, the school leadership including the heads of departments and the knowledgeable-other (the researcher) provided the necessary support so the teachers could transfer the newly acquired concepts and skills into the classrooms. This finding is in agreement with those of Guskey (1994) and Darling-Hammond and Richardson (2009), who reported on the importance of organisational support in sustaining teacher development programmes.

In the following section the contributions of lesson study to enabling the teachers to work collaboratively will be discussed.

5.6.3 Contributions of lesson study in breaking the culture of isolation

The fourth research sub-question posed was: "*How did lesson study contribute to breaking the culture of isolation*?" This question focused on the contributions of lesson study in breaking the culture of isolation. In this study, lesson study has created a platform for the teachers to come together to perform several activities collaboratively. These activities range from collectively identifying topics for research lessons to collectively planning, teaching, observing, debriefing, revising and re-teaching research lessons. These collaborative activities helped the teachers to minimise the prevailing culture of isolation. For each school, first the results that highlight teachers' earlier practice were presented and then the practices of collaboration during the lesson study cycles (see Table 5.8).

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Table 5.8: Teachers' perspectives on the contributions of lesson study in breaking the culture of isolation

Main categories	Generic categories	Sub-categories
Contributions of lesson study in breaking the culture of isolation	Earlier practice	Practice of isolation
	Practice of collaboration	Enhanced interpersonal relationships
		Enhanced working together and sharing of ideas

5.6.3.1 Contributions of lesson study in breaking the culture of isolation in School 'A'

The results in this Section 5.6.3.1 are categorised as earlier practice and the practice of collaboration (see Table 5.8). In School 'A', the participants indicated that their earlier experience was characterised by a feeling of isolation. They had limited opportunity to work with their colleagues. They were planning and teaching lessons alone. They knew little about their colleagues' planning, classroom practice, relationship with students and questioning styles. They added that their earlier interactions were limited to asking one another about the topics to be covered, as indicated below:

> *Everyone was preparing his or her own lesson plans alone. The exchange of idea was limited. […] We were not discussing on how to teach the lesson. (SAT1-H1-00:09:53)*
>
> *There was not much collaboration before lesson study. (SAT4-H1-00:19:55)*

Participation in the lesson study cycles provided the teachers with the new experience of working collaboratively. Lesson study created a platform for the participating teachers in this school to come together and collaborate with one another in order to improve classroom practices. The teachers indicated that lesson study served as an "icebreaker" and removed the barrier that was hindering them from interacting and working with one another. According to them, the lesson study cycles minimised the isolation and shyness that persisted among them. Participation in the lesson study cycles thus enhanced their coherence and interpersonal relationships. The participants frequently indicated that after participating in the lesson study cycles, they have started to love, respect, interact with, talk to and work with one another. It also enabled them to network with their colleagues in Schools 'B' and 'C'. The opinion of the school director corroborates the claims of the teachers. He stated that the teachers became friendlier with one another after participating in the lesson study cycles. Quotations that substantiate these claims are:

> *Lesson study served us as an icebreaker to break the barrier among us. Now, we can ask any questions to one another and share it with one another. (SAT1-H1-00:39:46)*
>
> *Now, we are discussing on what to teach, what type of questions to include, discuss on the demonstration and agree on the experiment. (SAT4-H1-00:19:55)*
>
> *After participating in this lesson study, the teachers started working together, meaning it increased their coherence. In short, it provided them with opportunity to discuss with one another. Lesson study helped them to know one another. (SAD-J-00:34:29)*

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Moreover, the teachers indicated that the lesson study cycles enabled them to come together and work towards teaching the perceived difficult topics. Participation in the lesson study cycles enabled them to learn from one another through the sharing of experiences, observing and giving feedback to one another. They frequently linked their experience of collaboration to a local proverb that says *two heads are better than one*. Excerpts that substantiate these claims are given below:

> *As commonly, said two heads are better than one head. From collaborative work, we found many advantages especially in the practical skills in which we had deficiency we got additional skills. One brings materials, one gives ideas and another prepares something. Therefore, by working with colleagues we got advantages. (SAT1-H3-00:01:22)*
>
> *[…] lesson study […] enabled me to work with colleagues collaboratively, teach a lesson collaboratively and be able to observe how a teacher teaches a lesson and how students learn it. (SAT2-G3)*

In summary, the above responses describe lesson study as a collaborative endeavour. Participating in the lesson study cycles helped them to remove the barriers that were hindering them from participating in professional collaboration. Lesson study enhanced their interpersonal relationships and encouraged them to build mutual trust and respect among themselves. It also enabled them to participate in collaborative activities such as planning, peer observation and sharing of ideas, which were often missing from their school culture. These collaborative activities helped the participants to learn from one another and change their classroom practices. The teachers had been working in isolation behind closed doors not knowing what others were doing. Such isolation was an obstacle to improving the teaching and learning process in Eritrea. In the researcher's opinion, the lesson study cycles contributed to minimising isolation and enabling the teachers to come together and engage in professional collaboration.

In Section 5.6.3.2 the contributions of lesson study to breaking the culture of isolation in School 'B' are discussed.

5.6.3.2 Contributions of lesson study in breaking the culture of isolation in School 'B'

The results in this Section 5.6.3.2 are categorised as earlier practice and the practice of collaboration (see Table 5.8). In School 'B', the teachers indicated that there was little tradition of collaborative activities. They worked alone with limited opportunities for professional dialogue, collaboration and observing one another in their teaching practices. They indicated that each of them struggled on their own with the demands of teaching. Excerpts that substantiate this claim are given below:

> *Before participating in lesson study, everyone was preparing his/her own lesson plan. (SBT4-H2-00:01:01)*

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> *Earlier, I was going on my own way and he was going on by his own way. (SBT5-H3-00:30:30)*
>
> *There was no practice of a teacher observing another teacher. (SBT1-H2-00:05:20)*

Thus, participation in the lesson study cycles removed the barriers that were isolating them and preventing them from coming together to collaborate and share ideas. They indicated that henceforth they would work collaboratively and share ideas and experiences in an effort to improve classroom practices. In addition to strengthening their relationships with one another, the lesson study cycles helped to strengthen the relationship with their students. Excerpts that substantiate these claims are given below:

> *I can say that the barriers that were blocking teachers from collaborating with one another or working in teams have been removed. These barriers were the negative feelings that the teachers were holding regarding being observed, the fear of being evaluated, or the fear of being belittled by colleagues. (SBT6-H3-00:26:52)*
>
> *Lesson study also consolidated our relationships. (SBT1-H2-00:12:20)*
>
> *After participating in lesson study, I have created friends. (SBT2-H3-01:27:18)*

The teachers also linked working together with the local proverb that says *two heads are better than one* as indicated below:

> *Now, I am taking collaboration as a productive process. Earlier, teachers were not considering collaboration as important. Therefore, they were avoiding working together. The good thing of lesson study is that it allowed teachers to work together collaboratively. Now, the advantage of working together is that it helped us to identify our strengths and weaknesses. It enabled us to correct our weaknesses and maintain the strengths. Collaboration enabled us to share ideas. I feel that it is important for us to work collaboratively in all our activities in addition to our collaboration in lesson study. The working of teachers collaboratively, also benefits students. If teachers work collaboratively, then they share their experiences and hence they narrow down their discrepancy in assessing students or in their teaching methods. As SBT2 indicated, two heads are better than one. I found working collaboratively very productive, because it involves many heads. (SBT6-H3-00:02:28)*

In summary, the above claims indicate that prior to their participation in the lesson study cycles; collaboration on professional activities was not a common practice. The teachers rarely shared ideas and experiences and they worked in isolation. Lesson study thus enabled them to participate in several collaborative activities and build strong interpersonal relationships. They realised that by participating in collaborative activities, each one of them had something to share with and learn from colleagues and this, in the long run, would improve the quality of teaching and learning process in Eritrea. Evidence from this study has shown that lesson study is an appropriate strategy to break the culture of isolation and bring the teachers together to collaborate, work and share ideas.

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In Section 5.6.3.3 the contributions of lesson study to breaking the culture of isolation in School 'C' are discussed.

5.6.3.3 Contributions of lesson study in breaking the culture of isolation in School 'C'

The results in this Section 5.6.3.3 are categorised as earlier practice and the practice of collaboration (see Table 5.8). In School 'C', the teachers indicated that they had limited opportunity to work with their colleagues. They revealed that their earlier practices were characterised by individualism. As a result, they worked alone with little or no collegial interaction. They neither planned lessons collaboratively nor practised peer observation. They indicated that their meetings were limited to informing one another of their progress on content coverage. However, they noted that their preference for working individually was not because they did not know the benefits of collaboration, but that there was simply no culture that supported collaboration. The teachers felt that they were overloaded and would rather use their free periods for relaxation or personal commitments instead of engaging in collaborative work. Excerpts that substantiate these statements are given below:

> *There was no collaboration like this, sitting together to discuss and plan together. We were developing lessons individually and then implementing them individually. (SCT1-H1-00:24:24)*
>
> *I have never practiced peer observation. (SCT2-H2-00:23:57)*
>
> *[…] many of us complained about using our free time [during the lesson study] (SCT2-H1-01:06:37)*
>
> *[…] working with colleague is really useful. However working with colleagues becomes difficult to implement it in a situation that we are in i.e. number of students and class size and so and so on. (SCT1-H1-00:01:31)*

Lesson study enabled them to observe one another, interact, discuss, work collaboratively and share ideas with one another in an effort to improve classroom practices. The teachers indicated that participation in the lesson study cycles strengthened their relationship with one another and their students. It also helped them to network with teachers from other schools. The views of the director and pedagogic head corroborate the teachers' claims. Comments that depict these ideas are given below:

> *Planning collaboratively helped us to develop relationships among ourselves. (SCT2-H2-00:02:15)*
>
> *It [lesson study] also helped to build friendly relationship with my colleagues. (SCT1-H3-00:30:02)*
>
> *There was good interaction among students and student-teacher. (SCT2-F7)*
>
> *[…] lesson study helped the teachers to know one another. (SCPH-J-00:15:00)*

The results also indicate that the lesson study provided the teachers with an opportunity to collaborate and work with one another in ways that they had not done before. The teachers also noted that the

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collaborative work enabled them to share ideas on how to teach difficult topics in a simplified way because *two heads are better than one* head. They added that working together and the sharing of ideas helped them to learn from one another. Some of such statements are given below:

> *[…] working and sharing ideas with colleagues is useful, it helps to learn from one another. (SCT1-H1-00:01:31)*
>
> *Through collaboration of the lesson study my lesson [becomes] too easy on teaching difficult lesson by sharing experiences and knowledge. (SCT2-G1)*
>
> *We worked as a team during planning, teaching and observation. During these processes, we have benefited from and shared ideas with one another. (SCT2-H3-00:28:54)*

In summary, the above responses indicate that prior to their participation in the lesson study cycles the participants worked mainly in isolation from one another. They performed all the professional activities alone. Working towards a common goal and sharing of ideas was not common. The sharing of ideas was limited to informing one another the extent of syllabus coverage. Lesson study therefore provided them with new ways of collaboration towards improving classroom practices. Lesson study also enhanced the interpersonal relationships among the teachers and between them and their students. In a nutshell, the results of this study have demonstrated that lesson study is an appropriate strategy to minimise isolation and bring the teachers together to collaborate with one another so as to improve their classroom practices. The following section summarises the contributions of lesson study in breaking the culture of isolation.

5.6.3.4 Interpretive summary of contributions of lesson study in breaking the culture of isolation

The contributions of lesson study in breaking the culture of isolation were organised into two categories, namely teachers' earlier practice and practices of collaboration during the process (see Table 5.8). The results revealed that in the three schools the earlier practices of the teachers were characterised by a culture of isolation. The teachers indicated that they typically worked alone with limited interaction, professional dialogue or collaboration with one another. They prepared lesson plans individually and taught alone. The practice of peer observation was limited. Hence, they knew little about their colleagues' planning, classroom practice, relationships with students and questioning styles. In line with Little's (1990) storytelling, the only time that the teachers had interaction was during tea breaks or breaks between classes where they shared superficial ideas about content coverage. The findings of this study fit in with the first step of Bell and Gilbert's (1996) social development where after participating in the lesson study teachers sensed isolation to be a problem. The teachers indicated that they worked alone because there was no culture in their schools that supported collaboration. This

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agrees with the findings of DuFour (2011) who stresses that teachers tend to work in isolation if they lack structures in their schools that support collaborative work. The literature also indicates that teachers choose to work in isolation in order to avoid outside interferences and criticism (Hargreaves, 1994) or if they consider teaching as a profession that requires "little specialized knowledge", which implies that they think that there is no reason for them to work in groups (Burney, 2004, p. 527).

The teachers indicated that participation in the lesson study cycles removed the barriers that were hindering them from working together. This finding confirms what is said in the literature, namely that lesson study is a vehicle that brings teachers together to work collaboratively (Lawrence & Chong, 2010; Cajkler, et al., 2014). In all the schools, the teachers indicated that participation in the lesson study cycles enabled them to work collaboratively, to open their classrooms to their colleagues to observe, to interact and discuss and share ideas with one another. Through the sharing of ideas, experiences and resources, peer observation and providing of feedback, the processes which Hargreaves (1994) describes as collaboration, the teachers in this study were able to refine and strengthen their professional knowledge and skills, as is also stated in the literature (Bell & Gilbert, 1996). The teachers examined the syllabus and student textbooks, selected lessons that were difficult to teach and collaboratively worked on developing joint research lessons. Before participating in the lesson study, the participants had no common planning time and never conducted formal discussions on teaching and learning. In line with the argument of Lewis (2009) and Murata (2011), this study thus provided an enabling environment for collaboration which proved useful in enhancing coherence among the participants and thereby promoting strong interpersonal relationships. In a similar vein, Coe (2010) and Coe, et al. (2010) reported the contribution of lesson study in bringing teachers out of isolation to collaborate meaningfully with their colleagues. In this study, participating in lesson study, in addition to enhancing their relationship with fellow team members enabled them to know and network with teachers from different schools who participated in joint workshops with them. This finding confirms the assertion of Chokshi and Fernandez (2004) on the positive impact of lesson study on the teachers' interpersonal relationships. The teachers were also observed to extend their collaboration beyond the research lessons in order to address the problems that they face in their work, as is also stated in the literature (Villegas-Reimers, 2003). In addition to enhancing collegial relationships among them, the participants reported that lesson study enabled them to build relationships with students as well.

The collaborative opportunity offered by the lesson study cycles enabled the teachers to participate in peer observation and provide feedback to one another. This confirms Bell and Gilbert's (1996) third step of social development where lesson study enabled the teachers to initiate collaborative ways of working with colleagues. The peer observation and the provision of feedback by the teachers enabled

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them to learn from one another thereby improving their classroom practices. These findings corroborate the observations made by Garet, et al. (2001) that structures which allow teachers to work collaboratively, share ideas, observe one another and provide feedback and support one another are effective in enhancing teacher learning and bringing about changes in classroom practices. In the same vein, Borko (2004) claims that collaboration and the sharing of experiences are important conditions supporting teacher learning and changing classroom practices.

As collaborative work was new to the teachers who participated in the study, some problems were visible during their collaboration. It seemed that to some extent the teachers lacked the skills of critically engaging with one another during the discussions. This was evident in the manner in which they questioned one another and accepted exchange of ideas. This indicates that collaboration is not an easy process especially in schools where isolation was the norm. The above observation supports Little's (1990) opinion that working together does not necessarily lead to teacher learning. It is teachers' critical engagement in the collaboration that contributes to teacher learning (Little, 1990). Since lesson study builds collaborative skills overtime (Stigler & Hiebert, 1999), the more teachers are involved in collaborative work, the more they develop the skills necessary for critical collaboration and the more they will bring about changes in their learning and classroom practice.

Even though collaborative participation as indicated above is a noble activity, the researcher observed that in certain situations the teachers left their students unattended in order to be available for the collaborative work. Therefore, lesson study might sometimes be counterproductive depending on how it is used.

In Section 5.6.4 the extent to which the teachers used the newly acquired knowledge and skills in their classrooms is discussed.

5.6.4 Changes in classroom practice

The fifth research sub-question posed was: "*To what extent did teachers who experimented with lesson study apply the new knowledge and skills gained in their teaching?*" This question deals with the extent of teachers' use of the newly gained knowledge and skills in their classrooms. The focus is on whether the new practices are different from what the teachers used to do in the past (Guskey, 2000). In this Section 5.6.4 the changes is practices are presented (see Table 5.9).

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Table 5.9: Teachers' perspectives on changes in classroom practice

Main categories	Generic categories
Changes in classroom practice	Collaborative work Peer observation Changes in the use of teaching-learning resources Changes in teaching methods

5.6.4.1 Changes in classroom practice in School 'A'

The results in this Section 5.6.4.1 are categorised as collaborative work, peer observation, changes in use of teaching-learning resources and changes in teaching methods (see Table 5.9). In School 'A', teachers conducted five lesson study cycles as indicated in Table 4.3. The teachers claimed that they had made several changes in their classroom practices that were different from their earlier practices (see Table 5.9). Unlike in the earlier practices, the teachers indicated that participation in the lesson study cycles enabled them to use student-centred teaching methods more frequently. They used teaching methods that incorporated a variety of practical and hands-on activities. They changed their roles from providers of information to facilitators of learning. One teacher stated that lesson study helped her to implement the student-centred methodology that she had studied in her initial teacher education programme. Another teacher also indicated that participating in the lesson study cycles enabled him to appreciate the student textbooks. He indicated that the textbooks guided them regarding what to teach and how to teach the lessons in a student-centred way. Some of the responses that reflect these ideas are provided below.

> *In earlier teaching, we focused on how to cover the content. Now, we are thinking about what concept the students would grasp and how to achieve the goals of the lesson. (SAT3-H2: 00:09:06)*
>
> *After participating in lesson study, I am taking the role of facilitator and enabling the students to participate more in the learning process. (SAT2-G3)*

Although the new curriculum advocates that teachers use teaching-learning resources in their classroom practices, the participants indicated that they did not frequently use them. This was mainly due to the shortage of teaching-learning resources and the lack of proper storage facilities. However, the teachers claimed that they had started to frequently use teaching-learning resources after participating in the lesson study cycles. They used teaching-learning resources by either instructing their students to bring from their environment and/ or home or by improvising and preparing themselves. Hence, they were able to organise a variety of hand-on activities for each research lesson. One teacher's responses are given below:

> *Unlike the usual teaching, I have started using teaching aid materials after participating in lesson study. (SAT1-G5)*

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> *In old days, we would not take extra pain to collect all these materials. We would simply continue our teaching by abandoning the demonstration altogether. (SAT1-H1: 00:22:12)*

The teachers also indicated that after participating in lesson study they have focused on individual students' needs, especially the needs of the average and weak students.

> *[…] in the previous practices the teacher may bring the teaching aids, but explains the concept and then proceed to the next lesson in a rush. In the current practice, teachers bring necessary materials and create an environment for the students to come forward and demonstrate themselves. Now we are giving more chance for the students to participate. We are preparing and using necessary teaching-learning resources. Even though the method was the same, the way it was presented was different. By allowing students, to participate we made it to be different from our earlier practice. (SAT3-H1-00:14:18)*
>
> *Before lesson study, I was giving more attention to outstanding students only. But now I am focusing on all students including the weak and average students. (SAT3-G3)*

Another new experience is that the teachers participated in collaborative planning, teaching and observing of research lessons. The school director observed that the teachers were applying the skills that they had acquired from the lesson study to their everyday lessons. Excerpts that substantiate these claims are given below

> *All of us were working alone. I was using my own way of teaching. SAT1 was using his own way of teaching. The other one also uses his own way of teaching. Now, we have started working together and discussing about the content that we intend to teach. (SAT4-H-00:06:58)*
>
> *This way of working in groups is also manifested in their normal teaching. They have started working collectively. In the staff room, these teachers talk to one another regarding teaching. (SAD-J-00:34:29)*

In summary, in the light of the above views, lesson study provided opportunities for the teachers to use practices that were different from what they used in the past. Unlike in the earlier practices, after participating in the lesson study cycles the teachers planned lessons collaboratively, taught publicly observed lessons, observed one another, used teaching-learning resources more frequently, focussed their teachings on student participation and learning, and acted more as facilitators of learning than providers of information.

In Section 5.6.4.2 changes in classroom practice in School 'B' are discussed.

5.6.4.2 Changes in classroom practice in School 'B'

The results in Section 5.6.4.2 are categorised as collaborative work, peer observation, changes in use of teaching-learning resources and changes in teaching methods (see Table 5.9). In School 'B', the participant teachers conducted six lesson study cycles as indicated in Table 4.4. In each cycle, they identified topics that were perceived to be difficult for their students and collaboratively planned and

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taught the research lessons. The teaching of the research lessons were followed by observation and debriefing sessions. Throughout the lesson study cycles, the teachers worked collaboratively. These practices were different from the practices that these teachers followed in the past. The participants in this school acknowledged that they had made changes in their teaching methods. Prior to participating in the lesson study cycles, their teaching practices were characterised by teacher-centred teaching styles where they considered students as passive receivers of information. However, they shifted their focus to student-centred teaching and paid more attention to student learning. An important component of the student-centred learning is giving students the chance to participate actively in the teaching and learning processes. The teachers were therefore of the view that they had shifted from being transmitters of information to facilitators of learning following their participation in the lesson study. Some of their responses in this regard are given below.

> *During lesson study, students were completely given more chance to participate. The role of the teacher was only to guide the students at the end of the lesson. Therefore, students did more jobs. Now, the approach is shifting more towards student-centred. Now, we were able to know student-centred approach and apply it. Lesson study takes you more towards student-centred approach. (SBT6-H3-00:31:15)*

> *The current lessons were organised in such a way that the students work on the activities. Each student was involved in the lessons. We were almost passive and the students were active. This way of teaching is good but with the number of students and lack of time we have it makes you lag behind. With such type of teaching one cannot complete the annual lesson plans. Actually as he said, we used to conduct very few group discussions. Student-centred teaching method is very good. Of course, it allows the students to participate. To teach the student-centred way there are challenges that hinder us. (SBT4-H1-00:11:38)*

The teachers indicated that before participating in the lesson study cycles they considered student-centred teaching as a method not appropriate to their context due to some limiting factors such as heavy teaching load, large class-sizes and curriculum overload. After participating in the lesson study cycles, they developed a positive attitude towards the student-centred approach. These views can be seen in the following statements:

> *Earlier, we were thinking that teaching big class-size, like our classes, using discussion method kills time. (SBT4-H2-00:11:50)*

Regarding changes in the use of teaching learning resources, the participants pointed out that after participating in lesson study, they frequently used teaching and learning resources by either bringing these themselves or requesting their students to bring them. They also indicated that they used the environment as a source of teaching learning resources. For example, one teacher indicated:

> *[…] we have started using teaching-learning resources in our lessons. For example, […] we brought flowers from a flower garden located at the back of our school. We have never*

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> *remembered this garden before. […] we also instructed our students to come to the lesson with flowers. (SBT1-H2-00:09:41)*

The teachers also participated in several new activities including the teaching of publicly observed lessons, observing research lessons and providing constructive feedback to one another. Throughout the lesson study cycles, the teachers participated in collaborative activities and shared ideas and experiences with their colleagues. Excerpts that substantiate these claims are given below:

> *[…] we were able to observe one another's lessons and then through debriefing we exchanged experiences and ideas. The earlier way of teaching was teaching teacher dominated lessons. We were not inviting students to participate in the teaching-learning process. Now, after participating in lesson study, I found it beneficial to allow student to participate in the lessons. (SBT3-H2-00:18:40)*
>
> *Now, we have already started working together in preparing lesson plans and observing one another's lesson in order to share ideas with one another. […] This practice will be helpful for the young teachers to observe and provide them feedback. They would in turn observe our lessons. (SBT3-H3-01:24:53)*

In summary, the above responses by the participants indicate that they had used student-centred teaching more frequently, allowed students to participate in hands-on activities, used teaching-learning resources more frequently, taught publicly observed lessons with confidence, observed research lessons, provided constructive feedback to one another and participated in collaborative activities with colleagues. In Section 5.6.4.3 changes in classroom practice in School 'C' are presented.

5.6.4.3 Changes in classroom practice in School 'C'

The results in Section 5.6.4.3 are categorised as collaborative work, peer observation, changes in use of teaching-learning resources and changes in teaching methods (see Table 5.9). In School 'C', the teachers conducted six lesson study cycles (Table 4.5). In each cycle, they identified topics that were suitable for implementing student-centred teaching especially those topics considered difficult for students to comprehend. After selecting the topics, they collaboratively planned and taught the research lessons. The execution of the research lessons was followed by observation and debriefing sessions. Throughout the lesson study cycles, the teachers worked collaboratively. These practices were different from the practices that they were accustomed to. The teachers also acknowledged that they had made changes in their classroom practices when compared to what they did in the past. They indicated that participation in the lesson study cycles enabled them to use the student-centred style of teaching more frequently.

> *[…] lesson study helped us to consolidate the presentations made by the students in the form student-centred approach more than the earlier approach. In the past, we were practicing a student-centred teaching learning process, but after the workshop, we emphasised on it more. This is because during lesson study we used student-centred way*

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> *of teaching where the students made more talk than the teachers did. […] In the past the vast majority of our teaching focussed on teacher-centred with only small part of it was student-centred. Now, lesson study helped us to make the teaching fully student-centred. (SCT1-H1-00:19:19)*

After participation in the lesson study cycles, the teachers were able to frequently use hands-on activities and teaching learning resources, activities that provided more active learning opportunities to the students. They indicated that by using simple and readily available resources they could make a big difference as indicated in the following illustration:

> *I do not have different opinion from theirs but I want only to express what I have learned. I have learned that in the teaching and learning process one can support students using simple methods. Actually we were taking preparing worksheet as something difficult. The reason is we do not have access to printer and photocopy. We consider typing the worksheet, printing it and then photo copying it as a difficult job. May be it is because the secretaries who take care of duplicator and printer are unapproachable. I have learned that it is easy to prepare one leaf worksheet and then duplicating. I have learned new thing that will help me in the future. You have supported us in this regard so that I could use them in the future teaching. It is big thing for the future. I have learned that by using simple resources one can make a big difference. If we prepare such worksheets, it is easy for our students to photocopy them. But we see it as something difficult. I would say I have learned this. (SCT2-H3-01:13:02)*

The participants were also excited about the unique experience of peer observation that they had never practised prior to participating in the lesson study. They indicated that this peer observation helped them to learn from one another as indicated below:

> *Regarding observation, I have mentioned the same idea in the first interview it was our first experience to observe one another. This is something that we have never done it before. We have started peer observation with lesson study. Therefore, it was a wonderful experience. We have gained a lot of ideas from our peer. I would like to mention that we have benefited a lot from observing one another. (SCT2-H3-00:09:00)*
>
> *Another point is observing lessons of one another. Personally, I did not observed many lessons before participating in lesson study. When one observes a lesson he is the first learner. During observation you look for what you do and what you do not do in your colleague's lesson and then complement your practice by taking ideas from your colleague. (SCT3-H1-00:11:04)*

Furthermore, the teachers described the collaborative planning, participating in professional discussions and providing constructive feedback to one another as practices that are different from the ones that they followed before. They indicated that as a result of these new practices they were able to prepare better lessons. They claimed that in the process they learned from these new approaches which provide them with new opportunities of sharing ideas and experience with one another. Below are examples of changes in classroom practice after participation in the lesson study cycles:

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> *Now, I want to talk about lesson planning, the material or idea that we want to inculcate into our students and about the teaching methods. In that, the plan which I have prepared is checked by other teachers and I also check the plan of others. I take some information from theirs and vice-versa. It is complementing one another. In other words it means that we are learning. I feel this is good. There was also sharing of ideas. (SCT3-H1-00:11:04)*
>
> *The lessons were better than the earlier lessons because we used better methods and resources. (SCT3-H3-00:54:00)*

In summary, the above quotations indicate that the participants made changes in their classroom practices. They indicated that participation in the lesson study cycles enhanced their ability to use student-centred teaching more frequently, prepare hands-on activities, use worksheets, provide active learning opportunities for students, work as facilitators of learning rather than providers of information and use teaching-learning resources more frequently.

In Section 5.6.4.4 a summary of the changes in classroom practice is provided.

5.6.4.4 Interpretive summary of changes in classroom practice

In Section 5.6.4.4 the focus is on the extent of teachers' use of newly acquired knowledge and skills. More specifically, the aim was to assess whether the teachers' practices are different from what they used to do in the past (Guskey, 2000). Even though the literature indicates that teachers require sufficient time to be able to internalise and adapt the newly acquired knowledge and skills to their settings (Guskey, 2000; Garet, et al., 2001), it was identified in this study that several changes in the teachers' classroom practices had occurred in a relatively short period of time. Differing from their earlier practice, the teachers reported that they focused their teaching on student-centred teaching, participated in collaborative planning, participated in peer observation and the provision of constructive feedback to one another. They also reported that they had increased the frequency of using hands-on activities and teaching and learning resources compared to their past practices.

Before their participation in the lesson study cycles, the participants thought that using student-centred methods were difficult because of the contextual constraints present in Eritrean schools. They indicated that heavy teaching load, large class-sizes and curriculum overload, forced them to use teacher-centred teaching methods more frequently. They used these teaching styles because they help them to cover the syllabus on time and to prepare their students for examinations. In such teaching styles teachers are expected to provide merely factual knowledge that the students study in order to pass examinations. Despite the challenges mentioned above, all the teachers from the three schools indicated that through participation in the lesson study cycle, they were able to use more participatory teaching methods that provided hands-on and active learning opportunities to their students. In this regard, they were also able to organise activities that satisfied the needs of a range of students, namely

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weak, average and outstanding students. This finding supports Bell and Gilbert's (1996) argument on teachers' personal development where teachers identify certain aspects of their teaching that are problematic, deal with the problem using appropriate strategies and then feel satisfied with the outcome. The implication of this is that the teachers in this study first identified that their teaching was not participatory; they then collaboratively designed hands-on activities that enhanced student participation and finally they felt satisfied with the new teaching strategies that addressed the problem. All these new activities are evidences of teachers' professional development, as suggested by Bell and Gilbert (1996). Since professional development is a process and not an event (Garet, et al., 2001), it is unfair to expect too many changes as the period of the programme was relatively short. Loucks-Horsley, et al. (2010) are of the opinion that teachers should be provided with ample time and support to practise, reflect and collaborate with one another. One way of ensuring this is having supportive leadership in place. This is because it is possible to implement and sustain a change over time in schools where there is strong awareness and commitment from the school leadership (Joyce & Showers, 2002). In addition to requiring extended time, the finding of this study indicates that changing classroom practices require support from school culture. Some community members exhibited resistance towards lesson study. This finding is in agreement with what the literature indicates, namely that changing classroom practices are difficult if the school culture does not support classroom implementation of the newly learned knowledge and skills (Guskey, 2000).

In Section 5.6.5 the benefits that the participants gained by participating in the lesson study cycles is discussed.

5.6.5 Positive experiences gained from lesson study

The sixth research sub-question, "*What are the positive experiences of teachers regarding lesson study?*" focused on the positive experiences that the teachers gained through their participation in the lesson study cycles. This question guides the presentation and discussion of the positive experiences that they gained in terms of their professional development. Although students were not the focus of this study, the participants indicated that their students also obtained several benefits from lesson study. Since students are at the centre of any teaching-learning process, the benefits that the students obtained from the lesson study cycles cannot be avoided. Thus, for each school the benefits that the teachers gained from the lesson study cycles will be presented first followed by the benefits that the students gained (see Table 5.10).

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Table 5.10: Teachers' perspectives on positive experiences gained from lesson study

Main categories	Generic categories	Sub-categories
Positive experiences gained by participating in lesson study	Benefits for the teachers	Acquaintance with syllabus guide Confidence of teachers Motivation of teachers
	Benefits for the students	Collaboration of students Confidence of students Learning of students Motivation of students Participation of students

5.6.5.1 Positive experiences gained from lesson study in School 'A'

The participants in this school stated that they obtained several benefits by participating in the lesson study cycles (see Table 5.10). Some of these benefits have already been discussed in Sections 5.6.1.1 and 5.6.3.1. In this section the benefits that have not been discussed, will be presented.

In School 'A', the teachers indicated that participating in the lesson study cycles increased their confidence because by participating in them they gained subject matter knowledge and developed several pedagogical skills. Even though one teacher was reluctant to teach publicly observed research lessons, the majority of the teachers did so, which confirms the extent to which their confidence had been boosted by the programme. One teacher attributed the increase in his confidence to the collaborative nature of lesson study that enabled them to support one another. The following responses from two teachers illustrate their views:

> *Earlier when a teacher or a supervisor observes my lesson, I was losing confidence. Now I feel nothing. I am open to anybody to observe my lesson, because I have taught several research lessons. (SAT3-H3-00:45:43)*
>
> *Participating in lesson study helped me […] to teach freely without shyness in front of my colleagues. (SAT1-G5)*
>
> *We presented the lessons with full confidence. This is because we worked in collaboration with one another and by sharing ideas with one another. (SAT1-H2-00:31:53)*

In this school, the teachers enjoyed participating in this study and this is evident from the high level of interest and commitment they showed during the lesson study cycles. Their interest is reflected in their willingness to re-teach the revised research lessons, their punctuality and attendance. These teachers attended all the research lesson meetings as indicated in Table 4.3. One teacher, for example, expressed her joy of participating in the lesson study cycles as follows:

> *I am very grateful for participating in lesson study. I am happy for getting this opportunity. (SAT5-H2-01:42:18)*

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Apart from their internal motivation, external factors also influenced their punctuality and attendance. During the whole process, the school director was supportive in selecting classrooms, arranging meeting places and providing resources. The interest exhibited by the school director in lesson study might have had a positive effect on the teachers. Moreover, the respondents agreed on the importance of financial rewards as motivating factors to produce better results for themselves and their students. According to the school director, the way the researcher treated the participants and the stipends paid to cover some of their costs as well as the food and drinks served during the workshops motivated the teachers. He described this as follows:

> *[…] the stipends provided to cover for their transport costs […] the tea and cookies, which were served during the workshops, motivated the teachers. Usually such types of incentives motivate teachers and should be encouraged. (SAD-J-00:36:15)*

Another benefit is that participation in the lesson study cycles enabled the teachers to study the textbooks thoroughly to be able to participate effectively in the lesson study cycles. One teacher appreciated the fact that the textbooks provided guidance on how to teach the student-centred lessons, as indicated in the following quotation:

> *The science textbooks are extremely good. They prescribe exactly what we were doing during lesson study. (SAT1-H1-00:08:49)*

Although students were not the focus of this study, the teachers indicated that their students had also obtained several benefits from the lesson study cycles (see Table 5.10). Students obtained these benefits because of the teachers' collaborative planning, teaching and reflection during the lesson study cycles. The results revealed that the lesson study cycles enhanced the collaboration of their students, because the research lessons were planned in such a way that the students worked collaboratively in groups. During the lesson study cycles, students shared their ideas and interacted freely with one another. The teachers identified subgroup formation of students as a hindrance to students' group works. Hence, they minimised this problem by changing the sitting arrangement of the students. Some of their suggestions are given below:

> *They [students] were freely discussing in the group discussions and they were free to ask their doubts to their colleague students than their teacher. They were sharing ideas i.e. as one asks questions the other was explaining to him. They were cooperating i.e. as one writes others were providing ideas. Therefore, I would say that they have benefited. (SAT1-H3-01:05:11)*

The results revealed that the lesson study cycles have enhanced students' confidence because the students worked in groups and discussed with their peers free from shyness. The teachers claimed that the confidence of their students increased because they grouped different ability student together in

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such a way that the low ability students work with higher ability students. Some of their comments are given below:

> *The group discussion helped them to conquer their shyness. The Shyness vanished. (SAT1-H2-01:04:35)*
>
> *Since it was their first practice, students showed lack of confidence at the beginning. However, continued use of the method, led to increased confidence and participation of the students. (SAT4-H2-00:18:06)*

The duty of teachers in any lesson is to motivate students to learn and achieve the set objectives. The teachers indicated that they had observed changes in the motivation of their students. This is because they planned student-centred lessons that enhanced student participation. The students got motivated to learn, when their teachers respect, value and involve them to participate in the learning process. One teacher explains her observation about the changes in motivation of one particular student as follows:

> *There was one shy student in my class, who repeated the same grade twice. He never participates in classroom activities. Moreover, he does not have much interaction with his classmates. During lesson study, I invited him to come in front of the class to assist me on the circuit board, during the demonstration. From that day onwards, the student seemed to be motivated. When I come into the classroom, he starts to welcome me with positive gesture. He also started talking to me. One day he said "Teacher I have finished writing and could you please correct my exercise book". I thought that I have motivated him. (SAT5-H1-00:45:20)*

Moreover, she indicated that students were motivated to answer questions posed by the teachers as follows:

> *Last time in my class, I asked a student, who has never answered a question, I am telling you the truth from that day onwards the student started answering. (SAT5-H2-00:13:26)*
>
> *I think that lesson study is a motivator, especially for the average and below average students. These students are our indicators. One can read from their faces. One can sense happiness in their faces. In the past, some of these students were avoiding from directly looking at a teacher for fear of being asked questions. Now, they started to look directly at the teacher indicating that they are ready to answer, a kind of. I think these are the indicators. (SAT5-H2-01:05:09)*

The school director also observed enhanced interest and curiosity of the students. According to him students liked lesson study because it was new. He observed students coming on time to the classes where the research lessons were taught. A response that illustrates this observation is given below:

> *When the students find new things, they accepted it with new spirit. Always students like new things. Since the new thing is starting with them, they became more curious and interested. They were eager to know what it is. They were coming to class on time. (SAD-J-00:24:57)*

Moreover, the teachers indicated that lesson study promoted students' participation. Since all the research lessons were planned in student-centred teaching ways, students were encouraged to

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discuss, ask questions, present and participate in the hands-on practical activities. Some of the views are given below:

> *[..] the students were actively participating. (SAT3-L6)*
>
> *In earlier lessons, only the outstanding students were answering while the weak students diverting their attention to something else. At this time when we used group discussion, they were obliged to participate in the discussions. We were also encouraging them to present their discussions. The weak students volunteered for presentation. I would say the students have benefited. (SAT2-H3-01:07:13)*

Finally, the teachers noted that that lesson study enhanced students' learning because of the increased frequency of using participatory methods and hands-on resources. Some of such views are given below:

> *[Students] were expressing their ideas fluently. (SAT1-H1-00:48:13)*
>
> *The students were able to obtain deep knowledge on the subject matter. (SAT3-G3)*
>
> *[Students] were able to explain fulcrum, load and effort and […] locate the position of each on the simple machines. (SAT1-L4)*

In summary, the above responses indicate that lesson study had enhanced their knowledge and classroom practices, improved their ability to observe lessons and students' learning, enhanced their confidence of teaching publicly observed lessons, improved their ability to study the science textbooks and syllabus guide more thoroughly to be able to participate effectively in the lesson study cycles and improved their relationships with their colleagues. The responses also show that lesson study enhanced students' learning, participation, collaboration, confidence and motivation because the teachers had planned lessons that allowed students to work and discuss with one another.

In Section 5.6.5.2 the positive experiences gained from the lesson study cycles in School 'B' are provided.

5.6.5.2 Positive experiences gained from lesson study in School 'B'

In School 'B', the teachers indicated that they had obtained several benefits by participating in the lesson study cycles (see Table 5.10). Some of these benefits have already been discussed in Sections 5.6.1.2 and 5.6.3.2. This Section 5.6.5.2 presents some more benefits. The participant teachers stated that participating in the lesson study cycles had increased their confidence in teaching public lessons and are not afraid of teaching lessons that are observed by their colleagues or other observers. They added that lesson study has enhanced their confidence and professional competence as science teachers. The following responses illustrate these views.

> *[…] we developed confidence. We do not feel anything when our colleagues observe our lessons. (SBT2-H1-00:29:47)*

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I have developed confidence in my teaching. (SBT2-G2)

The majority of the teachers in this school was punctual and regular in their attendance (see Table 4.4). Only one person did not attend regularly and was reminded by the researcher to exercise his right to freely withdraw from the research if he could not continue. According to this participant, however, he had divided attention because while he was interested in participating in the research, some of the sessions clashed with a course he had registered to attend in a private college. The teachers indicated that participating in the lesson study cycles has increased their motivation as follows.

[…] participating or working in collaboration with other teachers enhanced my motivation. (SBT5-H3-00:25:16)

Another benefit is that the collaborative nature of lesson study, simplified lessons that were usually difficult for individual teachers. Lesson study helped in simplification of lessons because the teachers were able to develop common understanding about what they taught, used same teaching methods, asked similar questions and gave students same notes as follows:

Earlier, I was going on my own way and he was going on his own way. Now, three of us are preparing the same questions for the Saturday programme. Our lesson plans are the same. The questions and answers are the same. These helped us to evaluate the students the same way. (SBT5-H3: 00:30:30)

The teachers believed that lesson study did not only benefit them, but it equally benefited their students (see Table 5.10). The benefits for the students included enhanced student collaboration, confidence, motivation, active participation and learning. These student benefits arose partly from the shift towards student-centred lessons that allowed active student participation.

Regarding student collaboration, lesson study enabled the students to work in groups to collaborate, discuss, share ideas as well as present the outcome of their discussions to their classmates as indicated below:

They were able to express their ideas and share their ideas with colleagues. (SBT2-G3)

[…] the students collaborate with each other so as to answer the questions. […] Since the lesson is accompanied by an activity which make the students carry out individually, everybody was engaged in the [activity].The students have had very good respond to every instruction. (SBT3-F1)

The results revealed that lesson study enhanced students' confidence because the teachers planned for student-centred lessons that allowed students to participate actively in the learning process. The teachers indicated that the engagement of students in the hands-on activities helped them to build confidence. One example of such a comment is given below:

[…] the first benefit that can be mentioned is that the students have developed confidence. They become confident because they were actively engaged in the process and they were

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> *not passive receivers of information. When they work in the activities themselves, they felt confident and that lifted their morale. (SBT1-H1-00:38:51)*

With regard to student motivation, the teachers indicated that the lesson study cycles enhanced enthusiasm of their students. They indicated that students were interested in the lessons and were volunteering to participate in the activities. This is because all the lessons were designed to have hands-on activities that allow student participation. Some of their suggestions are given below:

> *[…] students were enthusiastic. (SBT2-H2-00:29:24)*
>
> *[…] students have developed a spirit of competition, because they were volunteering to make presentation. (SBT2-H3-00:56:16)*
>
> *The students were interested. As it [lesson study] was new, they were reacting positively towards it. (SBD-J-00:12:57)*

Moreover, the participants revealed that the lesson study cycle promoted students' participation because all the research lessons were planned in a student-centred way. Although lesson study has enhanced student participation in general, the teachers in this school observed that more girls were actively participating during the discussions than boys. This is because the research lessons were planned in such a way that students were encouraged to discuss, ask and answer questions, present the outcome of their discussion to their peers and participate in the hands-on practical activities. Some of the views are given below:

> *During the three research lessons, the students were actively participating in the lesson. The teachers made less talking. The students were doing the activities themselves. (SBT1-H1-00:06:32)*
>
> *It [lesson study] also opened opportunities for the students to discuss. (SBT2-H3-00:09:09)*
>
> *[…] the good thing of lesson study is that it allowed students to participate actively in the teaching and learning process. (SBPH-J-00:00:37)*

Finally, the teachers indicated that the variety of participatory activities and the use of concrete hands-on teaching-learning resources enhanced students' learning as follows:

> *The students were able to understand the lesson because the lesson was supported with chart and it was practical. They were able to understand the lesson because it was conducted in the form of discussion. (SBT2-L5)*
>
> *The students that worked on the activities themselves performed better than the classes in which I demonstrated the activity myself. […] This shows that students achieve and understand better, when they work themselves practically. (SBT3-H1-00:13:01)*

In summary, the above quotations indicate that lesson study had increased the teachers' confidence in teaching publicly observed lessons and simplified lessons that were difficult for individual teachers. The

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above responses also indicate that lesson study enhanced student learning, participation, collaboration, confidence and motivation.

In Section 5.6.5.3 the positive experiences gained from the lesson study cycles in School 'C' are discussed.

5.6.5.3 Positive experiences gained from lesson study in School 'C'

In School 'C', the teachers indicated that they had obtained several benefits by participating in the lesson study cycles (see Table 5.10). Some of these benefits have already been discussed, namely enhanced teachers' learning through enhancing subject matter knowledge and teaching-related skills (see Section 5.6.1.3) and enhanced the practices of collaboration and observation (see Section 5.6.3.3). In addition, the teachers stated that participation in the lesson study cycles increased their confidence in teaching public lessons and their motivation to work in groups. The following responses illustrate these views:

> *Confidence in duty, encourage in doing with colleagues, readiness for any work or duty. (SCT1-G2)*
>
> *I am very much affected by lesson study. I am very much motivated by it. (SCT2-G2)*

The participants also found that participating in the lesson study cycles helped them to acquaint themselves with the syllabus guide of the MoE. One teacher's opinion is given below:

> *[…] this study introduced us with syllabus guide. We have never seen the syllabus guide before. We have received the syllabus guide prepared by the department of general education from you for the first time. Therefore, lesson study acquainted us with the objectives and aims of the syllabus guide. It also enabled us to relate what we are teaching with the overall objectives of the syllabus guide. (SCT2-H3-00:23:53)*

The participants believed that lesson study also benefited their students as it enabled the students to collaborate with one another during the various group activities (see Table 5.10). Thus, the lesson study cycles provided a platform for the students to work in groups, talk, interact, share ideas and collaborate with one another. Some of their suggestions are given below:

> *The students collaborated with one another actively and smoothly with great agreements. (SCT1-F3)*
>
> *Lesson study is a good strategy because it allowed students to collaborate with one another. (SCPH-J-00:00:52)*

The results revealed that lesson study enhanced the motivation of the students to confidently participate in the learning processes. They indicated that the students presented the findings of their discussions without fear and shyness. Students were also observed to continue their discussions outside the classroom, an indication of their motivation. Such comments are given below:

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> *It was great achievement to see the weak students present their assignment in the class with full confidence in front of their peers. No matter the accuracy of the information, it was a great achievement for them to come out and do the presentations. Therefore, the students developed confidence. (SCT2-H3-00:50:38)*
>
> *The students were highly motivated and they were very much interested in it. It enabled [them] to make preparation for presentation by reading different sources. The students were able to forward their ideas without any fear. They also wished to see similar lesson in the future. (SCT2-G2)*
>
> *Normally, we do not see students come together and talk about their lessons outside the classroom. Now, we are seeing them continue their discussion outside the classroom. This indicates that they liked the lesson. It indicated that they have developed interest in the lesson. Therefore, I would say the students have changed and they have benefited from lesson study. (SCPH-J-00:27:14)*

Moreover, the teachers indicated that lesson study enhanced students' participation because the lessons were planned in student-centred way so that they encouraged students to discuss, talk to one another, interact, measure, ask and answer questions and present the outcome of their discussions to their peers. Some of the views are given below:

> *[…] students were […] doing the given activities to measure the distance moved by the ant in relation to time they were trying to calculate the speed of the ant. Each student was engaged in the learning process because it was so interesting lesson. Except few students, most of the students were responding to the instruction […]. (SCT2-F5)*
>
> *Most students were active participants and they were eager to do something. (SCT2-L2)*
>
> *Instead of depending on their teachers for information, they were active participants in the teaching-learning process. It was more attractive for them to hear from their peers who are at their level and age than their teacher. Such type of involvements in presentations and discussions make the students enthusiastic. (SCT2-H3-00:50:38)*

Finally, the participants were of the view that students gained knowledge because the research lessons were presented in such a way that they allowed students to participate in the hands-on learning activities. Some of their suggestions are given below:

> *[…] most of the students were able to define lever, name simple machines [that are] considered as levers, locate load, effort and fulcrum of lever and finally classify levers into first, second and third order of levers based on the position of load, effort and fulcrum. (SCT3-F3)*
>
> *Even though it was not perfect, the students knew what they were doing. The students realised the relationship between distance and time in order to find speed i.e. v = s/t. Moreover, they were able to know the SI unit for distance, time and speed. (SCT2-L6)*

In summary, the above responses indicate that lesson study enhanced the confidence of the teachers in teaching public lessons, acquainted them with the syllabus guide of the MoE as well as enhancing student learning, participation, collaboration, confidence and motivation.

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5.6.5.4 Interpretive summary of positive experiences gained from lesson study

In this study, the participants indicated that they obtained several benefits as a result of participating in the lesson study cycles. They spoke of increased self-confidence, motivation, acquaintance with textbooks and syllabus guide and simplification of lessons that appeared difficult for individual teachers. The collaborative work during the planning, teaching and observing and debriefing sessions enabled them to support one another and hence build their confidence in teaching publicly observed lessons. As a result, they felt professionally empowered, which is the hallmark of effective professional development programme, as indicated in the literature (Bell & Gilbert, 1996; Carl, 2009). Rock and Wilson (2005) reported that teachers found lesson study beneficial in terms of increasing their professional confidence. Although the teachers who participated in this study indicated that the lesson study cycles had enhanced their confidence, one teacher from School 'A' was reluctant to teach a publicly observed research lesson but for no apparent reasons. This loss of confidence and fear of observation by their peers is not surprising for three possible reasons. Firstly, in Eritrea, classroom observation is performed by either a supervisor or a school director for the purpose of teacher appraisal. Thus, the teacher might have associated the peer observation with evaluation. Secondly, traditionally teachers in Eritrea work in isolation. It is challenging for teachers who have worked in such contexts for very long period to suddenly open their classrooms to external observers. Finally, the reason why this teacher was unwilling to teach publicly observed research lessons might be fear of revealing his weaknesses to his colleagues. Chokshi & Fernandez (2004) suggest that teachers' anxiety and self-consciousness about opening their classrooms to their peers could be minimised if the teachers are convinced that the ownership of the research lesson belongs to all the team members and not to the teacher who is teaching the lesson. They stressed the importance of shifting the focus from evaluating the performance of the teacher to evaluating the design of the lesson (Chokshi & Fernandez, 2004). In this study, the teachers agreed to focus their reflections on the research lesson rather than on the teacher who taught the lesson as advised in the literature (Stigler & Hiebert, 1999; Yoshida, 2002; Rock & Wilson, 2005; Puchner & Taylor, 2006; Stepanek, et al., 2007). This shift of focus gave them, to some extent, an opportunity to practise peer observation and provide constructive feedback to one another confidently.

Regarding level of motivation, the participants indicated that working collaboratively with colleagues, enhanced both their sense of belonging to a community of professionals as well as their motivation. This finding confirms what has been reported in the literature, namely that teachers who work collaboratively and share ideas and resources develop a sense of commitment, motivation and belonging to a community of professionals (Murata, et al., 2004; Lewis, et al., 2006; Lewis, et al., 2009).

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The motivation of the teachers was demonstrated by an increase in their punctuality and better attendance during the lesson study activities. School 'A' teachers, especially, were observed to be more punctual, regular in their attendance and taught more revised lessons than the teachers in the other two schools (see Table 4.3, Table 4.4 and Table 4.5). The teachers also expressed their satisfaction and happiness at being the first teachers in Eritrea to participate in lesson study. They were also happy to see the study taking place in their schools. Besides this internal motivation, external factors also influenced teachers' participation and commitment in this study. In School 'A', for example, the school leadership appeared to be more interested in lesson study and so did the participants. The latter's interest in the lesson study cycles might have been influenced by the interest and commitment shown by the former. Even when some of the participants appeared to show less commitment in the programme at some stages, they would say that they did so not because of lack of interest but due to their desire to moonlight for extra income. The teachers in this school seemed to prefer to use any free time at their disposal to do additional job outside the school to earn extra income to improve their standards of living.

The teachers from Schools 'A' and 'C' also indicated that lesson study acquainted them with the syllabus guide of the MoE. They further indicated that participation in the lesson study cycles enabled them to appreciate and study the science textbooks thoroughly to be able to effectively teach the research lessons. In particular, they appreciated their understanding of the textbooks in ways similar to how lesson study helped Japanese teachers to increasingly acquaint themselves with the national curriculum (Stigler & Hiebert, 1999; Lewis, 2002a).

Finally, the participants posited that participation in the lesson study cycles simplified their work because they were able to identify, through discussion, topics that were difficult for individual teachers. This finding is in agreement with Lewis's (2002a) finding that reports on the ability of teachers to discover and illuminate gaps in subject matter knowledge as benefit of lesson study for teachers. In addition to identifying topics that are difficult for them and their students, the collaborative nature of lesson study simplified their work by enabling them to use the same teaching methods which enabled them to develop a common understanding about what they teach. This finding also agrees with what has been reported in the literature (Lewis, 2002b; Watanabe, 2002; Yoshida, 2002).

In addition to the benefits to themselves, the teachers also reported that lesson study benefited their students as well. Even though it was not the intension of this study to focus on students, the teachers were more interested and comfortable when talking about their students' learning and engagement than when speaking about their own learning. However, it seemed justifiable for teachers to talk about the

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benefits of lesson study to their students because the latter are at the centre of any teaching learning process. Thus, the researcher was obliged to report the benefits the students obtained from the lesson study cycles. Even though there are models that focus on professional development as a means for improving student achievement (Guskey, 2000; Supovitz & Turner, 2000), the majority of the available literature links professional development to teacher-learning and classroom practice rather than to student achievement (Supovitz & Turner, 2000; Garet et al., 2001; Borko, 2004). Although not strongly reported in literature, the impact of lesson study on students' achievements in terms of enhancing their collaboration, confidence, motivation, learning and participation is touched on in this study.

Regarding student collaboration, the participants believed that the lessons organised during the lesson study cycles enhanced student collaboration because the activities provided the students with a platform to work in groups, interact with one another and share ideas with one another. The respondents also reported that lesson study had enhanced student confidence. They indicated that the organisations of the research lessons, namely working with mixed ability groups, participating in hands-on activities and presenting topics in front of their peers had enhanced students' confidences. The teachers indicated the confidence of the students manifested in their ability to discuss, participate and present in the classroom without fear and shyness. Another benefit mentioned was that lesson study enhanced the level of motivation of the students. Since they had planned for student-centred lessons that allowed students to participate in the teaching process, the latter were enthusiastic and willing to participate in the activities. The teachers recognised that the lessons organised during lesson study had an impact on student learning. Since they spent a lot of time on the planning of hands-on lessons that allowed for the active engagement and participation of the students, the teachers claimed that their students had learned better. This finding is consistent with Lewis, et al.'s (2009) assertion that improvements in classroom practice through lesson study contribute to enhanced student learning. In similar vein the finding of this study also corroborates Wei et al.'s (2009b) assertion that positively associates intensive and extended teacher development programmes with enhanced student learning.

Finally, the teachers indicated that the lesson study cycles had enhanced the participation of their students. They stated that lesson study promoted students' participation because all the research lessons were organised in a student-centred way. The lessons encouraged students to discuss, ask questions, present and participate in the hands-on practical activities. Although both boys and girls participated in the teaching learning processes, it was specifically observed that more girls than boys participated in School 'B'. In line with Puchner and Taylor (2006), the participants in this study reported that their participation in collaborative activities enhanced student engagement in the teaching-learning process.

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Although the teachers found participating in the lesson study cycles rewarding, they identified several factors as challenges and these are discussed in Section 5.6.6.

5.6.6 Challenges encountered while conducting lesson study cycles

The last research sub-question focused on the challenges that the teachers encountered while participating in the lesson study cycles. The research question that guided the presentation and discussion of result in this section was: "*What challenges did teachers identify in the use of lesson study?*" The teachers identified several challenges during the lesson study cycles. These challenges were lack of time, curriculum overload, large class-size, teachers' poor living conditions, lack of suitable space, shortage of resources, students' poor English proficiency, newness of the process and students' lack of interest (see Table 5.11). These challenges are presented for each school in the subsequent sections.

Table 5.11: Teachers' perspective on challenges encountered

Main categories	Generic categories
Challenges in conducting lesson study cycles	Lack of time Curriculum overload Large class-size Teachers' poor living conditions Lack of suitable space and shortage of resources Newness of the process Students' poor English language proficiency Students' lack of interest

5.6.6.1 Challenges encountered while conducting lesson study cycles in School 'A'

The teaches in School 'A' identified lack of time, curriculum overload, large class-size, teachers' poor living conditions, lack of suitable space and shortage of resources, students' poor English language proficiency, newness of the process and students' lack of interest as challenges encountered during the lesson study cycles (see Table 5.11).

The teachers in this school identified lack of time as a major constraint that affected their participation in the lesson study cycles. They indicated that the large teaching load coupled with the inherent nature of lesson study of requiring time constrained them to schedule common meeting time during the lesson study cycles. Working in two shifts was another factor that added to their difficulty in finding common meeting time. The school director's view also corroborates the teachers' responses. The following excerpts may serve as illustrations:

Lesson study requires time and teachers do not have this time. (SAT1-H1-01:11:23)

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> *Sometimes it was difficult to find free period to conduct meetings. We want to collaborate with one another, but our periods do not allow us to do so. This is one of the problems that has to be removed, if lesson study is going to be effectively implemented. (SAT4-H1-00:42:42)*
>
> *A teacher does not think the free periods he has as free, because they are already booked for doing other jobs. Practically speaking, teachers do not have free periods. Lesson study is an initiative that requires free periods and ample time. In order to observe a lesson in a form of group, the observers have to sit in another teacher's lesson during their free periods. At this time it is rare to find a teacher sitting in the school during his/her free periods. To implement this, one has to find voluntary teacher who sacrifice their time. (SAD-J-00:27:46)*

Curriculum overload was another factor identified by the teachers in School 'A' as a challenge. These teachers indicated that during their participation in lesson study, they were very much worried about covering the syllabus and preparing grade eight students for the approaching national examination. Unlike in the ordinary lessons, where they skipped many of the important practical activities, after participating in the lesson study cycles the teachers prepared student-centred lessons and provided their students with hands-on experiences during all the research lessons. They said that they had spent a lot of classroom time on few topics. Consequently, with respect to coverage of syllabus, they lagged behind the other science teachers who did not participate in lesson study. Some of the common views are given below:

> *In ordinary lessons, we skip many of the practical activities due to lack of time. (SAT1-H2-00:40:20)*
>
> *We spent a lot of time in one unit, many weeks. With such pressure of completing the syllabus, one would focus on covering the syllabus than thinking about how students are learning. One cannot get time to think about student learning. One thing that does not go with lesson study is the extensiveness of the syllabus. (SAT2-H3-00:52:36)*
>
> *This year we are lagging behind when compared to the annual plan. In such situations, instead of using real objects and demonstrate to the students we will be obliged to explain theoretically and rush to next topics, because the semester examination is approaching. To use lesson study the syllabus should be medium sized. (SAT3-H3-00:54:50)*

The participant teachers also intimated that large class-sizes hindered the lesson study cycles, because they added burden to the already existing heavy teaching time. They indicated that large class-size mean that they required extra time to prepare and assess student learning. The average class-size in this school was 51 students (see Table 5.1). Although the teachers acknowledged that class-size in their school is decreasing, they still felt that class-size is a problem. Juxtaposing the goal which they had set at the beginning of this study i.e. using a student-centred approach (see Section 4.3.3.1-i), they indicated that the large class-size constrained their efforts to achieve that goal. Some of their comments are given below:

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> *[…] class size and the classrooms are not suitable for teaching in this way. (SAT4-H1-00:15:33)*
>
> *The number of students should be manageable […]. Lesson study is very problematic with such […] number of students. (SAT3-H3-00:54:50)*

In this school, the teachers did not consider their salaries sufficient when compared to the work they were doing. Low salaries lead to not having time to spare for activities like participating in lesson study. In order to earn additional income, they look for jobs outside the school hours. They explained that the additional jobs ranged from tutoring children of wealthy families, running a small business, to working on a farm. Therefore, participation in lesson study was somehow an obstacle for the teachers who want to make extra income. Viewed from cause-effect perspective, however, this was the result of the poor living conditions with which they had to contend. Consequently, they felt that a teacher who participates in innovative activities such as lesson study should be compensated. The school director and the pedagogic head also agreed with the teachers. Despite their discontent with their poor living conditions, the teachers believed that there was always room to provide good services to their students and to hope for the better. Finally, they expressed their willingness to continue with lesson study or participate in other similar initiatives if their living conditions were improved. The following responses illustrate some of their views.

> *At this moment we are obliged to be here with you otherwise, in a normal day, she would go to wash her clothes and I would rush to tutor a child as a private work. (SAT1-H1-01:11:23)*
>
> *Lesson study takes time; it consumed our private time that we would have used to fulfil our social and economic requirements. (SAT3-H3-00:54:50)*
>
> *Teachers work outside the school during their free time. To speak logic there is no single teacher who sits here during his/her free time. This is because of the economic and social pressure. To earn their living, they usually teach children outside the school or do other jobs. (SAD-J-00:27:46)*
>
> *I see this lesson study positively. I have only one doubt and that is teacher satisfaction. This initiative will be effective only if the teachers are satisfied (SAPH-J-00:32:43)*
>
> *Most importantly this [lesson study] is something done with an empty stomach. If a teacher is satisfied with his basic needs and his profession, he could demolish a mountain overnight. He would invent new things overnight. At this time, the earnings that the teachers make and the market prices do not match. I know there is nothing that you could do about it, but I am informing you just to give you an indication about how much this has affected the teaching-learning process. (SAT6-H3-00:56:40)*

The teachers in this school also suggested that lack of suitable space and shortage of resources challenged their participation in the lesson study cycles. They stated that the classrooms were not suitable because they were dark, narrow and stocked with a large number of extra desks. These extra desks hindered movement around the class. The desks were not suitable for doing student-centred

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activities as they were arranged in rows, making it difficult to move them around in order to rearrange them for student-centred teaching. However, for the purpose of this study, the teachers moved some of the extra desks outside the classrooms in order to create more space for demonstration and group work. Moreover, the teachers indicated that they lacked demonstration or displaying table in the classrooms and space for storing their teaching learning resources. They indicated that the lack of storage space discouraged them from preparing teaching-learning aids. In order to teach in a student-centred way, the teachers suggested that they require a separate room that could be used for demonstrating teaching activities and storing teaching-learning resources. Quotations that substantiate these claims are given below:

> *The desks do not encourage lesson study. The classrooms are narrow. The students are many. The desks are not suitable for doing group work. There is no place in the classrooms for displaying materials. (SAT2-H3-00:52:36)*
>
> *[…] one problem that we have in this school is lack of separate room, which we could use it as a laboratory to perform our practical activities. (SAT5-H2-01:35:57)*
>
> *We should be able to move them [desks] to a rounded shape with the teacher at the centre so that all students could observe the demonstrations by the teacher or students. Lesson study is very problematic with such type of classrooms. (SAT3-H3-00:54:50)*

Students' poor English proficiency was another challenge that affected the lesson study cycles. The teachers indicated that the majority of their students experienced problems with expressing their ideas in English, understanding the concept and pronouncing some scientific words. However, they indicated that they managed to solve the problem by switching to a local language. Their views are given below:

> *Around half of the students have problems in English. As you know, the medium of instruction is English. They come from elementary schools to junior schools with poor background. The students face problem of understanding. We are telling them to do what they do not understand and which is beyond their scope. (SAT2-H2-00:55:38)*
>
> *Some of the students were not pronouncing the names of these joints appropriately while others were pronouncing them appropriately. (SAT6-L7)*

They also opined that at the beginning both they and their students had difficulty with the newness of the process. However, this was soon overcome with time and repetition. The following excerpt may serve as illustration.

> *This process was new for both the students as well as the teachers. The students have worried a little bit at the beginning about the method of teaching we used. They had views similar to what we had at the beginning of lesson study. When things repeated again and again the effect of newness disappeared at last. (SAT2-H2-00:15:06)*

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One teacher believed that some of the students lacked interest and motivation for study. This attitude affected the learning of other students. According to him, lesson study would work best with students who are motivated to explore and learn. His comment is given below:

> *[…] nowadays students are not interested in learning. They come to school, mainly, to get ID cards than gaining knowledge and skills. […] The biggest challenge that we faced is lack of interest of the students to learn. Advising them and encouraging them does not work. This is what we are observing every day. Generally, the students are not in a good situation. (SAT6-H3-00:56:40)*

Despite these challenges, the teachers expressed their willingness to continue participating in lesson study. They also commented on the importance of involving other subject teachers in order to ensure its continuity and gain their support.

In summary, this study has identified lack of time, teachers' poor living conditions, large class-sizes, lack of space for demonstration and storing of resources, curriculum overload, newness of the process, students' poor English proficiency and students' lack of interest as the main challenges.

In Section 5.6.6.2 the challenges in School 'B' are presented.

5.6.6.2 Challenges encountered while conducting lesson study cycles in School 'B'

The teaches in School 'B' identified lack of time, curriculum overload, large class-size, teachers' poor living conditions, lack of suitable space and shortage of resources, students' poor English language proficiency and newness of the process as challenges encountered during the lesson study cycles (see Table 5.11).

The teachers in this school identified time as a major constraint during the lesson study cycles. They were challenged to get a time schedule that would be suitable for every team member. The difficulty in arriving at a consensus regarding time schedules was due to their heavy teaching loads, 18 periods per week (see Table 5.2). Working in both morning and afternoon shifts was another factor that limited the chance of finding a suitable time schedule for the participants. After teaching the first shift, the teachers had to break for lunch and return for the second shift. Although the school director indicated that the teachers had many free periods that could be used for lesson study, in reality the issue of finding a suitable time schedule made the researcher assume that the teachers had already scheduled their free periods for doing private work. Hence, sometimes the teachers left some of their classes unattended in order to participate in the lesson study cycles. Since the teaching schedule of the teachers in this school was the same, the problem of missing classes was aggravated during observation sessions because they had to leave their classes unattended in order to observe a research lesson taught by a team member. One such comment is given below:

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> *From our experiences so far, time is the biggest challenge. (SBT2-H3-00:46:42)*
>
> *Because of our heavy workload, we were not getting time to meet. […] In order to be available for the lesson study, we were missing some of our periods. If lesson study is going to continue, I would suggest the school administration to make some adjustments on the timetable. Lesson study should not be conducted in our free periods, but the school administration should arrange a specific time for it. (SBT2-H2-00:20:28)*

The school leadership played an important role in managing these classes that were left without teachers. The pedagogic head indicated his role in managing the classes as follows:

> *[…] when all the teachers go for observing the research lessons we try to manage the classes left without teachers and calm the students. (SBPH-J-00:03:35)*

Curriculum overload was another challenge that constrained teachers. Since they taught activity-based research lessons that provided hands-on experiences for their students, they lagged behind the other science teachers with respect to coverage of the syllabus. One such comment is given below:

> *After preparing a weekly lesson plan, due to my participation in lesson study I missed some lessons. As a result, I could not finish what I have planned for that week. Therefore, I lagged one week behind my colleagues. (SBT4-H2-00:10:56)*

The teachers also indicated that large class-size hindered their practice. Based on the goal which they had set at the beginning of this study, they agreed to make all the research lessons activity-based. However, the teachers indicated that large number of students in the classrooms hindered them from achieving this goal. In this school the average number of students in a classroom was 53 (see Table 5.2). Even though the teachers considered large class-size as a constraint, they solved it by selecting classes with a smaller number of students as indicated below:

> *[…] the biggest challenge was class size. (SBT1-H2-00:13:18)*
>
> *The class size is not encouraging. […] Since number of students is big, it was difficult for us to conduct group discussions or demonstrations in the classrooms. (SBT1-H1-00:26:36)*
>
> *We choose the class with less number from the afternoon shift. (SBT5-G2)*

Teachers' poor living condition was among the frequently mentioned challenges. Teachers indicated that their earnings do not meet their basic needs. Low salary means that they are obliged to look for additional jobs to raise money in order to sustain their standard of living. The teachers hinted that they were challenged to balance the demands of lesson study and perform their additional jobs. They further indicated that they did not want to be in the school once they had finished their lessons. The school director also indicated that the teachers earn additional money to supplement their salaries when they have finished with their duties at the school. The participants were also of the view that the poor living conditions made teachers less committed to teaching which ultimately led to decline in the standard of education in Eritrea. The following responses illustrate some of their views

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> *After finishing teaching, everyone is in a haste to go to another work. Our salary is not sufficient to support our living. Therefore, we are compelled to do other jobs outside the school. That is why we do not want to waste time. (SBT2-H3-01:14:26)*
>
> *One challenge is the economic situation of teachers. Whenever teachers get free periods in their timetable, they prefer to use it for doing private jobs. (SBD-J-00:11:44)*
>
> *The decline in the status of teaching profession is not because teachers lack knowledge but it is due to lack of professional spirit among the teachers. Teachers are losing their professional spirit because of their earning. They put their main job aside and look for additional jobs in order to earn for their living. Mostly teachers enter into classrooms, without much preparation, only for the sake of engaging the classes. (SBT6-H3-00:16:50)*

The teachers in School 'B' were of the opinion that lack of suitable space and resources were other challenges that affected the lesson study cycles. They lacked separate classroom for demonstrating their lessons and a room for storing their teaching learning resources. They indicated that they solved the challenge of resources by either bringing something from home or using their environment. In addition, the director indicated that the availability of a computer lab and a library could be used as an opportunity to support lesson study. Some of the comments are given below:

> *Lack of separate room for conducting group discussions or demonstrations was another challenge. (SBT1-H1-00:26:36)*
>
> *If we had a separate classroom, where we can prepare and keep our teaching-learning resources and conduct discussion with one another, it would have been good. (SBT3-H2-00:13:52)*
>
> *We do not find suitable resources. There are not sufficient resources. (SBT1-H2-00:13:18)*

The teachers further indicated that poor English proficiency among the students was another challenge that affected the latter's participation in the lesson study cycles. However, they intimated that the students tried their best to express themselves during the research lessons. One teacher provided the following comment:

> *[…] the students had language difficulties that limited their participation. With all the language difficulties, however, they tried their best to participate in the lessons. They provided us good feedbacks. (SBT3-H2-00:06:16)*

Newness of lesson study was another challenge that affected both the teachers and their students especially in the beginning of the process. The teachers opined that they had little knowledge of lesson study and lacked experience of working together including observing one another. They also indicated that the students required additional direction and management because lesson study was new to them. However, they grew accustomed to it with time. Some of the comments that substantiate these ideas are given below:

> *[…] we did not have the culture of observing lessons of one another, which we found it difficult in the beginning. (SBT1-H1-00:26:36)*

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> *[…] working and sharing ideas with colleagues was not common in our school. (SBT2-H1-00:05:08)*
>
> *The newness of lesson study created problems in classroom management. Students disturbed a little bit. Students required additional instructions, as it was new for them. (SBT2-H1-00:29:47)*
>
> *Not having deep understanding about lesson study was another challenge. Of course, we have taken workshops, without taking training, it would have been difficult, but still we lack knowledge. (SBT3-H1-00:28:43)*

Despite these challenges, the teachers expressed their willingness to continue with lesson study. They also emphasised the importance of involving other subject teachers in order to ensure its continuity and gain the support of other community members.

In summary, in this study lack of time, newness of the process, large class-sizes, teachers' poor living conditions, curriculum overload, lack of suitable space for demonstration and storing resources and students' poor English proficiency were identified as the main challenges that confronted the teachers who participated in lesson study.

In Section 5.6.6.3 the challenges in School 'C' are presented.

5.6.6.3 Challenges encountered while conducting lesson study cycles in School 'C'

The teaches in School 'C' identified lack of time, curriculum overload, large class-size and teachers' poor living conditions as challenges encountered during the lesson study cycles (see Table 5.11).

The teachers indicated that they were challenged to get common time to plan, observe research lessons and conduct debriefing sessions. They opined that heavy teaching load and personal commitments restricted them from getting a suitable time to schedule for collaboration. They also claimed that in addition to teaching duties they participate in administrative duties, which further makes it difficult to find common time. The team members in this school worked in two different shifts, one of the teachers working during the morning shift while the other two worked during the afternoon shift, making it difficult for all of them to be available in the same shift at the same time. The problem of time was aggravated because all their loads were concentrated in one shift leaving little or no free periods to practise lesson study. In order to be available for lesson study, the teachers were obliged to miss some of their periods. Sometimes they were giving activities that the students required to do in the absence of their teacher. The teachers stated that when they left their classes unattended the students made a noise and misbehaved. They also considered the missed classes as a burden on them because they had to be compensated for by arranging make-up classes. Some of the comments read as follows:

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> *In reality, the only challenge that questioned lesson study was time. Lesson study does not go with lack of time. It is time consuming. We spent a lot of time for planning and debriefing meetings. (SCT3-H2-00:18:42)*
>
> *[…] we had to miss classes in order to observe our colleague. After teaching, we had to discuss about what we have observed. At least we were missing two lessons. At that time, the students were left without teacher and they were making noise. They could also break something. Luckily, that did not happen. (SCT2-H2-00:26:28)*
>
> *Time was the main challenge, because whenever we miss classes the burden was on us to make-up for the lost classes. (SCT1-H2-00:25:16)*
>
> *We, the teachers who are participating in lesson study, work in opposite shifts. The challenge that we had was finding common time. Two of us could meet in the morning shift, but we cannot find teacher SCT3 because at that time he is in class. Similarly, if he comes during our shift he may not find us because we are in class. This was a very big obstacle. There was difficulty of fixing time for discussion and even for lesson planning. After lesson planning, finding meeting time for the other processes was extremely difficult. Finding time was a big challenge. (SCT2-H1-00:38:03)*
>
> *We were solving this problem using different methods. First, we were giving them activity. We were engaging them in something else when we meet for planning. Whenever we had meetings, we tried to engage the students on certain activities inside the classroom. Secondly, we were exchanging periods with our colleagues. If lesson study is going to continue next time, then we must think about time. Time is a big issue. There must be a solution for that. (SCT3-H2-00:18:42)*

However, the views of the school leadership contradict the views of the teachers. The director, for example, indicated that the teachers have sufficient time. He added that they have a free second shift, which could be used for lesson study. The following response illustrates his opinion.

> *I would say that the teachers teach only one shift and they are free in the second shift to do preparations for lesson study. Therefore, they have enough time. They do not have time constraint. They have time to conduct meeting. For example, they have scheduled meeting time twice a week. Some of them also work in the same shift. I would say that they have sufficient time to work on lesson study. (SCD-J-00:18:56)*

Even though the teachers in this school work during only one shift, as indicated by the school director, this does not necessarily mean that they are free during the second shift. Apart from conducting some consultations with parents of the students at the school at scheduled times, the teachers seem to using the second shift to fulfil their social and economic commitments.

A concern for covering the curriculum was another challenge in this school. The teachers indicated that since science textbooks were overloaded with content, their primary duty was to ensure coverage of the syllabus based on the school plan and prepare their students for the national examination. According to them, lesson study did not facilitate the process of covering the syllabus because its implementation was slow and takes much time.

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> *The only problem was the bulkiness of the units and subunits […]. (SCT1-H2-00:28:01)*
>
> *[…] if there are ten chapters in a textbook, it is time consuming to deal with all the subtopics, the activities and the 'let us discuss' questions in a student-centred way. (SCT2-H2-00:19:06)*

Large class-size was one of the frequently mentioned challenges. In this school the average number of students in a classroom was 44 (see Table 5.3). The teachers indicated that large class-size hindered the lesson study cycles because it posed management problems as described below:

> *As we have explained earlier, the other challenge was class size. This big class size, the number of students is each class was 44 or more than 44, was a big obstacle during implementation. Managing and controlling was difficult. It was difficult to evaluate whether the one group of students were learning from the other group. (SCT2-H1-00:38:03)*
>
> *In principle, working and sharing ideas with colleagues is useful, it helps to learn from one another. However, it is difficult to implement it because of the number of the students of the class size as well as the size of the periods of teaching. (SCT1-H1-00:01:31)*

Teachers' poor living conditions were among the most frequently mentioned challenges. The participants stated that low salary and poor living conditions forced them to look for additional jobs during their free time in order to sustain their standard of living. They suggested that in order for them to work with new initiatives such as lesson study; they had to be satisfied with their income. The following responses illustrate some of their views.

> *[…] we were not coming on time because we had additional private work for our sustenance. (SCT1-H1-00:41:44)*
>
> *In order to apply lesson study, one has to spare his private time and I think there is nobody who is ready to do that. As teacher SCT1 indicated, we have problems in our living condition. We are dragged and stretched to fulfil our living. (SCT2-H1-00:57:11)*
>
> *At present teachers are not satisfied with the living condition. Underpaid and unsatisfied teachers will not be willing to work. […] we need incentives. (SCT2-H1-01:14:.00)*

Despite these challenges, the teachers enthusiastically expressed their willingness to continue in this study or in other teacher development programmes. They also wished similar professional development opportunities for their colleagues who are in their school and in other schools.

In summary, this study lack of time, large class-sizes, teachers' poor living conditions and curriculum overload are identified as the main challenges in this school.

In Section 5.6.6.4 the main challenges encountered are summarised.

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5.6.6.4 Interpretive summary of the challenges encountered while conducting lesson study cycles

In Section 5.6.6.4 the focus is on the challenges that the teachers encountered while participating in the lesson study cycles. Several challenges including lack of time, curriculum overload, large class-size, teachers' poor living conditions, lack of suitable space, shortage of resources, students' poor English proficiency, newness of the process and students' negligence are identified. However, these challenges are not peculiar to lesson study. Most of them are everyday challenges. Some of these challenges are consistent with those identified by Chokshi and Fernandez (2004), namely lack of time, lack of adequate understanding about lesson study and fear of opening classrooms for peer observation as the main elements that inhibit lesson study.

Lack of time was the major constraint for all the teachers who participated in this study. In addition to the inherently high demand for time made by lesson study, the teachers indicated that heavy workload, working in two shifts and their personal commitments restricted them from finding time for participating in the lesson study cycles. While they considered the issue of lack of time as an obstacle, they also showed commitment to solve the problem. This finding reinforces Rock and Wilson's (2005) argument that lesson study is a process that requires substantial time and commitment from the teachers. The teachers' willingness and commitment to work during their free time and the support of school community and leadership were helpful in solving the problem of time. Some of the strategies that the teachers used to address the problem of time were to exchange periods with colleagues, to borrow periods from colleagues and to forgo some of their equally important personal commitments. Moreover, in Schools 'A' and 'B' the school leadership adapted the school timetable in order to create a similar timetable for all the teachers participating in the study. Unfortunately, this adapted timetable created its own problems. According to the new time schedule, all the science teachers had classes at the same time and if they wanted to observe a colleague, they had to miss their own classes. However, the teachers in School 'A' again solved this new problem by exchanging their periods with other subject teachers to make the necessary adjustment for the research lessons to proceed. In School 'B', however, the teachers did not make such arrangements, and thus left some of the classes unattended which resulted in some disruption in the timetable. The leadership of this school, however, played an important role in managing these classes that were left unattended. In Schools 'A' and 'B', the teachers worked both morning and afternoon shifts, whereas in School 'C' the teachers worked during only one shift, namely either the morning shift or the afternoon shift. Despite working during only one shift and having more free time, the researcher found it more difficult to schedule appointments with the teachers in School 'C' compared to teachers in Schools 'A' and 'B'. There could be four reasons for this problem.

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Firstly, the loads of these teachers were clustered in one shift leaving little or no free periods that could be used for lesson study in that shift, whereas in Schools 'A' and 'B', the teaching time was spread over two shifts leaving some free periods in between. Thus, in order to be available for lesson study, teachers in School 'C' had to miss some of their periods. Secondly, since these teachers were free during one of the shifts, they seemed to be more privileged to use the second shift for doing their private jobs. Hence, they were more reluctant to come to school during the free shift. Thirdly, two of these teachers worked the same shift while the third teacher worked during the opposite shift, which made it more difficult for these teachers to meet during one shift. Finally, these teachers might be less committed compared to their counterparts in the other schools.

The teachers also mentioned that curriculum overload affected their participation in lesson study. They indicated that since they taught all the research lessons using student-centred methods by preparing more participatory and hands-on activities, in terms of syllabus coverage they lagged behind other science teachers who did not participate in lesson study. Perhaps it is not surprising that teachers are concerned about curriculum overload, given the large amount of content in the textbooks. They indicated that participating in lesson study requires more time and this coupled with overloaded textbooks slowed down the pace at which they worked to cover the syllabus. They added that in ordinary lessons, they would use less participatory methods in order to cover the syllabus. Due to the pressure posed by the curriculum overload, it seemed that the teachers were more concerned with covering the syllabus and preparing their students for examination than with focussing on the students' understanding of concepts.

Another factor that affected teachers' participation in the lesson study cycles was large class-size. They indicated that large class-sizes constrained them from using more participatory teaching methods, a goal which they had set at the beginning of this study, because it required extra classroom management and extra time for planning and assessing students' learning. Although class-size in Eritrean schools is decreasing, the teachers felt that it was still a problem. For example, in the three schools where the study was conducted, the average numbers of students in a classroom were 51, 53 and 44 for Schools 'A', 'B' and 'C' respectively (see Table 5.1, Table 5.2 and Table 5.3). Nonetheless, the teachers tried to solve the problem in their own way. In School 'B', for example, they solved the problem by choosing classrooms with a smaller number of students.

Teachers' poor living condition was another element that constrained their participation in lesson study. They indicated that they earned low salaries that did not meet their basic needs. To sustain their living, therefore, they had to look for additional jobs such as tutoring children of wealthy families, running

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businesses and working on farms. The implication of this is that they become less motivated to spare their free time in order to participate in professional development opportunities like lesson study. Moreover, they mentioned that the poor living conditions of teachers led to the decline in the standard of education in Eritrea because teachers care less about their profession and thus execute their duties poorly. During the lesson study cycles, the teachers indicated that they were challenged to balance the demands made by lesson study and their personal commitments elsewhere to make some extra money during their free times. They indicated their willingness and readiness to participate in professional development initiatives, such as lesson study, only if they were satisfied with their living conditions.

Furthermore, the participants considered lack of suitable space as one of the elements that constrained their participation in lesson study. This was a general concern expressed by the participants from Schools 'A' and 'B' regarding both the availability of classroom space to do participatory activities and the availability of space to store teaching-learning materials. This problem was not mentioned by the teachers in School 'C' which suggests that that school was better resourced than the other two schools. In School 'A', the classrooms were not suitable because they were dark, narrow and filled with large number of extra desks. Even though the large number of extra desks in the classrooms was an indication of decreasing class-size in this school, the presence of these extra desks in the classrooms made it difficult for the teachers to move the desks around in order to arrange the classroom for student-centred activities. The teachers in School 'A' tried to create space for demonstration and for doing group work by moving the extra desks outside the classrooms for short period. Notwithstanding the temporary solution to the lack of space in School 'A', the participants in both Schools 'A' and 'B' perceived lack of storage place and demonstration rooms as factors that discouraged them from using student-centred teaching or preparing teaching learning resources. Overall, however, the teachers did their best to prepare student-centred lessons according to the arrangement made during the introductory workshop (see Section 4.3.3.1-i).

The teachers in Schools 'A' and 'B' also reported a shortage of resources as one of the elements that constrained their participation in lesson study. Lack of resource was not raised by the teachers in School 'C' which again suggests that it was a better resourced school than the other two schools. Although the teachers in Schools 'A' and 'B' considered the shortage of teaching-learning resources as an obstacle, they tried to solve the problem by bringing them themselves, using the environment as a resource, or asking their students to bring from their homes.

Students' poor English proficiency was another element that affected teachers' implementation of lesson study. The teachers were of the view that poor command of the English language by the

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students constrained the use of participatory teaching methods, because the students experienced problems in expressing their ideas and pronouncing scientific words during the discussions and presentations. The teachers in Schools 'A' and 'B' indicated that their students had problems understanding the concepts, expressing their ideas and pronouncing scientific words because the lessons were conducted in English. Despite their low proficiency in English, the teachers were happy to see their students make efforts to express their ideas freely. Moreover, the teachers solved the language problem by allowing their students to switch to the local language. Students' poor English proficiency was not raised as a challenge in School 'C', an indication that students in this school were academically better than their counterparts in the other two schools. It appears from all indications that School 'C' was better endowed than Schools 'A' and 'B'.

Among the constraints that the teachers faced while participating in the lesson study cycles was the newness of the process. The teachers in Schools 'A' and 'B' opined that in the beginning the situation was strange and tense because the practice was new to them. They indicated that they lacked deep knowledge about lesson study, experience of working together and experience of observing one another. The challenge created by the newness of lesson study is not limited to this study. It also proved to be a problem elsewhere, where lesson study was experimented with (Taylor et al., 2005). However, the teachers in this study indicated that this newness decreased as they taught more research lessons and built up knowledge and skills. Chokshi and Fernandez (2004) also stated that teachers who participated in lesson study cycles found it difficult to shift from teaching in isolation to collegial observations and criticism. Moreover, the teachers in this study reported that lesson study was also new to their students. They indicated that their students, who were accustomed to traditional teacher-centred learning, found it difficult to make the transition to the new participatory approach. Hence, they required additional direction and management from the teachers.

Student lack of interest, though on a limited scale, was the last element that affected teachers' implementation of lesson study. Only one teacher from School 'A' indicated that the students had become increasingly negligent, an action that negatively affected the lesson study cycles. He opined that lesson study would work best when students were motivated. This challenge was not mentioned by the teachers in Schools 'B' and 'C'.

In spite of the aforementioned challenges, the participants reported evidence of growth and empowerment similar to what was reported in the literature (Bell & Gilbert, 1996; Carl, 2009). As a result, they recommended that lesson study be extended to other subject teachers in order to ensure its continuity and to gain the support of other community members.

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In Section 5.7 the key learning domains learned during the lesson study cycles are described.

5.7 KEY LEARNING DIMENSIONS

The findings of this study resonate with Bell and Gilberts' (1996) model that describes effectiveness of teacher development in terms of three interrelated dimensions, namely personal, social and professional development. Thus, in Section 5.7 the effects of lesson study on Eritrean teachers' learning is discussed on the basis of the above-mentioned three dimensions of teacher development (Bell & Gilbert, 1996).

According to Bell and Gilbert (1996), personal development is the first dimension in teacher development. They underscore the importance of personal development by indicating that it is the basis on which learning takes place in order to realise the other two dimensions. They intimate that progress does not happen in the social and professional dimensions unless there is development in the personal dimension. According to the authors, personal development refers to changes in attitude and motivation. Regarding changes in attitude, it is important that teacher should be able to identify aspects of their teaching with which they experience problem, then show willingness to solve the problems by using appropriate strategies and finally feel empowered after addressing the problems. Going through these stages is considered as a sign of personal development (Bell & Gilbert, 1996). In this study, the participants reported their dissatisfaction with their practices in various ways. Firstly, they indicated their dissatisfaction with their earlier lesson planning process, that their teachings were not participatory and did not use teaching-learning resources. Secondly, they collaboratively solved the problem by producing appropriate and detailed lesson plans, identifying appropriate resources and by collaboratively designing hands-on activities that enhanced student participation. Finally, they felt satisfied by producing improved lesson plans, taught lessons that facilitated students' learning and increased the frequency of using teaching-learning resources. Additional evidence that shows the effect of lesson study on teachers' personal development is that they developed positive attitudes towards various aspects such as the workshops, lesson study, collaboration, new lesson plan format, teaching of publicly observed lessons and providing of feedback. These all resonate with the work of Bell and Gilbert (1996).

In addition to changes in attitudes and feelings, motivation to participate in professional development programme is another sign of personal development. Motivated teachers are more prepared to use newly acquired knowledge and skills and bring about the required changes in their classroom practices (Guskey, 2000). Although external factors influence teacher development, it is the internal motivation

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that facilitates teacher development (Bell & Gilbert, 1996). In this study, the nature of organisational support impacted on the motivation of the participants. In a school where the leadership showed interest in lesson study, the participants were more committed and the school community members were observed to be more cooperative.

According to Bell and Gilbert (1996), social development is the second dimension in teacher development. Social development deals with the relationship between team members and the ability to work collaboratively with colleagues. The teachers being able to identify the social isolation that is inherent in teaching, then they start valuing collaboration and seeking out support from colleagues and finally initiate collaborative ways of working with colleagues are signs of social development (Bell & Gilbert, 1996). Conforming to the work of Bell and Gilbert (1996), the findings of this study indicate that the earlier practices of the participants were dominated by a culture of isolation which meant that they typically worked alone with limited interaction, professional dialogue and collaboration with one another. They prepared lesson plans individually and taught them in isolation. Their practice of peer observation was limited. Hence, they knew little about their colleagues' planning, classroom practices, relationships with students and questioning styles. After participating in this study, the teachers appreciated the collaboration that they had experienced during the lesson study cycles. Participating in lesson study also enabled them to initiate collaborative ways of working with colleagues. They enjoyed the collaborative planning and teaching because they were able to share ideas and learn from one another.

Professional development is the third dimension in Bell and Gilbert's (1996) model. This dimension refers to changes in teachers' subject matter knowledge and pedagogical skills as well as new ways of doing things. It starts with the teachers' acquisition of new knowledge and skill, their trying out of the newly acquired knowledge and skills in their classroom, bringing about changes in their classroom practices and initiating other development activities. The findings of this study also confirm the findings reported by Bell and Gilbert (1996). The participants in this study acknowledged that they had gained new subject matter knowledge and developed teaching-related skills from the workshops and the lesson study cycles. They indicated that they were able to frequently use teaching-learning resources, to examine the syllabus and student textbooks, to select lessons that were difficult for them to teach, to develop and use a much wider range of teaching strategies, to participate in collaborative activities, to teach publicly observed lessons, to observe one another, to provide feedback and support one another, to participate in professional discussions and to observe students' learning. All these new activities are evidences of professional development as described by Bell and Gilbert (1996). Finally, since the participants felt that they had benefited from lesson study, they recommended similar teacher development programmes to other teachers.

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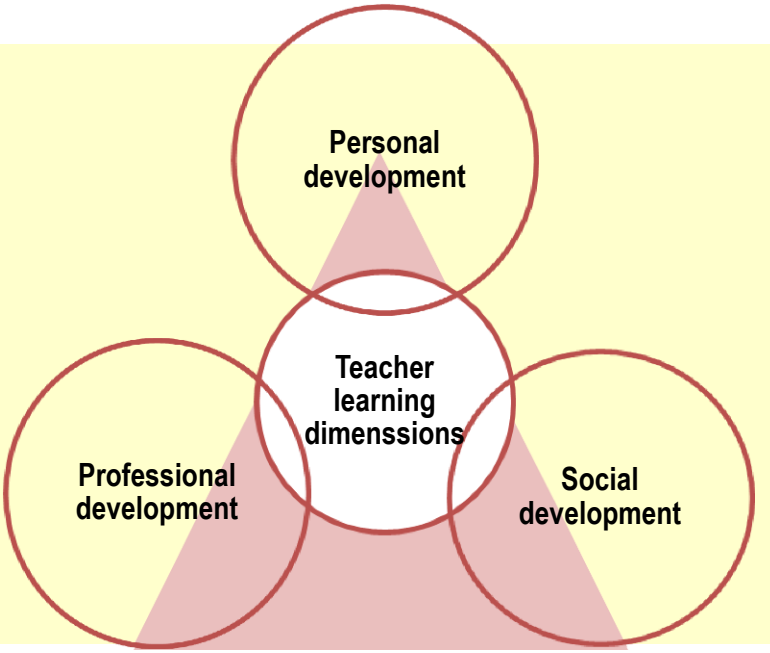
The learning of teachers and practice changes can be linked to the categories developed by Bell and Gilbert (1996) and described above. In essence then lesson study in this particular research has provided opportunities for teacher learning and professional growth in the dimensions described above by Bell and Gilbert (1996) and has consequently had an impact on the participant teachers' classroom practice (see Section 3.2.2). The interconnectedness of these key learning dimensions is diagrammatically represented in Figure 5.3.

Figure 5.3: The interconnectedness of the key learning dimensions



In Section 5.8 a summary of the chapter is provided.

5.8 CHAPTER SUMMARY

As indicated in Sections 1.4 and 4.2, the purpose of this study was to use lesson study as a teacher development strategy for supporting science teachers in selected middle schools of Eritrea and then to explore its effect on the teachers' learning and classroom practices. This study was conducted by two steps, namely providing training on lesson study through successive workshops and then allowing the teachers to implement lesson study in their classrooms for the course of one year. The duration was extended to one year in order to provide the teachers with sufficient time to put into practice the newly obtained knowledge and skills, as suggested by Garet et al. (2001). The workshops were organised to provide training on lesson study using theory presentation and the demonstration of skills using video,

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whereas during the implementation process the teachers practised lesson study in their classrooms guided and supported by different role players.

In this chapter the results were presented and discussed. From the results it was determined that teacher learning is a complex endeavour that is affected by several interrelated factors and that it is not easy to identify a one-to-one relationship between the various factors and their positive impact on teachers' learning classroom practices. Nevertheless, it was clear that the overall process that integrated workshops with classroom practices impacted on teachers' learning in three domains, namely the deepening of subject matter knowledge, the development of teaching-related skills and the enhancement of feelings and emotions with regard to lesson study. The findings of this study indicate that the teachers witnessed significant changes in their classroom practices including the increased use of student-centred teaching styles, the increased use of teaching-learning resources, the teaching of publicly observed lessons and the provision and reception of constructive feedback. Participation in the lesson study cycles enabled the teachers to collaborate and discuss issues related to teaching. Lesson study enhanced their interpersonal relationships and thus minimised isolation. It further enhanced the motivation and confidence of the teachers to teach publicly observed lessons and speak publicly about their weaknesses and strengths. While this study does not focus on students, there were some positive reports about the effects of lesson study on students' learning, participation, motivation and confidence.

Although the teachers claimed that they have developed professionally as a result of their participation in the lesson study cycles, lack of time, curriculum overload, large class-size, teachers' poor living conditions, lack of suitable space, shortage of resources, students' poor English proficiency, newness of the process and students' lack of interest affected the smooth execution of the lesson study process. Despite these limitations, the participants recommended that similar teacher development opportunities should be organised for their colleagues. Finally, it is assumed that although in this study the focus was on middle school science teachers, the findings could be relevant to other subject teachers and levels, or even to other professionals such as nurses in Eritrean context.

In the next chapter conclusions and recommendations are provided.

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CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This study originated from the researcher's interest, as a teacher educator at a higher education institute, to make a positive contribution to teacher development in Eritrea. The purpose of the study was to explore the effects of lesson study on selected middle school science teachers' learning and classroom practice. The problem underlying this study was that the successive education reforms introduced in Eritrea expected teachers to shift their teaching from more teacher-focused to student-centred approaches with little or no support provided to them. As a teacher educator at a higher education institute, the researcher was aware that teachers at schools struggle on their own to implement the reform initiatives in order to bring about changes in their classrooms. In addition to the demands of the reforms, the high number of unqualified teachers at middle schools means that more support is required at this level (see Table 2.1). The important position that the middle school level holds in the Eritrean education system was another factor that motivated the researcher to conduct this study at this level in order to support science teachers and make positive contributions towards their development.

Research into possible studies in the field of the professional development of teachers in Eritrea, indicated that very few studies had been conducted. Tecle (2006) conducted a study that explored the potential of exemplary curriculum materials in supporting biology teachers within Eritrean secondary schools. No study has been conducted so far on professional development that used lesson study within Eritrean context. In the light of lesson study being a new concept in Eritrea and because of the possible contributions it could make to support teachers in improving teaching, the researcher undertook this study objectively, free from any predetermined ideas about the possible outcome.

This study is a qualitative case study that took place in three purposefully selected middle schools in the *Zoba Maakel* region of Eritrea and involved 15 science teachers, three school directors and three pedagogic heads. The unit of analysis was a group of three to five science teachers, from each school, who volunteered to participate in the study for one academic year. Each group participated in about six cycles of lesson study. Data generated through multiple techniques were coded and analysed using the grounded theory approach and the results were presented in accordance with the research questions.

This chapter is divided into seven sections. In Section 6.1 highlights of the chapter are presented. In Section 6.2 there is a summary of the major findings of the study in relation to the research questions.

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In Section 6.3 the contribution of this study is discussed. In Section 6.4 the factors that limited this study, are presented. Based on the research findings, in Section 6.5 recommendations for improving teacher development in Eritrea are provided. The researcher's personal reflections can be found in Section 6.6. Lastly, Section 6.7 contains concluding remarks.

6.2 SUMMARY OF THE FINDINGS

This study was intended to explore the effects of lesson study on science teachers' learning and classroom practice in selected middle schools of Eritrea. As this study was essentially an inductive investigation, formal hypotheses were not stated. Instead the following seven research sub-questions were stated in order to answer the main research question. In Section 6.2 there is a summary of the key findings of this study based on the following research sub-questions.

a. What are teachers' reactions to the professional development arrangement? (Section 6.2.1)
b. What are teachers' perceptions about their knowledge and skill gain due to their participation in lesson study? (Section 6.2.2),
c. What is the nature of organisational support available to teachers? (Section 6.2.3),
d. How did lesson study contribute to breaking the culture of isolation? (Section 6.2.4)
e. To what extent did teachers who experimented with lesson study apply the new knowledge and skills gained in their teaching? (Section 6.2.5)
f. What are the positive experiences of teachers regarding lesson study? (Section 6.2.6)
g. What challenges did teachers identify in the use of lesson study? (Section 6.2.7)

6.2.1 Teachers' reactions to the professional development arrangement

Section 6.2.1 offers a summary of teachers' reactions to the workshops that were held before the actual implementation of lesson study at classroom level. Although professional development approaches that are arranged in the form of workshops of the one-shot variety are mainly criticised for being ineffective (Guskey, 1994; Lieberman, 1995; Feiman-Nemser, 2001; Kennedy, 2005; Fullan, 2007; Guskey & Yoon, 2009; Loucks-Horsley, et al., 2010), in this study the majority of the participants found the workshops to be valuable. They highly appreciated the context, process and content of the workshops. Moreover, they indicated that the workshops enhanced their understanding of lesson study and equipped them with the necessary skills on how to implement lesson study in their classrooms. This finding might be expected because the activities of the workshop were organised on the basis of an

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effective professional development model discussed in Section 3.2.5 (see also Section 5.5.4). Moreover, in this study it was confirmed that the participants would have preferred the workshops to have been extended for a relatively longer period of time so that they could gain more knowledge and skills from the training.

It can thus be concluded from this study that it is not the format of the professional development but the organisation of the activities that determines the effectiveness of professional development. A traditional format can be effective as long as it has follow-up, support, content and pedagogical knowledge development and opportunities for active learning (Birman, et al., 2000). In this study, a unique model was developed to provide a required teacher development opportunity that fits in with the Eritrean context (see Figure 3.6). The teacher development programme was organised into two phases, namely training workshops and implementation of lesson study in the classroom context. The training workshops were organised in such a way that they contained components such as theory presentation and demonstration of skills using video, whilst the implementation phase consisted of participation in the lesson study cycles, guidance and support, the creation of a supportive school environment and support from the knowledgeable-other, as suggested by Joyce and Showers (2002). The participants had sufficient time to internalise and to implement in their classrooms what they had learned during the training workshops, a situation which is believed to have contributed to the effectiveness of the professional development programme. This model could therefore be used as a framework to guide future teacher development initiatives within the Eritrean education sector or other professional development programmes.

6.2.2 Impact of lesson study on teachers' learning

The main purpose of this study was to facilitate science teachers' learning and to bring about changes in classroom practice in selected middle schools of Eritrea. The finding of this study is that lesson study supports teachers' learning in three domains, namely enhancing the understanding of subject matter, skills development and it also contributes to changes in the attitudes and beliefs of the participants. This finding is consistent with literature which indicates that effective professional development equips teachers with pedagogical content knowledge that is useful when teachers to make changes in their classroom practices (Borko, et al., 2010). From this study it is clear that by their consulting books and other resources, lesson study positively contributed to participating Eritrean teachers' subject matter knowledge development. The collaborative nature of lesson study enabled them to share experiences and learn from one another. The finding indicates that through lesson study and collaboration, the participating Eritrean teachers developed and enhanced their teaching skills and abilities. It was also

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found that through participation in this study teachers were enabled to value lesson study and develop positive attitudes towards collaboration, lesson planning, teaching and observing of publicly taught lessons, and reception and provision of feedback. Participating Eritrean teachers also valued the four-column lesson plan format (Figure 3.4, Appendix-N) because it enabled them to think and predict students' reactions to the set learning activities in advance and to be able to prepare appropriate responses to the students' reactions. They also felt empowered after participation in the lesson study cycles. More strong evidence of teachers' learning is that each of them was willing to continue in the study or wished to participate in similar professional development programmes.

Although the majority of the participating Eritrean teachers indicated that they have learned from the lesson study process, a few were reluctant to indicate that they have gained new knowledge. It seemed that these teachers did not want to be perceived as learners and they wanted to maintain their self-image in front of their colleagues. It can be deduced that such perceptions held by some teachers about themselves could restrict teachers from learning and developing professionally. To motivate teachers for learning, changing these perceptions to new ones, where teachers perceive themselves as adult learners is necessary.

It can be concluded that using lesson study is an important strategy to help teachers to develop knowledge, skills and attitudes. Lesson study is therefore an appropriate strategy to support teachers in Eritrean schools because in addition to supporting teachers' learning, it created a platform for teachers to come together to share ideas and professional experiences in order to find solutions to their pedagogical problems.

6.2.3 Extent of organisational support

In Sections 3.2.5.7 and 4.3.4.3 it was indicated that professional development programmes become effective if they extend their support and follow-up to teachers once the teachers return to their schools (Guskey & Yoon, 2009) and start implementing the newly acquired concepts and skills (Guskey, 1994; Darling-Hammond & Richardson, 2009). In this study, the teacher development programme was organised in such a way that it combines workshops with the actual implementation of lesson study in classrooms, where support from different role players are embedded in the latter phase. In Section 6.2.3 there is a summary of the findings regarding the extent of organisational support that the participating Eritrean teachers received at their schools from members of the school community, school leadership, head of department and knowledgeable-other (the researcher).

The result of this study show that members of the school community in the three schools reacted differently to lesson study. In two schools, the majority of the members of the school community

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supported and honoured the teachers for participating in lesson study, while in the third school, the majority of the members of the school community reacted negatively towards lesson study. But this does not mean that the participating Eritrean teachers did not receive support in the third school. Regardless of some negative reactions, members of the school community in the three schools provided the necessary support to the participants.

This study shows that the leadership in the three schools granted permission for this research to take place in their schools. They also encouraged and supported the participants to implement lesson study in their classrooms. They provided the participants with resources and a meeting place to perform their activities. In two schools the leadership modified the timetable in order to create time for the participants. It was also observed that the interest of the participants in lesson study was directly influenced by the level of interest that the school leaderships showed in lesson study and by the extent of support they provided to the participants. In one school, where the school director showed relatively more interest in lesson study than the directors in the other two schools, the participants were found to be more committed and the members of the school community were observed to be more cooperative. Hence, this study shows that the involvement of the school leaderships in the study catalysed the creation of a supportive school environment for the participants to implement lesson study within an Eritrean context.

The findings of this study show that the head of departments in the three schools played important leadership roles during all lesson study processes, including coordinating the meetings, facilitating communication among the team members and the researcher and leading the lesson study team in all aspects. Hence, the findings show that in the Eritrean context the involvement of heads of departments catalysed the creation of supportive school environments for the participants to implement lesson study.

In this study the researcher assumed the role of the knowledgeable-other in addition to the role of a researcher (see Section 4.3.4.4). During the process the researcher (as knowledgeable-other) supported the participants by providing training, resources and guidance during the lesson study process. By providing this support, the researcher facilitated the creation of a suitable school environment for the participants to implement lesson study in their schools.

It can be deduced from the above findings that the nature of organisational support available to the participating Eritrean teachers played a significant role in enhancing teachers' motivation, commitment and their learning from the teacher development programmes.

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6.2.4 Teacher collaboration

The findings described in Section 5.6.3.4 indicate that prior to their involvement in this study, participating Eritrean teachers planned and taught lessons alone with limited discussion on matters related to teaching and learning. Peer observation and collaboration were limited. This professional development initiative that combined workshops with the actual implementation of lesson study in classrooms has contributed positively to enhancing teacher collaboration and minimising teacher isolation in the Eritrean context. Literature indicates that all types of teacher collaborations are not effective in minimising teacher isolation (Hargreaves, 1994), but only those with a high degree of teacher interdependence and interaction (Little, 1990). In this study, the participants were encouraged to participate in lesson study and interact with one another for the course of one year. This prolonged engagement and interaction helped the participants to collaborate, work together to achieve shared goals, share ideas and experiences and learn from one another. They planned lessons collaboratively, taught publicly observed lessons, conducted peer observation, engaged in professional dialogue, provided feedback to one another and critically reflected on their own actions. Thus, these collaborative activities are pathways for teachers' professional development.

Working together for prolonged periods also helped the participants to interact, build relationships, build trust among one another and contribute positively towards improving their interpersonal relationships. The participants who previously did not have much of a relationship, started to network with one another to discuss matters related to teaching and learning. The interpersonal relationships that they developed during lesson study were also extended beyond the workshops and research lessons. The workshops were suitable platforms for the participants to talk to one another and exchange professional ideas and experiences with one another and for networking with teachers from other schools. It can thus be concluded that a professional development that used lesson study as a strategy minimised teacher isolation and contributed positively towards enhancing teacher collaboration. Similar findings are reported from studies in South Africa, where lesson study contributed positively to reducing teacher isolation and enhancing collaboration (Coe, 2010; Coe, et al., 2010; Posthuma, 2012).

6.2.5 Impact of lesson study on teachers' classroom practice

The evidence of this study proves that lesson study had a significant positive impact on teachers' classroom practices. The findings of this study have shown that lesson study enabled the teachers to practise activities that are different from what they were used to in the past. Lesson study enabled the teachers to plan research lessons collaboratively, teach publicly observed research lessons, observe a colleague while teaching, exchange feedback during debriefing sessions, frequently use teaching and

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learning resources, frequently use student-centred techniques, carry out more hands-on activities and focus on the facilitation of learning rather than on the provision of information.

In this study, the participants observed one another's lessons throughout the project. Previously they feared observation because they viewed it as exposing their weakness to the public. In lesson study, since the teachers collaboratively planned, taught and observed research lessons, the research lessons were considered as a shared responsibility. The focus of observation in lesson study was on the research lessons and not on the individuals who taught the lessons. This shared responsibility indeed created a feeling of security among the teachers. So they were able to observe and give constructive feedbacks to one another freely. The opportunity to observe and give constructive feedback to one another is an important pathway for teachers to gain teaching expertise and develop professionally.

Moreover, the participants believed that participation in the lesson study cycles assisted them in improving their classroom practices. Lesson study gave them the opportunity to discuss and solve practical problems that they encountered in real contexts. After identifying suitable topics, teachers planned and taught the lessons collaboratively. Unlike in their previous practice, teachers used hand-on activities and resources more frequently. Student-centred approaches were emphasised throughout the lesson study process. The teachers also shifted their roles from providers of information to facilitators of learning. It is thus concluded that lesson study is an effective strategy that supports and motivates teachers to improve their classroom practices.

6.2.6 Benefits of lesson study

This study identified several benefits for both teachers and students. In addition to the benefits summarised in Sections 6.2.2, 6.2.4 and 6.2.5 teachers gained several benefits. Firstly, the collaborative nature of lesson study enabled the teachers to come together to share ideas and support one another. As a result of working together, teachers increased their confidence to teach publicly observed lessons. The participants indicated that they felt more professionally competent compared to the situation prior to their participation in lesson study. Secondly, teachers reported that lesson study had increased their motivation. They expressed their happiness in being the first teachers in Eritrea to participate in lesson study and because their schools were selected for this study. Thirdly, the teachers indicated that lesson study provided them with a chance to become acquainted with the syllabus guide and students' textbooks. Finally, the teachers indicated that the collaborative nature of lesson study contributed to simplifying lessons that were difficult for individual teachers.

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In this study five benefits to the students were identified, namely enhanced students' collaboration, confidence, motivation, learning and participation. Students obtained these benefits because the teachers organised more participatory and hands-on activities during lesson study.

6.2.7 Challenges to lesson study

In this study several challenges that impacted negatively on teachers' participation in lesson study were identified. These challenges include a lack of time, curriculum overload, large class-size, teachers' poor living conditions, lack of suitable space, shortage of resources, students' poor English proficiency, newness of the process and students' lack of interest. However, these challenges are not peculiar to lesson study.

Lack of time was identified as a strong constraint that affected teachers' participation in lesson study. The teachers reported that they had difficulty in finding common time for collaboration. Teacher could not find common time because of factors such as heavy teaching load, working in two shifts (in two sessions) and being occupied with personal commitments. In addition to the participants' willingness and commitment to working during their free time, the support of the school community and leadership was helpful in solving the problem of time. To create common time, members of the school community cooperated in exchanging periods with the participants. The leadership of Schools 'A' and 'B' also supported them by adapting the timetable so that the participants would follow the same programme. Although this change in timetable had its own problems, to a large extent it was helpful. Thus, time should be built into the school timetable so that teachers can come together to participate in professional development initiatives.

Curriculum overload was also identified as a major challenge that affected participating teachers in their experimenting with lesson study. As a result of participation in the lesson study cycle, teachers reported that they lagged behind in terms of syllabus coverage. This was due to several factors including the inherent nature of lesson study which requires more time, content overload in the students' textbooks and the frequent use of student-centred methods. In ordinary lessons, teachers use teacher-centred methods that emphasise the provision of factual information that prepares students for examinations rather than focusing on students' understanding.

Large class-size was also identified as a challenge that affected the participants in their experimenting with lesson study. Since the participants were dedicated to preparing student-centred research lessons, they indicated that large class-size constrained them from using more participatory teaching methods, because they required extra classroom management and extra time for planning and assessing

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students' learning. It can be deduced that although class-size is decreasing, it is still a major challenge in the Eritrean school system.

Poor living conditions were also identified as a challenge that constrained teachers' participation in lesson study. The teachers indicated that their poor living conditions, that do not meet their basic needs, force them to look for additional jobs to earn extra incomes instead of participating in professional development initiatives wholeheartedly. Thus, is can be concluded that the poor living conditions of teachers discourage them from participating in professional development programmes.

A lack of suitable space was another challenge that affected teachers in their experimenting with lesson study. Since the participants were dedicated to preparing student-centred research lessons, they indicated that lack of demonstration rooms, lack of demonstration tables and the arrangement of desks in the classrooms constrained them from preparing student-centred lessons.

Shortage of resources was another challenge identified by this study. Although shortage of teaching-learning resources was considered as an obstacle, the participants solved the problem by either bringing them themselves from their homes, using the environment as a resource, or asking their students to bring from their homes.

Students' poor English proficiency also affected teachers' implementation of lesson study. Since the participants were dedicated to preparing student-centred research lessons, they indicated that poor English proficiency constrained them from using more participatory teaching methods, because the students had problems in expressing their ideas and pronouncing scientific words during the discussions and presentations.

This study identified the newness of the process as a challenged that affected teachers' participation in lesson study. Lesson study was new to all the participants. Although the notion of lesson study was new to the participants, their willingness and commitment to develop their capacity and the support from the school community and leadership was helpful.

Finally, the lack of interest of some students in their studies affected teachers' implementation of lesson study. The findings indicate lack of students' motivation was a factor that affected teachers' participation in lesson study.

In Section 6.3 the contributions of this study are discussed.

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6.3 CONTRIBUTIONS OF THIS RESEARCH

Although lesson study is a well-established teacher development strategy in the Japanese education system (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Yoshida, 2002; Lewis, et al., 2009), it is at its formative stages outside Japan. No research has been done in the area of lesson study within the Eritrean context. This implies that the literature on lesson study is limited. In most of the existing the literature the focus is on describing lesson study, rather than exploring its impact on teachers' learning and classroom practice. In this sense, this study is significant because it contributes towards this limited body of knowledge by exploring the effects of lesson study on teachers' learning and classroom practice. Although this was a small-scale study, the findings of this study also contribute to enriching the knowledge base surrounding teacher development in general and in particular to creating a new knowledge base regarding lesson study in the Eritrean education context.

There are four areas where the findings from this study contribute to building a good knowledge base for future research on lesson study in the Eritrean educational context. These are that lesson study satisfies the principles of effective teacher development, lesson study enhances teachers' personal, social and professional development, lesson study is a strategy for improving classroom practice and lesson study is a strategy for minimising isolation. Since most of these contributions overlap with one another, a schematic representation of the relationships are presented in Figure 6.1.

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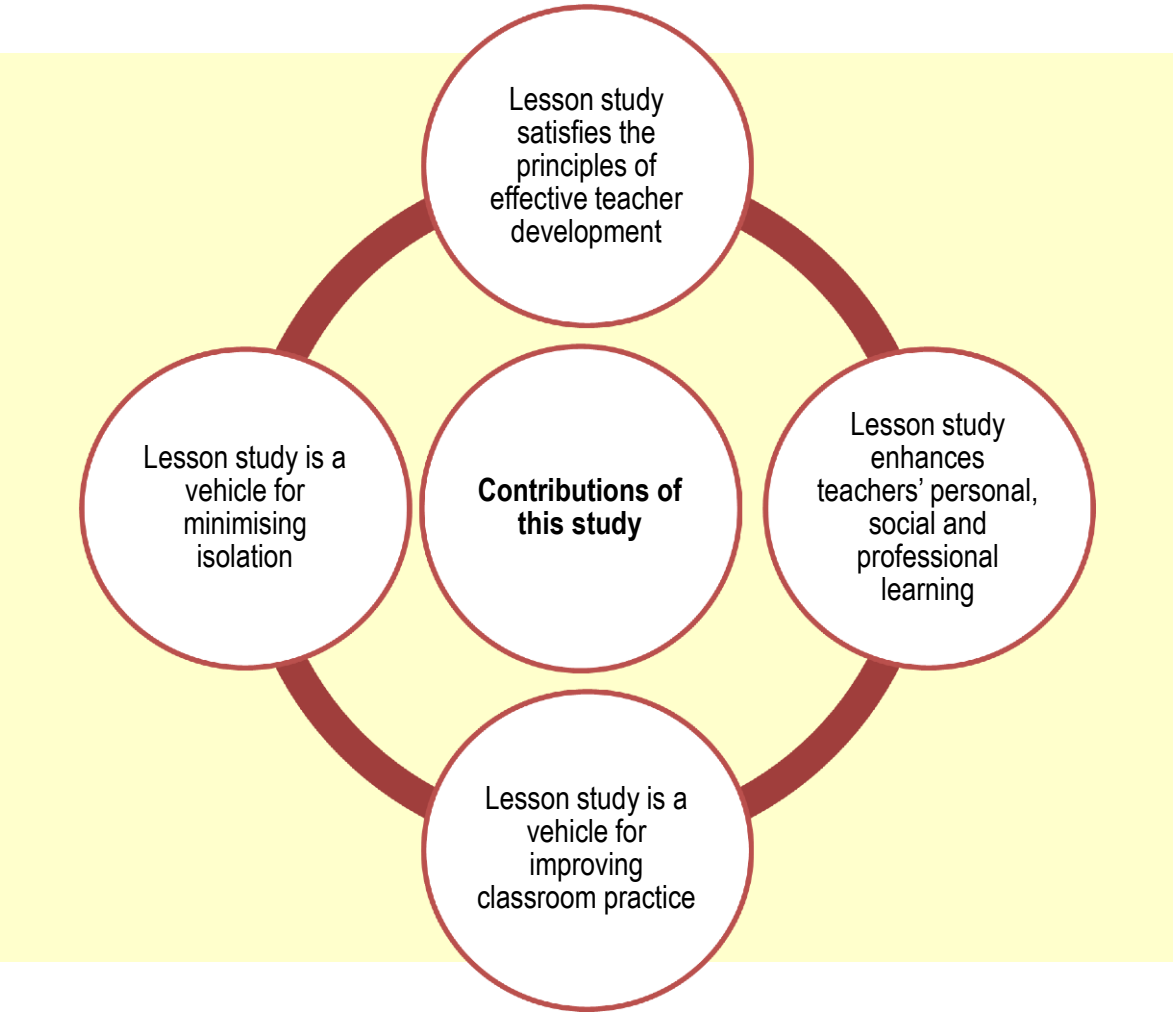
Figure 6.1: Summary of the main contributions



6.3.1 Lesson study satisfies the principles of effective teacher development

The findings of this study have confirmed that lesson study supports the principles of effective teacher development. There are five areas where this study complies with the principles of effective teacher development, namely by enhancing teachers' pedagogical content knowledge, being extended over a relatively longer period, allowing the active participation of teachers, providing opportunities for follow-up and support and including appropriate procedures for evaluation.

As indicated in Section 3.2.5.1, teacher development programmes that deepen teachers' content knowledge play an important role in enhancing the classroom practice of teachers. To address this issue teachers who participated in this study were encouraged to identify contents that are either difficult for their students to understand, a methodology that they want to apply or contents that are difficult for them to teach. After identifying appropriate content, teachers worked collaboratively to plan, teach, observe and debrief. Evidence from this study revealed that teachers developed both content

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knowledge and pedagogical knowledge as a result of these collaborative activities. They developed positive attitudes towards lesson study, collaborated in lesson planning, practised peer observation and gave feedback. They became more comfortable and confident to teach student-centred lessons, teach publicly observed lessons and give and receive feedback. The findings also show that after participation in the lesson study cycles the teachers developed several teaching-related skills such as lesson planning skills, observation skills and reflective skills.

The literature in Sections 3.2.5.2 and 3.4.1.1 indicates that in order for professional development to be effective it should be extended over relatively longer periods. The traditional approaches have been criticised for not giving enough time for teachers to actively engage in professional learning. The more time teachers find to participate in professional development, the more they internalise the newly learned concepts. By taking the importance of time into consideration, in this study the professional development setup that combined workshops and classroom practices was extended for the duration of one year. Extending the professional development arrangement for one year allowed the participants to talk to one another and share experiences, build trust for meaningful collaboration, build their interpersonal relationships, observe changes in their professional development, implement the knowledge and skills gained during the workshops in the classrooms and network with teachers from other schools.

Unlike in the traditional approaches where teachers are considered as passive receivers of information, this study put more emphasis on teachers' active engagement in professional development. As a result, teachers were allowed to actively participate during the workshops and the classroom practices. During the workshops teachers worked in groups to identify topics that they would like to teach. During classroom practice they collaboratively planned research lessons, taught publicly observed lessons, conducted peer observation and provided and received feedback.

The literature in Section 3.2.5.7 indicates that professional development programmes become effective if continued follow-up and support are provided to teachers in their workplaces. This study was organised in such a way that the participants obtained regular follow-up and guidance from the heads of department, school leadership and the knowledgeable-other (the researcher). This support had a positive influence on enhancing teachers' commitment and motivation.

Finally, literature indicates that evaluation is an essential component of any teacher development programme which is aimed at determining achievement (see Section 3.5.3). In this study, evaluation was taken as an important component of the teacher development initiative. Thus, Guskey's (2000) first

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four levels were used to explore the effects of lesson study on teachers' learning and classroom practice.

6.3.2 Lesson study enhances teachers' personal, social and professional learning

This study has confirmed that lesson study contributed positively to the holistic development of teachers in three dimensions, namely personal, social and professional. Personal development is crucial to teacher development if teachers take responsibility for their own learning by identifying their strengths and weaknesses. It comes from within the teacher's interest, motivation and commitment to participate in professional development initiative. In this study, teachers participated voluntarily and were committed to their self-improvement by identifying weaknesses in their teaching in order to guarantee that their students are provided with the best possible learning experiences, they designed lessons that addressed their weaknesses and finally felt empowered after addressing those weaknesses. Social development involves the ability of teachers to work with others and contribute and share ideas with colleagues. In this study, teachers acknowledged that working in isolation was a problem and that lesson study removed the barriers and created suitable conditions for them to come together to collaborate with one another. Finally, the professional development was materialised by teachers trying out new activities that brought changes in classroom practices. This study has therefore established the fact that lesson study enhances the holistic development of teachers that is development in personal, social and professional dimensions.

6.3.3 Lesson study is a vehicle for improving classroom practice

Teacher development approaches that address teachers' personal, social and professional development, are more likely to improve classroom practice. Lesson study is a process that allows teachers with shared goals to come together to plan, teach, and observe in order to gather relevant data, reflect as a team, and revise and re-teach a research lesson. This study has therefore established the fact that participating in lesson study helped teachers to bring about changes in their classroom practices in a relatively shorter period of time. In contrast with their earlier practice, the findings show that the teachers used student-centred teaching styles more frequently, participated in collaborative planning, peer observation and the provision of constructive feedback to one another. This study has also shown that participating in lesson study helped the teachers to increase the frequency of using hands-on activities and teaching-learning resources.

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6.3.4 Lesson study is a vehicle for minimising isolation

Effective teacher development provides suitable structures for teachers to work together. In this study, the workshops and the classroom practices were organised in order for teachers to work in groups. The lesson study cycles at classroom level were performed collaboratively. These collaborative activities helped to minimise isolation. As a result, teachers worked collaboratively, talked to one another, shared ideas with one another and supported one another. Towards the end teachers built trust among one another became more comfortable with one another. They also became more confident about teaching publicly observed lessons and giving and receiving feedback. This study has therefore confirmed that lesson study minimises teacher isolation.

In Section 6.4 the limitations of the study are presented.

6.4 LIMITATIONS OF THE STUDY

Having identified the contributions, it is also appropriate to acknowledge the limitations of this study. There were a number of limitations that were identified during the conduct of this study. However, these limitations do not imply that this study was a failure but rather indicate that this study's success should be seen within the context of its limitations.

- This study is a qualitative research that used case study as a methodology. The justification for choosing case study from a myriad of methodologies has been discussed in Section 4.3.2.2. Case study was chosen because it enables the researcher to study the phenomenon, a group of middle school science teachers' participation in lesson study, within its real-life context as suggested by Yin (1984; 1993). This makes the data generated unique to the cases studied and making it difficult to generalise. This could be taken as a limitation inherent to case study. Case study was chosen because the intention with this study was not to generalise the findings to a larger population but to understand and obtain diverse views regarding teachers working in a specific context. Had the intention been to obtain findings that could be generalised, the researcher could have used a quantitative approach. It is also important to mention at this juncture that this study could have been better had the researcher used action research methodology instead of case study because of the close relationship that lesson study has with action research as highlighted in the literature (Coe, 2010; Coe, et al., 2010). Although the researcher understood the relationship between action research and lesson study, he opted for case study because of his preference for and confidence in case study.

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- The rationale for conducting this study in three schools was not to generalise the finding obtained to a larger population, but to obtain diverse views of teachers working in different settings. It would have been better had more schools participated in this lesson study initiative, because more teachers would have understood and benefited from the process.
- The continuous load shedding experienced during the fieldwork limited the data generation process in two ways. Firstly, the researcher was supposed to check with the respondents whether or not the transcribed and translated interviews reflect their intended responses. Due to inconsistencies in power supply, the researcher was not able to transcribe the interviews on time while he was in the field to do these checks. In the absence of such checks, one may question whether the transcriptions and translations were done correctly. As much as possible the researcher tried to construct the most plausible meaning from the interview transcriptions. Firstly, being a teacher helped him to understand the expressions that the teachers used. Furthermore, since the interviews were audio-recorded it was possible for the researcher to listen to the interview time and again until he captured the intended meaning. Apart from this, the researcher relied on the use of multiple data collection methods. The use of multiple techniques provided some form of triangulation. Secondly, the continuous load shedding affected the data generation in that the researcher was not able to show the recorded videos of the research lessons to the participants for discussion during the debriefing sessions, because the researcher wanted to save the power in the battery for subsequent sessions. Watching the videos could have generated more in-depth data during the debriefing discussions.
- In two of the schools the participants were selected by the school directors. This could be viewed as a limitation. However, the researcher made certain that all the teachers participated in the research voluntarily.
- The final limitation deals with the subjectivity of the coding process. It is possible that different people could code the same data differently and could come up with different findings. In this study, for example, the researcher coded and classified the data of this study in several different ways until he was convinced that it was final.

In Section 6.5 recommendations of this study are provided.

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6.5 RECOMMENDATIONS

Based on the findings of the study, some recommendations for education policy makers (Section 6.5.1) and for further research (Section 6.5.2) are made.

6.5.1 Recommendations for education policy-makers

Based on the findings, this study provides the following recommendations for policy considerations. It is recommended that:

- Lesson study be introduced in Eritrean schools as a viable and effective strategy to bring teachers together to collaborate and to jointly seek solutions for their pedagogical problems. This will make quality professional development opportunities available to teachers, which is central to improving the quality of education delivered to students.
- The authorities in MoE extend their roles beyond reforming the curriculum to ensuring that teachers are equipped with the necessary knowledge and skill through organising training opportunities and extending follow-up and support mechanisms at school level so that teachers apply the newly acquired knowledge and skills in their classrooms.
- Teachers get time to participate in professional development programmes and practise in the classroom what they have learned in workshops. It was identified that teachers have little time for development. To facilitate teachers' participation in professional development initiatives such as lesson study, it is recommended that school leadership extend their support to teachers by building professional development time into the school timetable.
- Teachers be motivated in order to commit themselves to implement what they learn from professional development initiatives. The findings of this study indicate that teachers were dissatisfied with their poor living conditions. It is, therefore, recommended that the MoE to take the issue of teachers' poor living conditions seriously and motivate them by either revising their salaries or devising other means of compensating them.
- School leadership should provide appropriate storage place so that teachers are motivated to prepare more resources for their teaching. Lack of teaching and learning resources was observed in the schools. The findings of this study reports that the problem of resources was exacerbated by teachers' lack of motivation to prepare teaching aid materials. The teachers were discouraged from preparing teaching-learning resources because they lacked space for storage once they had prepared them.

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- The findings of this study indicate that teachers' interest in lesson study is directly related to the interest that the school leadership shows in lesson study and to the extent of support they provide to them. It should be noted that in order to bring about meaningful changes in teachers' learning and classroom practice, professional development efforts should also focus on involving members of school leadership such as the heads of department, school directors and pedagogic heads. This is because the school leaders are important role players in facilitating the implementation of teacher development processes by showing active interest in the innovations, motivating teachers and providing moral and material support to the teachers, as suggested in the literature (Fullan, 2007).

6.5.2 Recommendations for future research

In this study the impact of lesson study on teachers' learning and classroom practice was revealed. From the findings of this study, the researcher has identified the following areas that require further study:

- This study has provided evidence of the positive impact of lesson study on teachers' learning and classroom practice within the Eritrean context. The findings of this study are based on data generated over a one-year period. Several factors dictated that the conduct of the fieldwork for this study be for one year, namely the time available for the completion of this dissertation, the possibility of getting participants who are willing to participate in the study for that particular period and obtaining access to the schools. In the absence of these limiting factors and by taking the dynamic nature of teaching into account, extended study would have been more desirable. Future research might examine the wider impact of lesson study with many more samples taken and the long-term effect of lesson study on teachers' learning and classroom practice. Future research could also investigate the potential of lesson study on teachers' learning and classroom practice by conducting similar studies either with other subject teachers in the field of education or with other professionals such as nurses in the Eritrean context. As an alternative to Guskey's model, the Cultural Historical Activity Theory (CHAT) could be used to record the tensions that develop in such a lesson study design and explore effect of professional development programme on teachers' learning and student achievement.
- This study was concerned with exploring the effects of lesson study on teachers' learning and classroom practice. Although students were important elements in the process, the impact of lesson study on student achievement was not considered. As the effectiveness of professional

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development in ultimately evaluated through its influence on students' learning, further research that links lesson study to students' learning outcomes is desirable.

In Section 6.6 the learning and personal reflections of the researcher are discussed.

6.6 PERSONAL REFLECTIONS

At this point the study has reached its end and the researcher wishes to share his personal experiences, learning and reflections about the journey. In Section 6.6, the researcher prefers to report his personal reflections in the first person singular and thus uses either I, me or my.

I obtained a B.Sc. Degree in Biology from University of Asmara and started my professional career as secondary school teacher. I taught General Sciences to Grades 6 to 8 and Biology and Chemistry to Grades 9 to 12 for ten years before I obtained my M. Phil Degree in 2001, from the University of the Western Cape (UWC). I also worked as teacher educator, from 2001-2003, in ACCE and was later appointed as lecturer in 2004 at the College of Education of the EIT until I left the Institute, in 2012, to pursue my doctoral study. This background information indicates that I have worked as either school teacher or teacher educator during my entire professional experiences. These professional experiences could be taken as potential sources of subjectivity for this research.

I began this doctoral research journey in 2012, eleven years after receiving my M. Phil from the UWC, after being absolutely detached from research. Actually I remembered little about research design, research methodology and methods when I first started this research. Hence, I had to begin anew. My promoters provided me with a reader and some journal articles to start with and suggested some more literature that could help me in this regard. I also consulted professors at the Faculty of Education, whom I knew from UWC, for their guidance and support. Moreover, I attended various seminars, related to research methodology organised by the Department of Policy and Management and the International Office of Postgraduate Skills Development of Stellenbosch University. Therefore, a combination of reading literature, guidance from promoters, talking to other researchers and attending seminars helped me to pick up again.

Obviously, I started this study with a proposal development. I came to Stellenbosch University with a research proposal, which I used in Eritrea in order to qualify for a scholarship. Since this research proposal was not up to standard, it required some changes. Therefore, shortly after my arrival at the University I started working towards improving it. The focus of the old research proposal was on how to support school teachers in Eritrea using mentoring. During the process of improving this research

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proposal, I came across lesson study. I was attracted to it and I discussed the matter with my promoters in order to shift the focus of my study from mentoring to lesson study. Based on consent from my promoters I adjusted the topic of my study to lesson study. During this process, in addition to the lack of academic writing skill and the task for acquainting myself with literature in the field, I found keeping the proposal within the prescribed word length a challenging task. As the number of words of the proposal decreased, all information appeared to me as relevant. When I reached a point where I could not reduce the number of words anymore, the proposal already exceeded the limit by a few words. Finally, my research proposal was approved by the Department of Curriculum Studies Higher degrees committee on 14 May 2012. I found the process of writing the research proposal the first learning experience as it acquainted me with literature in the field and provided me with opportunities to practise academic writing.

After approval of the research proposal, I started writing the literature review chapter. I found literature review the most challenging part of the process. I had to face two challenges, namely reading and understanding literature and writing at the same time. In order to pick up and acquaint myself with the literature, I had to read a lot of literature. As a result, I claim that I have gained new knowledge on teacher development in general and lesson study in particular. Moreover, I claim that I have developed my writing skills. Although there is still room for improvement, at this time I claim that I am in a better position regarding my writing skills than in the formative stages of this research.

Choosing appropriate methodology was another challenge. For some time I struggled to comprehend and identify appropriate methodologies. Finally, I realised that my proposed research fits in the interpretive paradigm and that I should make use of case study methodology. Although action research was the best choice, considering the close connection of lesson study with action research, it was my personal choice to use case study because I felt more comfortable with it than with action research.

I generated data using multiple methods including video recording. I video recoded 29 lessons. At this moment I regret that I used so much of my time and energy in recording the videos and editing them, when I ended up using them only as a source of supplementary information. Another method of data generation used in this study was semi-structured focus group interviews. After returning from the fieldwork, I realised that I lacked some interviewing skills. I identified some gaps in the interviews where some follow-up questions were required. This problem was not evident to me while I was in the field. This is another learning experience that I have gained from this research. Preparing data for analysis was another challenge which I had to face. It was the most frustrating moment for me. I was not sure

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how and where to start. I discussed the matter with a friend who had gone through the process. The information obtained from the discussions helped me to organise my data.

Finally, I am happy that I am able to come to the end of the doctoral research journey after travelling through several challenging and emotional moments. After completion of this dissertation, I feel empowered and sense that I have contributed to the knowledge base in teacher development in general and teacher development in the Eritrean context in particular. The following section, Section 6.7, concludes the study.

6.7 CONCLUDING REMARKS

Evidence reported in this study shows that the professional development programme that used lesson study as its strategy was effective in enhancing the learning and confidence of teachers. More specifically it contributed to the holistic development of the participating Eritrean teachers namely in their personal, social and professional domains. Combining traditional workshops with classroom practices that are extended overtime was found to be effective in changing the way teachers teach science in their classrooms, resulting in enhanced student confidence, participation and learning.

Lesson study also made a significant contribution to minimising teacher isolation by bringing teachers together to collaborate and develop a learning community i.e. the coming together of teachers to discuss with one another issues related to teaching.

An additional finding indicates that there is a direct relationship between participating teachers' interest in teacher development initiatives and the interest that the school leadership shows in such initiatives and the extent of support they provide to the teachers. Most of the findings of this study corroborate the literature reviewed in Chapter Three.

Finally, the overall experience of implementing lesson study in selected middle schools of Eritrea shows that teachers are generally convinced of the value of lesson study. However, the success and implementation of such reforms depends on the extent of support provided to the teachers so that teachers and the students can reap optimal benefits. The provision of time, resources, space as well as resource-persons that would provide support during the planning and debriefing sessions is necessary.

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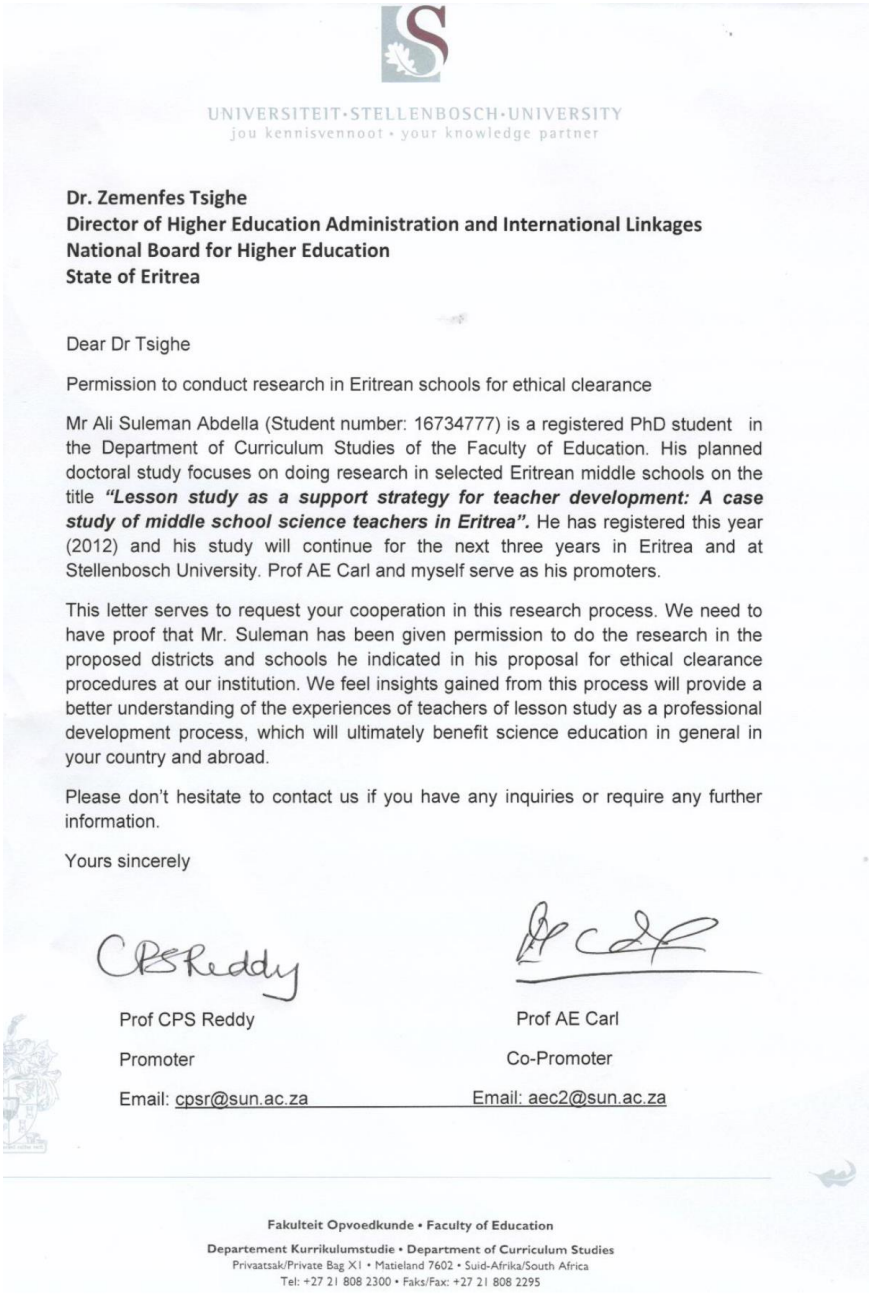
APPENDIXES

Appendix A-1:
Request for permission to conduct research in Eritrean schools



UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

Dr. Zemenfes Tsighe
Director of Higher Education Administration and International Linkages
National Board for Higher Education
State of Eritrea

Dear Dr Tsighe

Permission to conduct research in Eritrean schools for ethical clearance

Mr Ali Suleman Abdella (Student number: 16734777) is a registered PhD student in the Department of Curriculum Studies of the Faculty of Education. His planned doctoral study focuses on doing research in selected Eritrean middle schools on the title ***"Lesson study as a support strategy for teacher development: A case study of middle school science teachers in Eritrea".*** He has registered this year (2012) and his study will continue for the next three years in Eritrea and at Stellenbosch University. Prof AE Carl and myself serve as his promoters.

This letter serves to request your cooperation in this research process. We need to have proof that Mr. Suleman has been given permission to do the research in the proposed districts and schools he indicated in his proposal for ethical clearance procedures at our institution. We feel insights gained from this process will provide a better understanding of the experiences of teachers of lesson study as a professional development process, which will ultimately benefit science education in general in your country and abroad.

Please don't hesitate to contact us if you have any inquiries or require any further information.

Yours sincerely

CPS Reddy

Prof CPS Reddy
Promoter
Email: cpsr@sun.ac.za

Prof AE Carl
Co-Promoter
Email: aec2@sun.ac.za

Fakulteit Opvoedkunde • Faculty of Education
Departement Kurrikulumstudie • Department of Curriculum Studies
Privaatsak/Private Bag X1 • Matieland 7602 • Suid-Afrika/South Africa
Tel: +27 21 808 2300 • Faks/Fax: +27 21 808 2295

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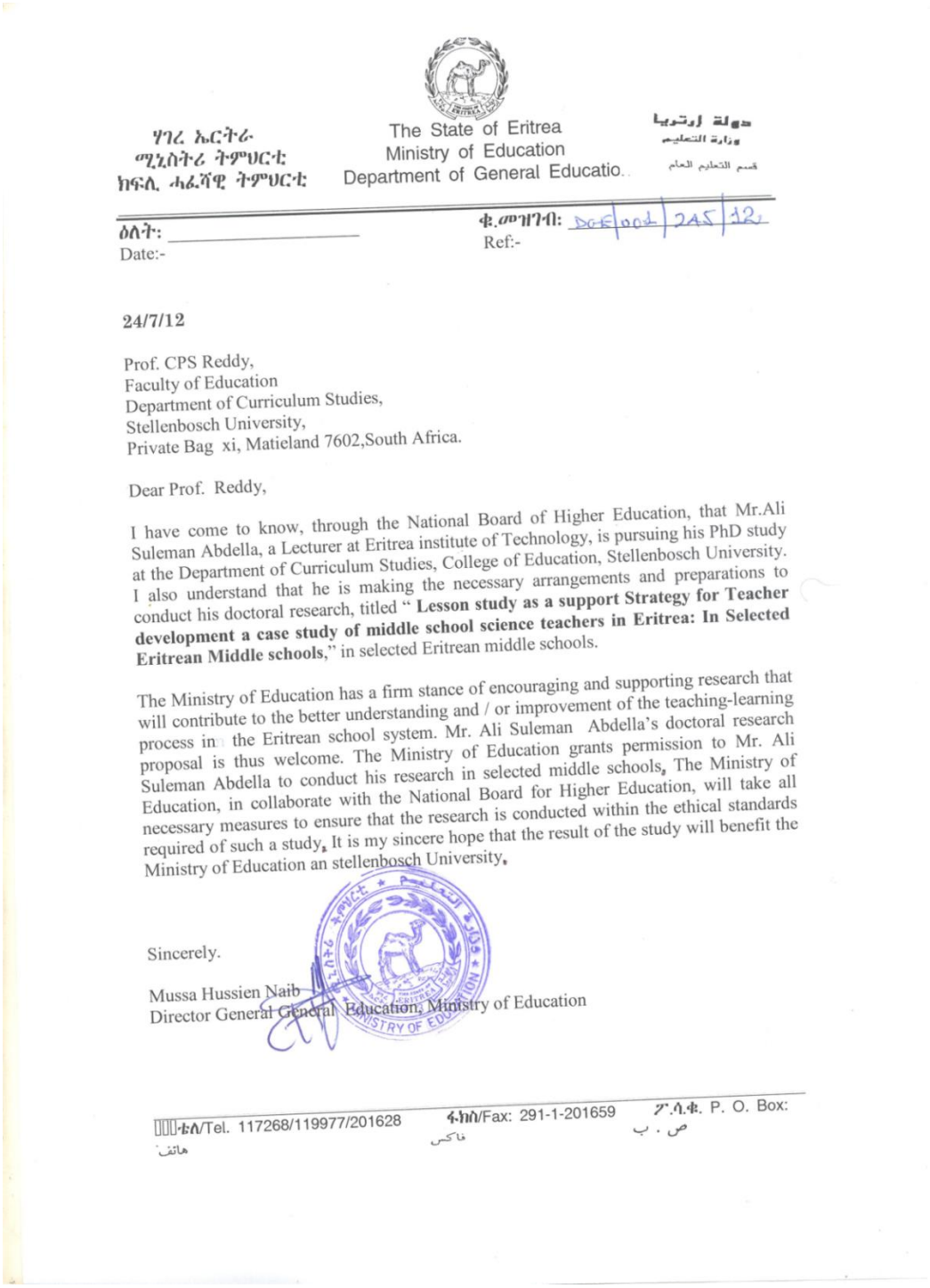
Appendix A-2:
Permission letter from Ministry of Education, State of Eritrea



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The State of Eritrea
Ministry of Education
Department of General Educatio..

دولة إرتريا
وزارة التعليم
قسم التعليم العام

ዕለት: _____ ቁ.መዝገብ: DGE/001/245/12
Date:- Ref:-

24/7/12

Prof. CPS Reddy,
Faculty of Education
Department of Curriculum Studies,
Stellenbosch University,
Private Bag xi, Matieland 7602,South Africa.

Dear Prof. Reddy,

I have come to know, through the National Board of Higher Education, that Mr.Ali Suleman Abdella, a Lecturer at Eritrea institute of Technology, is pursuing his PhD study at the Department of Curriculum Studies, College of Education, Stellenbosch University. I also understand that he is making the necessary arrangements and preparations to conduct his doctoral research, titled " **Lesson study as a support Strategy for Teacher development a case study of middle school science teachers in Eritrea: In Selected Eritrean Middle schools**," in selected Eritrean middle schools.

The Ministry of Education has a firm stance of encouraging and supporting research that will contribute to the better understanding and / or improvement of the teaching-learning process in the Eritrean school system. Mr. Ali Suleman Abdella's doctoral research proposal is thus welcome. The Ministry of Education grants permission to Mr. Ali Suleman Abdella to conduct his research in selected middle schools, The Ministry of Education, in collaborate with the National Board for Higher Education, will take all necessary measures to ensure that the research is conducted within the ethical standards required of such a study, It is my sincere hope that the result of the study will benefit the Ministry of Education an stellenbosch University,

Sincerely.

Mussa Hussien Naib
Director General General Education, Ministry of Education

ቴሌ/Tel. 117268/119977/201628 هاتف ፋክስ/Fax: 291-1-201659 فاكس ፖ.ሳ.ቁ. P. O. Box: ص . ب

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Appendix A-3:
Zoba Maakel MoE permission letter

ሃገረ ኤርትራ
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دولة إرتريا
وزارة التعليم

THE STATE OF ERITREA
Ministry of Education
Central (Maekel) Region Educational Office

14/01/2012

ዕለት:- 14/01/2012 ቁ.መዝ:- P1-03/6130

ናብ:-
ቤት ጽሕፈት ን/ዞባ

ጉዳይ:- ብዛዕባ መጽናዕቲ (Research) ዘካይድ መምህር ምሕባር

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2.
3.
4.

ስለ'ዚ በብናትኩም ኣብያተ ትምህርቲ ነዚ ሓበራታ'ዚ ብመንገድኹም ይዋሃበን።

ዓወት ንሓፋሽ !!

መስፍን ወልደስላሴ
ሓ/መስ/ት/ጨ/ትም/ዞባ ማእከል

ቅ ዳ ሕ:-
- ንመምህር ዓሊ ሱሌማን ዓብደላ

Mailing Address:
Ministry of Education
P.O.Box 82
Asmara, Eritrea
H.A

Tel:
180388/180377
180374
R 20

Fax:
00-291-1-201674

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Appendix B1:
Introductory Workshop schedule

23 – 24 Feb, 2013
Venue: MoE Head Office Resource room

Date	Activity	Time
Feb 23, 2013	Registration	08:00-08:30
	Welcoming, introductions and overview of program	08:30-08:45
	Signing of consent paper	08:45-09:15
	Presentation : *Overview of Lesson study*	09:15-10:30
	Tea break	**10:30-11:00**
	Discussion	11:00-11:15
	Presentation: *Introducing lesson plan*	11:15-12:00
	Discussion	12:00-12:15
	Lunch	**12:15-14:00**
	Video show: *Japanese lesson study*	14:00-14:10
	Discussion	14:10-14:20
	Video show: *What is lesson study*?	14:20-14:30
	Discussion	14:30-14:40
	Video show : *Lesson study kit*	14:40-15:10
	Discussion	15:10-15:25
	Tea break	**15:25-15:45**
	Plenary discussion • How do we do this in our respective schools?" • Identifying the opportunities and challenges	15:45-16:30
Feb 24, 2013	Splitting into groups	8:30-8:40
	Group work • Identify a research theme • Analyse curriculum expectations: refer to the syllabus • Identify needs and strengths of students	8:40-9:45
	Sharing with the groups Examining commonalities & differences	9:45-10:30
	Tea break	**10:30-10:45**
	Determining specific science topics	10:45-11:30
	Deciding on dates for planning and teaching of research lessons Determining roles and assignments of each group member	11:30-12:00
	Clarification on the instruments	12:00-12:15
	Closing of the workshop	12:15-12:30
	Lunch	**12:30-14:30**

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Appendix B2:
Follow-up Workshop schedule

07 Sep Feb, 2013
Venue: MoE Department of General Education Conference Hall

Date	Activity	Time
Sep 07**, 2013**	Registration	08:00-08:15
	Welcoming and overview of program	08:15-08:30
	Signing of consent paper	08:30-09:00
	Presentation : *Overview of Lesson study*	09:15-09:45
	Introducing lesson plan format	09:45-10:00
	Tea break	**10:00-10:15**
	Video clips: *Japanese lesson study, What is lesson study*? *Lesson study kit*	10:15-11:10
	Discussion	11:10-11:15
	Report on the previous phase	11:15-11:45
	Reflection on the previous phase	11:45-12:15
	Lunch	**12:15–14:00**
	Introducing the documents for reporting lesson study events	14:00-15:00
	- Identifying topics for the next phase - Deciding on dates for planning and teaching of research lessons	15:00-16:15
	Sharing the outcomes with the workshop participants	16:15-16:45
	Closing of the workshop	16:45-17:15
	Tea	**17:45-18:30**

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Appendix C:
Participants' consent form

STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Lesson study as a support strategy for teacher development: A case study of middle school science teachers in Eritrea

You are asked to participate in a research study conducted by Ali Suleman Abdella, a PhD student, from the Department of Curriculum Studies at Stellenbosch University.

1. PURPOSE OF THE STUDY

The purpose of this study is to introduce lesson study as strategy for supporting science teachers in selected middle schools of Eritrea and then examine its effect, if any, on their knowledge and classroom practices

2. PROCEDURES

If you volunteer to participate in this study, I would ask you to do the following things:

1. Actively engage in the process of lesson study i.e. planning, teaching, and observing research lessons in collaboration with group members.
2. Participate in feedback meetings.
3. Keep record based on available formats.
4. Be available for interviews.

3. POTENTIAL RISKS AND DISCOMFORTS

No risks, discomforts or stresses are envisaged at this stage. However, if something comes up it will be dealt with in sensible way. If you feel that the research is hurting you or if you are uncomfortable with the research you may discontinue participation at any time.

4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

Potential benefits could be that teachers participating in this study will learn to work in groups, be able to refine and develop high quality lessons that increase student understanding. Finding of this research will contribute to the scientific literature in the area of lesson study.

5. PAYMENT FOR PARTICIPATION

No payments to the participants will be made.

6. CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. All research participants will have the right to review/edit any recordings that will be created as a result of this study. The information will be stored and locked in secure places. All recordings will be destroyed at the completion of this research.

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7. PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study.

8. IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact me at (+291) 7198438 and e-mail alisuleman2004@yahoo.com.

9. RIGHTS OF RESEARCH PARTICIPANTS

You may choose whether or not to be in this study. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. If you have questions regarding your rights as a research participant, contact Department of General Education, Ministry of Education of the State of Eritrea Tel. (+291) 201628.

SIGNATURE OF PARTICIPANT

I have read and understood the Informed Consent and conditions of this research. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this research project. I agree to abide by the rules of this research. I have been given a copy of this form.

_____

Name of Participant

_____ _____

Signature of Participant **Date**

SIGNATURE OF RESEARCHER

In my judgment the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

_____ _____

Signature of Researcher **Date**

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Appendix D:
Participant Background Information Questionnaire

Dear Teacher,
You will be requested to participate in a Lesson Study workshop that will be conducted very soon. Through this questionnaire I would like to get your background information. The information you provide will be used as the basis for designing and organising the programme.
Any information that you provide will be confidential.

Please fill in the following information:

1. Name: ……... Date: ……
2. Name of your school: ……
3. Age range

   20-29 ☐ 30-39 ☐ 40-49 ☐ 50- 59 ☐ 60+ ☐

4. Gender: Male ☐ Female ☐
5. Grades taught: ……
6. Which grades are you teaching currently? …… ……..
7. What other subjects do you teach apart from science? …… ……..
8. What type of professional qualification do you have?

   Certificate (12+TTI) ☐ Diploma ☐ Degree ☐ Other: ……..…

9. Total number of years of being a teacher: …… …...
10. Number of years completed in current school: ……...
11. Teaching load/week: …….
12. Responsibility other than teaching: ……..
13. Have you ever participated in teacher development workshops? Yes ☐ No ☐

    If yes, would you please describe the nature of the workshops?

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14. What do you think about collaborating with colleagues?

- ☐ Not important
- ☐ Slightly important
- ☐ Important
- ☐ Very much important

Please explain:

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15. Have you ever participated in collaboration with colleagues? Yes ☐ No ☐

If yes, would you please describe the nature of the collaboration?

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16. Has this collaboration helped you to improve your instruction? Yes ☐ No ☐

If yes, would you please motivate your answer?

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17. Have you ever observed a colleague teaching? Yes ☐ No ☐

If yes, would you please indicate the frequency and the nature of the observation?

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18. How do you feel about the idea of observing a colleague while he/she is teaching?

- ☐ Very uncomfortable
- ☐ Uncomfortable
- ☐ Comfortable
- ☐ Very comfortable

Please explain:

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19. Do you think you could benefit from observing a colleague teaching?

- ☐ Not at all
- ☐ Very little
- ☐ Little
- ☐ Much
- ☐ Very much

Please explain:

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20. How do you feel with the idea of being observed by a colleague?

- ☐ Very uncomfortable
- ☐ Uncomfortable
- ☐ Comfortable
- ☐ Very comfortable

Please explain:

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21. Do you think you can benefit from being observed by a colleague?

- ☐ Not at all
- ☐ Very little
- ☐ Little
- ☐ Much
- ☐ Very much

Please explain:

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22. What is the reason why you are participating in this research?

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23. What do you expect to benefit by participating in this research?

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Thank you for your cooperation

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Appendix D-1:

Summary of Participant Background Information- School 'A'

S. No.	Items	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6
1	Name of school	School 'A'	School 'A'	School 'A'	School 'A'	School 'A'	School 'A'
2	Name	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6
3	Age	60+	60+	20-29	40-49	20-29	50-59
4	Gender	Male	Male	Male	Female	Female	Male
5	Grades taught	8, 9 & 10	8	6 & 7	8, 9 & 10		7
6	Grade currently teaching	8	8	7	8	7	7 & 8
7	What other subjects do you teach	No	No	Mathematics	No	English	No
8	Qualification	Diploma	12+1	Diploma	Diploma	Diploma	12+TTI
9	Number of years being a teacher	40	39	5	26	4	34
10	Number of years completed in current school	15	3	5	6	4	16
11	Teaching load per week	18	18	18	24	21	18
12	Responsibility other than teaching	Department Head	Head of health club	Participate in farming	No	No	No
13	Have you ever participated in teacher development workshop? If yes what was the nature of the workshop?	Yes. I have participated in several workshops. The workshops were on – 1) teaching methods, discussing and sharing idea on how to transmit a particular topic to students.	Yes. The workshop was about student-centred and interactive approach.	Yes. The nature of the workshop was based on new curriculum and sharing of experience among teachers of our sub-region.	Yes. The workshop was about lesson planning and student-centred and interactive pedagogy.	Yes. Mostly learning and sharing teaching experience i.e. method of teaching. Motivating your students and upgrading your teaching.	Yes. In 1997 methodology. In 2012 methodology (new assessment) and in 2013 new assessment.

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S. No.	Items	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6
14	What do you think about collaboration with colleagues? Explain?	Very much important. Collaborating with colleagues is important because it allows an experienced teacher to support beginner teachers. Since two head are better than one it provides with opportunities for teachers to share experience and chose the best method.	Very much important. It is sharing of experience and knowledge, peace and love. Teachers learn more about effective practices that result in improved learning outcomes for students.	Very much important. Because it may help the teacher in the teaching process. The teachers can share different experience. It can also help the teacher in solving some difficult points in the teaching-learning process.	Very much important. Because teachers share experience among themselves. Especially beginner teachers gain experience from the experienced teachers.	Important. Collaboration with colleagues helps and guides you in your learning and teaching experience. One of which would be your method of planning, methods of implementing procedures in your lesson plan and methods of teaching which would put you at ease.	Very much important. I got different ideas, concepts and teaching techniques from my colleagues.
15	Have you ever participated in collaboration with colleagues? If yes describe the nature of the collaboration	Yes. The collaboration with colleagues was important. Each teacher was providing his/her ideas. After discussion on the forwarded ideas we were coming to a common conclusion.	Yes. It was about how to teach and it was really interesting. It was workshop among science teachers. It was a good collaboration with fellow teachers to plan, observe and reflect on lessons.	Yes. The collaboration focused on three issues: 1) lesson planning 2) evaluation of teaching material (textbooks) and 3) sharing of experiences among new and experienced teachers.	Yes. It was about preparing lesson plan, student-centred interactive pedagogy and conducting experiments in sciences.	Yes. The nature of collaboration was in our 1) our year lesson plan, monthly and weekly, 2) preparation of class work, test, exams and projects.	Yes. In the research lesson observation exchange of different ideas, teaching techniques, to give different tasks, to identify the fast and slow learners, how to prepare lesson plan etc.

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S. No.	Items	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6
16	Has the collaboration helped you to improve your instruction? If yes motivate your answer?	Yes. Since collaboration improves the teaching-learning process, it has become a tradition in our school. This year we are planning for the second session where teachers collaborate.	Yes. Sharing knowledge and experiences and methods of teaching.	Yes. It always helped me to get ideas. As a result of this workshop I was able to prepare my lesson plan well.	Yes. Because it provides opportunities for the experienced teachers to develop their experiences further. Moreover, the beginning teachers benefit from the experienced teachers and put into practice the experience that they gain from the experienced teachers.	Yes. Sharing from my experience, it has helped me a lot. Through this I gained so many experience and techniques which I couldn't have only through the lessons I was given in college years.	Yes. How to manage time, prepare lessons, evaluate the lesson, students, exchange of experience etc.
17	Have you ever observed a colleague teaching? If yes indicate the frequency and nature of the observation.	Yes. When I was in Head of Department in Secondary School I have observed two or three times together with the School Director. We were providing suggestions for improving the weaknesses rather than commenting on the strengths.	No	No	No	Yes. During my first year I must say I struggled a bit, so I used to visit other colleagues (my teachers) in their classroom. I remember the first semester where I frequently went and observed the lecture, model and demonstration given by the teacher.	Yes. 5 times. 2 times in grade seven and 3 times in grade eight. Good.

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S. No.	Items	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6
18	How do you feel about the idea of observing a colleague teaching? Explain	Very comfortable. I support the idea of observing a colleague. When one observes a colleague he/she benefits. He gets opportunities to observe the strengths which can he/she could adopt it to his/her teaching. Secondly he/she gives suggestions on the weaknesses for improvement.				Comfortable. Well for me, I feel comfortable observing the teaching technique of teaching, but it may put my colleague in uncomfortable position, so only then would I feel uncomfortable. So it depends on my colleague (if he/she) is comfortable it would put me a tease.	Very comfortable. To get new ideas, concepts, sharing of experience, to know deeply about the lesson, and the learners' behaviour and nature of the lesson etc.
19	Do you think you could benefit from observing a colleague teaching?	Very much. The essence of teaching is to be able to transmit knowledge to students. Having knowledge alone does not make a teacher effective unless he/she has the skill of transmitting that knowledge to the students. When one observes teachers with good transmission ability he/she also learns a lot.	Very much. The observers will learn more from the teacher and the teacher will learn more from the comments they give him. The observers as well as the teacher will have a good opportunity to share best teaching practice.	Very much. As he is my colleague I can benefit from him very much. It helped me to improve my teaching ability. It also helped me to prepare different teaching aids.	Very much. Because when one observes a colleague, he/she would gain new experience that he/she had never used before. Secondly by identifying the weaknesses of the teacher being observed one could be able to give constructive feedback for improvement.	Very much. One way of advancing oneself is not only through reading books, but through observation. Our action speaks louder. So whatever you are missing you can place it. What you may lack can be gained.	Very much. To exchange of experience, ideas, teaching techniques. To observe different lesson preparation, representation.

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S. No.	Items	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6
20	How do you feel about the idea of being observed by a colleague? Explain	Very comfortable. I feel happy when my colleague observes my lesson because he/she is teacher like me and does not make pressure on me. I can also express my feeling freely with him/her until we reach to a common understanding.	Very comfortable. By the end of the lesson the observer will give me comments which will help me to improve my way of teaching.	Comfortable. I feel happy when my colleague observes my lesson because it reinforces me to make extra preparation in order to teach the lesson confidently.	Very comfortable. Because the teacher observing my lesson could identify my strengths and weakness and finally provide me constructive feedback.	Comfortable. Mostly comfortable especially if I am in a good mood (student participation is always my engine).	Very comfortable. To develop collaboration among their colleagues. I feel positively and fruitful ideas.
21	Do you think you can benefit from being observed by a colleague? Explain	Much. Yes I can benefit from being observed. The observing teacher would provide me constructive feedback that would enhance my teaching.	Very much. The colleague will share me his idea i.e. he will tell me the weak and good points of my teaching and this will help me to teach better for the next time.	Very much. Because it helps to: come to common terms, share ideas with colleagues and improve teaching skills	Very much. It is very much helpful if the teacher observing my lesson could be able to provide me positive and constructive feedback.	Very much. Once in a while we (teachers) are visited by our colleagues (director, head department, members) every time in an observation I find it rewarding because I am reminded what I have and what I lack. So it helps me to stronger and more qualified teacher.	Very much. Because I got different ideas, concepts, techniques sharing of teaching experience, time manageable, class management, how to prepare the lesson, motivate the learners etc.
22	What is the reason why you are participating in this research?	I am participating in this workshop because: 1) I am invited to do so. 2) The experience that I gain during the workshop will help me to improve my teaching.		The reason why I am participating in this workshop is to improve the teaching-learning process	I am participating in this workshop in order to share my experience with others and gain best practices from others.	To share and gain mostly experience, but hopefully those would more to that.	To develop the concept of the lesson (the subject matter) and to gain different methods of teaching and to develop the collaborating skills.

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S. No.	Items	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6
23	What do you expect to benefit by participating in this research?	From this research I will be able to know how a researcher begins and ends a research. Secondly I trust that this research would come up with benefits to the school system.		From this research I expect better teaching-learning activities, improve classroom management. Encouraged to be observed by my colleague.	To use best ideas and practices in my teaching and learning process.	Experience, knowledge (surely there are so many things I still need to learn and search) so overall gain. Something I don't know and upgrade it later.	To know and identify new methods of teaching or to analyse the new learner centred approach. To identify the types of learners.

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Appendix D-2:

Summary of Participant Background Information- School 'B'

S. No.	Items	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6
1	Name of school	School 'B'	School 'B'	School 'B'	School 'B'	School 'B'	School 'B'
2	Name	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6
3	Age	30-39	30-39	60+	20-29	50-59	20-29
4	Gender	Male	Male	Male	Female	Male	Male
5	Grades taught	8	6	8	8	8, 9, 10, 11, and 12	
6	Grade currently teaching	8	6	8	8	8	6
7	What other subjects do you teach	Life skills	--	--	Nothing	Physics	Social studies and English
8	Qualification	Diploma	Diploma	Diploma	Diploma	Diploma	Diploma
9	Number of years being a teacher	Seven	14	43	2	36	4
10	Number of years completed in current school	4	1	3	2	1	4
11	Teaching load per week	18	18	18	18	18	24
12	Responsibility other than teaching	No	No	No	Focal person	Health focal person of the school	No

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S. No.	Items	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6
13	Have you ever participated in teacher development workshop? If yes what was the nature of the workshop?	No	No	Yes. Once I participated in a workshop focused on helping teacher on how to prepare good questions which is conducted by an English expert for a period of two months. I have also participated in a workshop that introduced teachers the new methods of assessment i.e. continuous assessment. Thirdly I participated in a workshop designed to acquaint teachers to the middle school curriculum.	No	Yes. It was about presentation of lessons based on KU, GIs', PS and attitude. Teaching-learning process, pedagogy and life skill. So many times in my teaching experience.	Yes. How to assess the students with the new type of assessment. How to apply student-centred method.
14	What do you think about collaboration with colleagues? Explain?	Very much important. Because it can help me to share an experience and knowledge	Important. Because I can share knowledge and experience. I get feedback as teaching method. I can know the positive and negative side of mine.	Very much important. As it is commonly said that two heads are better than one, collaborating with colleagues is very important. Teaching becomes effective when one shares experience with others and gains new experience from colleagues.	Very much important. Because something you do not know or experienced before you may get it form you colleagues. So that it is very important to work collaboratively with your colleagues.	Very much important. One may get experience, show ideas, and get methods of giving the lesson in improved way so it is very important.	Very much important. It helps to share ideas among the teachers.
15	Have you ever participated in collaboration with colleagues? If yes describe the nature of the collaboration	No.	No.	Yes. Since I acknowledge the benefits gained by working with colleagues I worked jointly with colleagues in designing lesson, writing notes (summary), and preparing tests.	Yes. For example giving the student exam even the continuous assessment which means providing questions to them. It is a kind of mutualism.	Yes. In lesson study program, in particular with other school teachers.	No.

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S. No.	Items	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6
16	Has the collaboration helped you to improve your instruction? If yes motivate your answer?			Yes. As I mentioned earlier working together helps us to support one another and sharpen our ideas. Similarly it helps us to solve problems easily.	Yes. You may get more wrongs if you work lonely, but working collaboratively is very essential.	The collaboration helped me a lot in improving my teaching-learning process, to follow up learners' activities, methods of evaluation.	Yes. Yes because in the previous time we are working individual work that comes from one head but now it comes with collaboration (two heads are better than one).
17	Have you ever observed a colleague teaching? If yes indicate the frequency and nature of the observation.	No.	No.	Yes. Long ago I participated in observing a colleague teaching. It is very important because it helps us to share experiences and approaches of teaching.	No.	Yes. In my past experience of teaching physics we used to make observations every semester. I also started to observe my colleague teacher frequently after I take workshop of lesson study by Mr. Ali. I thank him.	Yes. When I was in teaching practice I observed that two teachers can teach in one class. This is for the first time. I had never seen after this.

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S. No.	Items	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6
18	How do you feel about the idea of observing a colleague teaching? Explain			Very comfortable. It is helpful to observe a colleague teaching and then give him/her constructive feedback. If the colleague accepts the feedback it is an indication that he/she is learning.		Very comfortable. I feel nothing even I appreciate it in pin pointing the weak points, student participation, teachers and students responses.	Very comfortable. Because you can learn a lot of things that you didn't know before.
19	Do you think you could benefit from observing a colleague teaching?	Very much. To share experience.	Much. Because I can have confidence, I can gain knowledge and experience about teaching methods and I can improve my teaching method.	Very much. As I have explained earlier it is important. It provides with opportunity to share experience on methods of teaching and lesson planning.	Much. Because I can correct him/her if he/she has mistaken in the teaching and learning process.	Very much. I will see my weakness from the observation and get confidence in presenting the lesson in a simple and participating way.	Very much. Yes because I think that two heads are better than one.
20	How do you feel about the idea of being observed by a colleague? Explain		Comfortable. Because, I can create confidence in my language, knowledge and teaching methods.	Very comfortable. I personally accept the idea of being observed by a colleague. I ask my colleagues to observe my class and give me feedbacks that are not noticed by me.	Comfortable. Because I must understand that if is for my benefit. In order to be a good teacher. Otherwise there is nothing uncomfortable.	Very comfortable. I feel comfortable and am eager to see their follow up and suggestion it is given in debriefing.	Comfortable. If you understand positively, it helps us to know our weakness and improve our teaching-learning methods.

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S. No.	Items	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6
21	Do you think you can benefit from being observed by a colleague? Explain		Much. Because I can share teaching methods and experiences.	Very much. It has immense importance. It provides opportunity to share experience.	Much. Because he/she observe the way you teach that you don't understand in the method you are doing. I can say that your colleague is your mirror.	Very much. I will get suggestions from the observers and be improved in re-teaching the lesson if the first lesson was not beneficent.	Very much. It is profitable because we can learn our weakness and improve it.
22	What is the reason why you are participating in this research?	In order to get some knowledge about lesson study	I am simply selected.	I understand that participating in workshops, researches or meetings always benefits the participants. Therefore, I am confident that participating in this research will benefit me. There is nothing that I will lose by participating in this research.	In order to discuss about the advantages and disadvantages of working together with our colleagues. And also preparing lesson plan and notes effectively.	To improve the methods of teaching and learning activities and produce best citizens equivalent with other countries' students.	In order to increase knowledge in lesson study and to know how to apply lesson study.
23	What do you expect to benefit by participating in this research?	I expect to benefit from this research very vast knowledge about lesson study.	To get /gain knowledge for my work. To share teaching methods and experiences. To exchange our experience in our work.	I anticipate getting a lot of benefits by participating in this research.	I expect having more information about working together collaboratively.	Yes I do a lot such as certification and recommendation.	I expect that to increase my ability and skill. How to apply the lesson study.

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Appendix D-3:

Summary of Participant Background Information -School 'C'

S. No.	Items	SCT1	SCT2	SCT3
1	Name of school	School 'C'	School 'C'	School 'C'
2	Name	SCT1	SCT2	SCT3
3	Age	50-59	40-49	30-39
4	Gender	Male	Female	Male
5	Grades taught	6,7,8, & 9	4,5,6,7, & 8	1 – 8
6	Grade currently teaching	8	7	6
7	What other subjects do you teach	Mathematics	Mathematics	
8	Qualification	Diploma	Diploma	12+TTI
9	Number of years being a teacher	35	24	11
10	Number of years completed in current school	3	2	1
11	Teaching load per week	24	24	28
12	Responsibility other than teaching	Academic affairs, unit leader, committee member in different in the school	No.	No.
13	Have you ever participated in teacher development workshop? If yes what was the nature of the workshop?	Yes. The workshops were about: assessment, classroom management and how to prepare lesson plan.	Yes. The workshop was about : student-centred way of teaching, sharing experience in methods of teaching, laboratory use, lesson planning, corporal punishment, and psychological treatment for students with special needs	Yes. The workshop was based on teaching methods (methodology), preparation of lesson plan, understanding of student psychology, in general student-centred way of teaching.
14	What do you think about collaboration with colleagues? Explain?	Very much important. You gain method of teaching, you share some very important learning and teaching concept, like classroom management ways of teaching as well as system of	Important. It is important because: sharing of experience, knowledge and management, keeping the strengths and improving the weaknesses and building confidence	Important. It helps to have a general understanding of students, to exchange new ideas concerning ways of teaching and handling students. In short ground breaking through ideas and way can be attained.

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S. No.	Items	SCT1	SCT2	SCT3
15	Have you ever participated in collaboration with colleagues? If yes describe the nature of the collaboration	No.	Yes. It focuses mainly on: discussion on how to solve problems of the students and student-centred and interactive pedagogy i.e. on how students solve problems and engage in learning.	Yes. I have given training about teaching methodology which is useful or applicable in maths, English and even science at different clusters.
16	Has the collaboration helped you to improve your instruction? If yes motivate your answer?	No.	Yes. It enabled me to: solving students' problems, on easy way of transmitting knowledge to students, develop self-confidence and on how to engage students in learning.	Yes. I had an exchange of ideas with different teachers and the feedback I received was constructive, beyond my expectation.
17	Have you ever observed a colleague teaching? If yes indicate the frequency and nature of the observation.	Yes. Once. It was good. As one enters to observe the other the one that is going to observe will make a good preparation in work.	No. Even though it is important to observe a colleague teaching, for unknown reasons such type of practice is not common. Therefore, I did not get opportunity to observe a colleague teaching.	Yes. I have observed more than ten times Hirete Una elementary school from 2001 up to 2003.
18	How do you feel about the idea of observing a colleague teaching? Explain	Comfortable. You gained and shared teaching experience		Comfortable. To see or adapt different ways of teaching. To be able to improve the shortcomings of the teaching methods that is in use by a colleague.
19	Do you think you could benefit from observing a colleague teaching?	Much. You can evaluate yourself how I am, You can improve also your weak side from your colleague teaching	Much. Even if I did not observe a colleague teaching I acknowledge its importance in the following: classroom management, teaching methods and teaching approaches.	Much. As mentioned above it is beneficial for the colleague being observed and the one who is observing, because one can learn new methods of teaching and correct him if there are shortcomings.
20	How do you feel about the idea of being observed by a colleague? Explain	Comfortable. In order to evaluate how I am and to correct my mistake with the suggestion of my colleague	Very comfortable. One can easily identify his/her strengths and weaknesses and correct the weaknesses on time. Therefore, I am comfortable to be observed by a colleague.	Very comfortable. To improve my weakness and shortcomings and again the colleague can also adopt my better way of teaching. Both ways benefit the students.
21	Do you think you can benefit from being observed by a colleague? Explain	Much. Yes. I can benefit what I have not understood in the learning and teaching process of some points.	Much. It helps to identify strengths and weaknesses and correct the weaknesses on time and keep the strengths.	Very much. As mentioned above it benefits the colleague, me and the students.

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S. No.	Items	SCT1	SCT2	SCT3
22	What is the reason why you are participating in this research?	In order to improve my learning and teaching method. To gain the advantage of colleague teaching (collaboration).	To gain new knowledge and experience, to renew my knowledge and to bring about changes in the teaching-learning process.	To get new ideas, to have new standards, to have better understanding and knowledge about teaching.
23	What do you expect to benefit by participating in this research?	A lot of information and what the advantages and disadvantages of colleague teaching are.	I anticipate that participating in this will help me to improve my job as a teacher.	To achieve better professionally, improve my career and to have better knowledge in general.

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Appendix E:
Lesson Study Workshop Evaluation Questionnaire

Dear teacher,

You have participated in a workshop that is intended to introduce lesson study to the Eritrean middle school science teachers. By means of this questionnaire I would like to gain insight into your opinion to various aspects of the workshop. The information you provide will be used to generate suggestions for improving lesson study trainings in the future.

I assure you that all information that you provide will be handled confidentially.

Male/Female: _____

Name of school: _____

General instruction: Respond to each of the following statements or phrases by putting a thick mark on the space provided and supplement you response with comments.

1. What is your overall impression of the workshop?

	Statements	Yes	No	Comments
a.	The Lesson Study workshop was according to my expectations			
b.	The Lesson Study workshop was instructive			
c.	The Lesson Study workshop was helpful			
d.	The Lesson Study workshop was enjoyable			
e.	The Lesson Study workshop was relevant			
f.	The Lesson Study workshop covered the topics in sufficient detail			
g.	The Lesson Study workshop provided me with new information			
h.	The Lesson Study workshop was valuable			
i.	The place was suitable for the training			
j.	Time was effectively used			
k.	The Lesson Study workshop was effectively delivered and well organized			

Over all comment:

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……
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2. What is your opinion on the following aspects of the workshop?

	Statements	Yes	No	Comments
a.	I understood the goals and processes of lesson study prior to starting of lesson study cycle			
b.	The materials provided were helpful to develop my understanding of lesson study			
c.	The Lesson Study workshop has provided me sufficient information and suggestions on how to implement lesson study in my school			
d.	The Lesson Study workshop has provided me with clear image of how to implement lesson study in my school			
e.	The Lesson Study workshop has enhanced my confidence in implementing lesson study in my school			
f.	I found the pedagogical quality of the resource person helpful to develop my understanding of lesson study			
g.	I found the methods used during the workshop helpful			
h.	The Lesson Study workshop was conducted at convenient time for me			
i.	The Lesson Study workshop provided me enough time to develop my understanding of lesson study			
j.	I found the working atmosphere of the workshop to be suitable for me to understand the process of lesson study			
k.	I found the technical organization of the workshop to be appropriate			

3. What were the most effective sessions of this workshop?

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4. What were the least effective sessions of this workshop?

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5. Do you support the ideas of Lesson Study? Yes☐ No ☐

Explain:

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6. Are you confident to implement lesson study in your department/school? Yes☐ No ☐

Explain:

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7. Would you recommend similar lesson study workshop to your colleagues? Explain

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8. What changes would you recommend, if any, to improve this workshop?

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9. Any comment that you would like to add:

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Thank you for your cooperation

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Appendix E-1:

Summary of lesson study workshop evaluation questionnaire -School 'A'

No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
1a.	The Lesson Study workshop was according to my expectations	Yes, because it is informative to both teachers as well as students.	No. It was beyond my expectation because I had no idea about lesson study. But when I participate in this workshop, I find it interesting.	Yes. It was according to my expectations because it was concerned about preparing lesson.	Yes. Since I read the guiding materials that were provided to us and I found it the same when it was presented in the workshop practically.	Yes. I was able to gain about lesson study which I previously didn't acknowledge (have knowledge).	Yes. Because I have seen lesson study was helping the teachers who participated in this workshop before me.	Yes. The organization of the workshop was well beyond my expectation. It was well organized workshop.	Yes. It was very good.
1 b.	The Lesson Study workshop was instructive	Yes it was instructive, because teachers from three schools and the three grades i.e. grade 6, 7 & 8 participated in it.	Yes. As is said two heads are better than one. This workshop has given me good understanding to work collaboratively.	Yes. Truly. Because it helped us how to teach, plan a lesson, identify student problems, and how to identify difficult topics.	Yes. It helped us to identify the weakness and strengths.	Yes. This workshop should be given to all schools in Eritrea as it enhances every teacher's knowledge.	Yes. Because it enables us to collaborate with colleagues and prepare it in collaboration with colleagues. It also enables us to compare our curricula with the curricula of other countries.	Yes. Because we gained a lot of knowledge from the discussion sessions.	Yes. It was instructiv e.
1c.	The Lesson Study workshop was helpful	Yes it was helpful. We were able to know and examine many things about our practice in collaboration with different teachers.	Yes. Helpful in all respects.		Yes. Because it taught us this new way of teaching.	Yes. In every aspect of the teacher. It was able to teach and remind us what we also already know.	Yes. Because it allows all the weak, average and bright students to participate.	Yes. It was helpful because we came to know new knowledge that we did not know before.	Yes. It was very much helpful.
1d.	The Lesson Study	Yes it was enjoyable. Since we	Yes. It was really enjoyable	Yes. It was enjoyable	Yes. Because it taught us this	Yes. It was truly enjoyable and	Yes. The workshop provided was not	Yes. The organization of the	Yes. It was

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
	workshop was enjoyable	were few in number the situation was quiet and peaceful as a result we were able to discuss and share ideas with the teachers.		because there was enough time to break, enough water and good lunch.	new way of teaching.	relaxing.	boring.	workshop and the people who organized the workshop was very enjoyable.	enjoyable .
1e.	The Lesson Study workshop was relevant	Yes it was relevant because we have learned two things namely how. To teach easy lessons and what means to use while teaching difficult content.	Yes. Relevant in all respects.	Yes.	Yes. Because it taught us this new way of teaching.	Yes. Very much. Teachers would be able to take this awareness to their everyday work.	Yes. It helps us to complement our teaching methods with new methods and it also enables us to identify our gaps or weaknesses.	Yes. It was relevant because it was related to our daily work.	Yes. It was relevant.
1f.	The Lesson Study workshop covered the topics in sufficient detail	No. I wouldn't say the workshop had covered the topics in sufficient detail. It would have been better and enjoyable had it been for longer period of time. However, it has provided us some guidance.	Yes.	No. There was a rush in order to cover all the topics within the two days of workshop. I would consider this as a deficiency.	Yes	I am not sure. May be if more time was given it would have been more productive.	Yes. Because we have discussed on the topics that we are going to stress from the three grades.	Yes. The topics were presented briefly. It would have been better had it been presented in more detail.	Yes. But the time was a little bit short.
1g.	The Lesson Study workshop provided me with new information	No. I didn't get new information, but I got some additional ideas that support my earlier ideas.	Yes. This was a workshop which I didn't participate before.	Yes. Because instead of saying my students or your students, we have learned to	Yes. Especially it will enable us in the future to make detailed preparation.	Yes. Yes personally I have gained a lot from this lesson study because my understanding was limited.	Yes. Since we prepare it in collaboration with all colleagues, it enables to get constructive ideas	Yes. We came to know new knowledge that we did not know it before.	Yes

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
				say our students.			from colleagues. It also enables to evaluate our situation and the situation of students.		
1h.	The Lesson Study workshop was valuable	Yes it was valuable. It taught us that one head is subordinate to two heads. I have learned that one could identify a topic and then reflect on it after teaching.	Yes. It was valuable in all cases.	Yes.	Yes	Yes	Yes. Because it complements our teaching methods and it enhances our teaching and it provides renewed motivation.	Yes. Because it supports the daily teaching-learning process.	Yes. It was very much valuable.
1i.	The place was suitable for the training	Yes the place was suitable because there were nothing to be seen through the windows and it was quite place and there was no sound that distracts us.	Yes.	Yes. It was suitable because I has enough tables, chairs and even light was good.	Yes	Yes. Time was used as it has been informed, which make it more professional.	Yes. It was quite place and the distance of the venue was suitable.	Yes. The place was suitable when compared to the number of participants.	Yes. The place was good.
1j.	Time was effectively used	Yes. Time was effectively used.	Yes	Yes. I really appreciate you Mr. Ali in your time management. But the speaker (sound system) should be prepared before the workshop.	Yes	Yes.	Yes. According to my understanding the workshop was completed effectively within specified time.	Yes. The workshop was executed based on the timetable given to us. Therefore, it was well organized. Especially the program on 23 Feb, 2013 was clearly organized and the	Yes. It was well organize d.

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
								sessions were clear.	
1k.	The Lesson Study workshop was effectively delivered and well organized	Yes it was effectively delivered and it was well organized.	Yes. Good.		Yes	Yes	Yes. Because it was short and precise.	Yes. It was well organized and the sessions were clear.	Yes
	Over all comment	I would suggest similar workshop for other teachers.		Mr. Ali if the Ministry (MoE) is ready to help you morally or financially, I would like to tell you to conduct suck kind of workshop for large number of teachers.	This workshop was informative and motivating. Therefore, I suggest more of such workshops in the future.	As a teacher I would like to comment that this type of workshop would be most important for MoE to introduce has it remind those teachers what teaching means and teach teachers what they don't know in the learning and teaching process. Personally this has motivated me to apply the things. I have learned in this workshop of my school with my student if not all at least what i can do with the space and	The organization and delivery of the workshop was invaluable and informative. I would say it is very good initiative. But it is difficult to implement it with the available situation in our country where we have about 56 students in a class. Moreover, the lack of interest and motivation of the students will make it difficult to implement it.	This type of workshop is important for the smooth conduction of the research as it informs the teachers to act responsibly and it informs what is expected of them.	My comment , this workshop is very important and useful to me and for all teachers who are in middle school level. So it is possible, it is better to conduct for other teachers.

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
						material provided.			
2a.	I understood the goals and processes of lesson study prior to starting of lesson study cycle	No.	No. This is new to me.	No. I had some prior understanding but not like what has been explained in lesson study.	No. I have never attended such type of workshop on lesson study.	No. My expectation was to gain experience from other teachers (in Asmara) in teaching but we all have learned to new ideas too.	Yes. My understanding is partial but I would say it is attractive for me because it enables me to collaborate and share ideas with colleagues in order to implement it.	No. Because it is organized and delivered for the first time.	Yes. Now it is more clear to me and I understa nd and very important .
2b.	The materials provided were helpful to develop my understanding of lesson study	Yes. If I read the materials provided thoroughly and use it in practice, it would help me a lot in my teaching and learning processes.	Yes	Yes. The materials (hand-out), video show were helpful for me.	Yes. All what we have learned through the workshop and reading the materials was very much helpful.	Yes. Power points, flip charts and all other stationery and printed paper were able to help me understand with much ease.	Yes. This workshop was helpful in implementing lessons suitable for weak, average and bright students.	Yes. It is difficult for me to say that it increased my understanding but it served as a reference for me.	Yes. It was well prepared beforeha nd.
2c.	The Lesson Study workshop has provided me sufficient information and suggestions on how to implement lesson study	Yes it has provided me with sufficient information.	Yes	Even though the participant teachers were few in number, this workshop provided us with sufficient information.	Yes. But I am say so if there is time and suitable environment for implementation.	Yes. Reminding me on how to implement my lesson study as well as teaching me on how I could improve was sufficient enough.	Yes. This workshop enables us to prepare lessons in collaboration and then teach it in collaboration. Finally evaluate it in collaboration. It provides sufficient knowledge about how to identify our	Yes. It is not sufficient but it is enough for starting the work.	Yes. This workshop I am satisfied enough and well organize d.

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
	in my school						weaknesses and weaknesses of our students.		
2d.	The Lesson Study workshop has provided me with clear image of how to implement lesson study in my school	Yes the workshop provided me with clear image about how to implement lesson study. It is good that the administration and my colleagues are invited into it.	Yes	Yes	Yes.	Yes. Provision of printed papers and explanation were much clearer than any workshop that I have taken.	Yes. But as I have explained it earlier, the large number of students in a class and the weakness of parents in following their children are hindrances for its implementation.	Yes. I have got clear picture about lesson study. For its implementation it is good to consult experts in the field.	Yes. I have understood the goals and achievement about teaching-learning process with its result.
2e.	The Lesson Study workshop has enhanced my confidence in implementing lesson study in my school	Yes, I hope to confidently implement it.	Yes	Yes. I am confident to implement. But the administration should help us.	Yes	Yes. Provided format for teachers as a guide.	Yes. It is good approach. But the large number of students in a class and the lack of motivation and interest of the students might be hindrance for its implementation.	Yes. We were doing similar things in small scale, but now it is in a more organized form.	Yes. It enhanced me on my daily duty. Yes I do
2f.	I found the pedagogical quality of the resource person helpful to develop my	Yes. Since the workshop was presented using the language that we master, it enhanced my understanding.	Yes. Good facilitators.	Yes. Sure especially you Mr. Ali and your colleague Amare is very smart.	Yes	Yes	Yes. The sessions were precise and clear. They were not boring. The materials were comprehendible.	Yes. I could see the quality of resource persons from the explanations and the written materials given to us.	Yes. I enjoyed it.

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
	understanding of lesson study						One can easily understand by reading them.		
2g.	I found the methods used during the workshop helpful	Yes. I found the methods helpful. It taught us how to face and solve problems.	Yes. It was well arranged and facilitated.	Yes. First we were allowed to freely discuss using the language that we master and secondly we were allowed to work through group discussion.	Yes	Yes. As a comment more teachers and other staff should participate as more ideas would have been available.	Yes. Because the organization and the time were convenient, the materials were precise and clear, and it helps us to identify our weaknesses and strengths.	Yes I found the methods used during the workshop useful.	Yes. It is helpful.
2h.	The Lesson Study workshop was conducted at convenient time for me	Yes, because it took place outside the school schedule. We did not use student time.	No	Yes. For me it was conducted at convenient time.	Yes. Had this workshop was given during the beginning of the academic year, and then we would have been able to work on it.	Yes. It is the beginning of a term and I am hopping I will use this lesson study as opportunity to implement at my school.	Yes. The workshop took place in convenient time prior to commencement of classes. There was nothing that worried us during that time and we were relaxed to attend the workshop.	Yes. It clashed with Saturday classes of many teachers. Therefore, I would suggest it to be conducted in another time.	Yes. It was convenie nt.
2i.	The Lesson Study workshop provided me enough time to develop my understanding	No. I wished the workshop had been conducted for longer period of time because we would be able to discuss each topic	No	Yes. Yes it provided me enough time but I expect more than this (if it is possible).	Yes. Two days are not sufficient. It should have been for at least five days in order to enable	No. Time was short.	Yes. In order to have detailed knowledge and in order to increase its effectiveness I would suggest the same workshop to	Yes	Yes. Yes I have got enough knowledg e.

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
	of lesson study	in more detail.			us develop professionally.		be repeatedly provided to us two or three times.		
2j.	I found the working atmosphere of the workshop to be suitable for me to understand the process of lesson study	Yes	Yes. Really good atmosphere.	Yes. Yes the delivery, the atmosphere and light was all attractive.	Yes	Yes. The atmosphere of our workshop was great as it was comfortable to share ideas and learn.	Yes. It would have been good had it been given for more time.	Yes	Yes
2k.	I found the technical organization of the workshop to be appropriate	Yes	Yes	Yes.	Yes	Yes	Yes. The organization of the workshop was effective because it was organized by two resource persons in the field.	Yes	Yes
3	What were the most effective sessions of this workshop?	I learned how to teach an easy topic and a difficult topic to students. How to face the challenges.	All were good.	Time management, preparation of materials, your politeness Mr. Ali and your colleague Amare.	The materials given on lesson study and lesson planning were very helpful. The video session also enabled us to see lesson study practically. The organization of the workshop was satisfactory.	Why and when lesson study originated? To which type of learning-teaching strategies does Eritrea relate? (Japan or USA)? How do USA teachers implement their lesson study (video show).	There is difference between the lesson study in our country and the lesson study in other countries. There is difference the way we prepare lesson plan and the way teachers in other countries prepare and also there is difference in implementation of	The written materials given to us, the presentations provided to us were effective. Moreover, the organization of the workshop, group work sessions and lesson planning sessions were effective.	The organizat ion and appropria te preparati on of the workshop and the efforts made to transmit knowledg e were

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
							the lessons i.e. student-centred and teacher centred.		some of the main points that have to be mentioned.
4	What were the least effective sessions of this workshop?	I would say that there were no sessions which was ineffective.	I didn't see least effective sessions.				In our country and some other countries the teacher centred approach is common.	Due to the lack of electricity, the first explanation was not effective.	In my opinion it is a short of time.
5	Do you support the ideas of Lesson Study?	Yes. Because the process supports student-centred and interactive pedagogy. Secondly it enhances collaboration and sharing among teachers.	Yes. I support it because it is helpful.	Yes. Because it is very important for developing our curriculum. It was helpful for the teachers to be confident in front of his students. It was helpful for the students to be more familiar with the lesson.	Yes, because it is very helpful.	Yes. Lesson study is a guide for the teacher and make her/him confident in the process of teaching and learning. Helps for all the teachers to collaborate and make effort to improve.	Yes. Because 1) it minimizes burden on the teacher, 2) it allows many active participation of many students and makes them inquisitive and 3) it helps to evaluate the curricula of our country and the curricula elsewhere.	Yes. Because it involves the ideas from many heads. It helps us to work collaboratively and learn from one another.	Yes. Because it was well organized and well executed.
6	Are you confident to implement lesson study in your department/school?	Yes. I want what I have learned to be implemented in my school because student would be able to become active participants	Yes.	Yes. I am confident that I will be able to implement what I have learned, but I am not sure of what	Yes I am confident to implement it because I have learned it.	Yes. As it has already mentioned earlier, our school use this process. And am confident enough we will continue to	Yes. But teacher satisfactions, interest of student to learn and number of students in a class are major factors for its	Yes. I am confident to implement it in our school because we will work as facilitators of the programme.	Yes. I want it to be appropriately implemented in

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
		of the teaching and learning process and secondly the teachers would develop self-confidence in their teaching.		would happen in reality.		implement it even more. But some of the other things that cannot be implemented because of problems of number of students (class size) and financial status sill will be ahead.	successful implementation.		my school.
7	Would you recommend similar lesson study workshop to your colleagues? Explain	Yes, because it is helpful.	Yes. This workshop was helpful to students by teacher in collaboration so this it will be good if all teachers know lesson study.	Yes. Because this kind or workshop is very interesting and very important for all Eritrea teachers who are using the traditional way.	Yes. Because it indicates ones weaknesses I suggest this to be given to all other teachers.	Yes. I could recommend similar lesson study to all my colleagues. Because as teachers we all have different skills and knowledge so this workshop would help us to collaborate and come to similar understanding.	Yes. Because it helps teachers to assess the status of their students and it initiates active participation of students, initiates competition of students among themselves and motivates students to study more. Therefore it reduces burden on the teacher.	Yes. If there is a plan of implementing the same in all schools, I would say that similar workshop should be given to all.	Yes. I would recommend similar lesson study to be introduced in my school.
8	What changes would you recommend, if any, to improve this workshop?	I would suggest that this should continue.	Enough time and for all teachers.	Enough time should be allocated. If it is possible more number of teachers should be invited.	The school administration has to work on this so that all teachers could participate in such	Mostly financial problem. In order to include a large number of teachers both time and financial problem would be the	According to my understanding this workshop would have produced better results had it been conducted for more days.	You must work towards its continuity. Making all who participated in this workshop to implement in their work what they	I recommend it to be introduced in my school as

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No.	Statements	SAT1	SAT2	SAT3	SAT4	SAT5	SAT6	SAD	SAPH
					workshops. The Ministry of Education also should make plan to offer such type of workshops.	question.		have learned. Ensure the participation of all bodies of the school in the process. Those who have taken this workshop should transfer the information to other teachers who didn't take this workshop.	it is.
9	Any comment that you would like to add	I don't have additional comment because I have explained everything.	Generally it was a good workshop.	If it is possible the Ministry of Education (the MoE) should conduct such kind of workshop for all teachers.	I was extremely good.	I would like to thank for the workshop that have been given to us. I truly enjoyed the workshop.	I would say the teacher would implement lesson study if the redundancies in the curricula are removed and if the salary of the teacher is improved.	Since this workshop enabled the teachers to have clear ideas about its goal, I would say it will be very helpful for the research. I wish this to continue in the future. Secondly there is redundancy of many questions in this questionnaire. Therefore the repeating questions should be removed if the questionnaire is going to be used again.	As I said above it is very important and useful topic or workshop . So please introduce or conduct in schools to many teachers.

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Appendix E 2:

Summary of lesson study workshop evaluation questionnaire -School 'B'

No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
1a.	The Lesson Study workshop was according to my expectations	No. I didn't expect to get such type of knowledge.	Yes.	Yes.	Yes. Working together collaboratively. Two or three minds are better than one.	Yes.	Yes.	Yes. I got so many information and that is what I expected.	Yes. It will help me to develop my staff members regarding the lesson study and myself.
1 b.	The Lesson Study workshop was instructive	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. Yes it was instructive because from the time that I get the workshop I will be able to apply the lesson study on my class.	Yes. Yes it is. Lesson study is new for me and I can say it is better to have such information to others.	Yes. Really fact and very significant.
1c.	The Lesson Study workshop was helpful	Yes.	Yes.	Yes.	Yes. Whatever method you don't know before, you may know it now	Yes.	Yes. Because it helps us how to apply the different type of teaching-learning difficulty at one time. E.g. brain storm, lecture etc.	Yes. Because I knew new information.	Yes. Not only helpful it initiates us to read more and more about the lesson study.
1d.	The Lesson Study workshop was enjoyable	Yes.	Yes.	Yes.	Yes. It was not boring; because of there were some breaks.	Yes.	Yes.	Yes. Because of the variety methods like video show, lecturing by the experts.	Yes. It was enjoyable and attractive also.
1e.	The Lesson Study workshop was	Yes.	Yes.	Yes.	Yes. The significance is to the	Yes.	Yes.	Yes. It was relevant in all	Yes. For those who wants to

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No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
	relevant				idea about working together collaboratively (sharing).			aspects, time, concepts of the lesson, new information related to our work etc.	continue in teaching profession it is necessary.
1f.	The Lesson Study workshop covered the topics in sufficient detail	No.	Yes.	No. Because the time was very short. At least it should have been for five days.	Yes.	Yes.	Yes.	Yes. Yes for the Saturday but for the Sunday.	Yes. But it needs more time for further discussion.
1g.	The Lesson Study workshop provided me with new information	Yes.	Yes.	Yes.	Yes. Information not new but it encourages my knowledge.	Yes.	Yes.	Yes. I got new information and I have also got chance to relate what I have with the new information.	Yes. Yes as I compared to my lesson study. Discussing with teachers who taught the same subject.
1h.	The Lesson Study workshop was valuable	Yes.	Yes.	Yes.	Yes. It may lead us from now on to work collaboratively.	Yes.	Yes. Yes valuable cost. It help us how to prepare the lesson plan and how to apply it.	Yes. Yes it is. I will try to apply practically and see the difference.	
1i.	The place was suitable for the training	No.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. To be in the Ministry that is okay because it is centre. But to climb up it is	No. Narrow to discuss freely without noise.

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No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
								time wasting.	
1j.	Time was effectively used	No.	No.	Yes.	Yes.	Yes.	Yes.	Yes. Yes for the Saturday but not for the Sunday.	Yes.
1k.	The Lesson Study workshop was effectively delivered and well organized	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. Yes. It was effectively organized.	Yes. With good disciplined.
	Over all comment	Time was short.	The workshop was very useful because I got new information and knowledge; I shared instructions and teaching methods or knowledge in my work.	This workshop was relevant and very good. However sufficient time was not allocated to it. It is difficult to transmit the required knowledge within this limited time. I would suggest that more time should be allocated to it in the future. Thank you.	I feel that this workshop is effective, so that I agree or I advise that to continue.	It would be good if number of participants teachers increases.	Number of participant was few so it is better to have more participants.	Generally as I have mentioned in the above, provided tables. It was good and attractive workshop. I can only say to have such kind of workshop for other members of our staff if there is possibility.	The participants of the workshop were discussing on the lesson plan heartily. Schedule was implemented according to the given time for each topic.
2a.	I understood the goals and processes of lesson study prior	No.	No.	No.	No. Which is a small bit you may know it but there is not stage to discuss	No.	No.	Yes. I have the idea but not that much.	Yes. Not much but information as I compared to my recent

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No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
	to starting of lesson study cycle				with to develop.				knowledge.
2b.	The materials provided were helpful to develop my understanding of lesson study	Yes.	Yes.	Yes. However, the materials given were few and I find it difficult to find important points.	Yes.	Yes.	Yes.	Yes. It was helpful to read all the materials given before and present by the experts.	Yes. No doubt they are good materials to develop my knowledge for the future.
2c.	The Lesson Study workshop has provided me sufficient information and suggestions on how to implement lesson study in my school	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. I have the information at least to start and then to implement little by little.	Yes. Fact I got sufficient information.
2d.	The Lesson Study workshop has provided me with clear image of how to implement lesson study in my school	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. But it needs additional information and follow up by the experts.	Yes. Yes, not only in science department but also in all subject departments.
2e.	The Lesson Study workshop has enhanced my confidence in implementing lesson study in my school	Yes.	Yes.	Yes.	Yes. It must be continuously.	Yes.	Yes.	Yes. If you do have all the information it is very simple to implement it.	Yes.
2f.	I found the	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. It helped	Yes.

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No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
	pedagogical quality of the resource person helpful to develop my understanding of lesson study							me to improve the quality I have.	
2g.	I found the methods used during the workshop helpful	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. Because it helps us on our daily teaching-learning activities.	Yes.	Yes. Yes not only for science but also for other departments.
2h.	The Lesson Study workshop was conducted at convenient time for me	No.	Yes.	Yes.	Yes.	Yes.	Yes. Because I have nothing to do at that time.	Yes.	Yes. Yes, I did not clash with my day activities in the school.
2i.	The Lesson Study workshop provided me enough time to develop my understanding of lesson study	No.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. But I need more information.	Yes. Less date and time was happened.
2j.	I found the working atmosphere of the workshop to be suitable for me to understand the process of lesson study	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. Yes

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No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
2k.	I found the technical organization of the workshop to be appropriate	No.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes. Very clear punctuality with good discipline.
3	What were the most effective sessions of this workshop?	The hand-outs and the video that we have observed (that of Lewis) was effective.	The sharing of ideas and knowledge from the learners. The organization of workshop.	According to me all the sessions were effective.	We understand and participated but I think it is not more. So I can say that it must be continuous.	The most effective was the way the lesson study was given or presented.	The most effective session of the workshop was the way how to apply the lesson study.	Generally all and relatively the lesson presented Saturday morning (lesson study).	The materials were prepared ahead of time for reading and full understanding.
4	What were the least effective sessions of this workshop?	Power points and time limitation.	Time organization is not good. Projector is not used.	There was no session that was ineffective.		All were effective.		Not at all.	The date given for this workshop was not enough.
5	Do you support the ideas of Lesson Study?	Yes. Because it is an ideas that supports teaching very much. It enhances teachers' awareness. It also clearly indicates how to transmit knowledge to students. Therefore, it was very much useful.	Yes. Because from discussion we can share knowledge and new information, and how to present and understand our students.	Yes. As I have said it earlier what makes this workshop relevant is because it motivates teachers to work collaboratively.	Yes. It helps us to discover and get more ideas for we neglect before.	Yes. Because, the participation is by group of teachers. Observation will be done by all teachers teaching science. It helps share experience and share ideas.	Yes. The lesson study helps to cooperate among the teachers, to share experiences and also to share ideas on the lesson study.	Yes.	Yes. I helps us to revise and to see our previous knowledge of lesson study.

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No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
6	Are you confident to implement lesson study in your department/school ?	Yes. After discussing with the school administration and requesting necessary resources I wish to implement it with all the teachers in our school and within our department.	Yes. Because all of our members/teachers are very experienced in teaching and the lesson study is helpful for us in the work/daily work.	Yes. Since two heads are better than one head, working collaboratively is more productive than working individually. Therefore I am confident that we will work like this with teachers in our department and with our students.	Not sure. Because it is more enough through theory than practically.	Yes. I am because I taken the methods, the principles and procedures that must be applied.	Yes. Because I have taken enough workshop to apply the lesson study.	Yes.	Yes. I will have a plan to share my knowledge to my staff members.
7	Would you recommend similar lesson study workshop to your colleagues? Explain	Yes.	Yes. Because if we get knowledge about lesson study, we can guide by the same instruction.	Yes. As I have indicated above since this is relevant I would suggest for its continuity if it is possible.	Yes. It is a little bit hint for us so that it must be given to my colleagues.	Yes. It is important and helpful in brining change in the attitude, skill and knowledge of the learners and colleagues.	Yes. Because it is helpful in teaching and learning process.	Yes.	
8	What changes would you recommend, if any, to improve this workshop?	Such type of workshop should be given for a longer period of time during summer vacation by allocating more resources.	We have to be given like this workshop another time.	More time should be allocated for it and more resources should be allocated.		At least it must be widen and given for weeks so that we have time far more brief discussions and explanations that help for the			

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No.	Statements	SBT1	SBT2	SBT3	SBT4	SBT5	SBT6	SBD	SBPH
						application.			
9	Any comment that you would like to add			As I have indicated above this workshop should been conducted for longer duration with more resources (printed resources).	It must be needed more time.			Generally, it was good I have no anything to add to what you have done.	

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Appendix E-3:

Summary of lesson study workshop evaluation questionnaire -School 'C'

No.	Statements	SCT1	SCT2	SCT3	SCPH
1a.	The Lesson Study workshop was according to my expectations	Yes.	Yes. Because it makes me energetic as I expect.	No. I was expecting to get new ideas on teaching not on the process only.	Yes.
1 b.	The Lesson Study workshop was instructive	Yes.	Yes. I can understand different views, experiences of teachers that help me.	Yes.	Yes.
1c.	The Lesson Study workshop was helpful	Yes.	Yes. It was helpful on sharing experiences that helps me in the future.	Yes.	Yes.
1d.	The Lesson Study workshop was enjoyable	Yes. It was done with motivate way for the other time add some teaching aid.	Yes. Because I was activated from the starting to the last.	Yes.	Yes.
1e.	The Lesson Study workshop was relevant	Yes.	Yes. It is important to improve the way of teaching of the same topic in different schools.	Yes.	Yes.
1f.	The Lesson Study workshop covered the topics in sufficient detail	No.	Yes. It was presented and enough time to share our idea.	Yes.	
1g.	The Lesson Study workshop provided me with new information	Yes. Because I got idea and shared ideas. Moreover I was able to identify difficult topics in science curriculum.	Yes. I understand the short coming and strength of different lesson as well as for some topics.	Yes.	Yes.
1h.	The Lesson Study workshop was valuable	Yes.	Yes. It refreshes me that can help makes me powerful.	Yes.	Yes.
1i.	The place was suitable for the training	Yes.	No. For the first day it was not clear. The exact place so that it confused some.	Yes.	Yes.
1j.	Time was effectively used	No. According to programme set we didn't finish on time specified.	Yes. As it was planned it is completed.	No.	
1k.	The Lesson Study workshop was	Yes.	No. It was have a shortcoming while	Yes.	Yes.

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No.	Statements	SCT1	SCT2	SCT3	SCPH
	effectively delivered and well organized		we start i.e. lack of Electricity on the video show.		
	Over all comment	Others additional trainers must be added. The time of workshop should be elongated on the day. The time given for the workshop was very short.	This workshop is given as its importance for the researcher but it was helpful for the teachers/participants to enhance their confidence, share experiences, how to solve problem identify problems and how can solve their problems to make their lessons attractive and understandable by the students.	It was great. Keep it up. It would be great if things like this workshop take place over a long period of time.	First of all I want to express my failure which I couldn't able to attend the whole sessions of the workshop. But I understand that it was very helpful and enjoyable. Our teachers get more information of lesson study so that they can implement in their respective schools.
2a.	I understood the goals and processes of lesson study prior to starting of lesson study cycle	Yes.	Yes. I know the goal but I was not understood as I found it.	Yes. Because the hand-outs were provided prior to the workshop, I think I had all the clues that were presented in it.	Yes. I have got more information.
2b.	The materials provided were helpful to develop my understanding of lesson study	Yes.	Yes. I understand if there is difficult topic we can adjust such workshops to solve it.	Yes.	Yes. I have had the materials.
2c.	The Lesson Study workshop has provided me sufficient information and suggestions on how to implement lesson study in my school	Yes.	Yes. But this workshop must be given to all teachers in all subjects.	Yes.	Yes.
2d.	The Lesson Study workshop has provided me with clear image of how to implement lesson study in my	Yes.	Yes. It helps me to be close with since department and to implement it and also it gives more image.	Yes.	Yes.

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No.	Statements	SCT1	SCT2	SCT3	SCPH
	school				
2e.	The Lesson Study workshop has enhanced my confidence in implementing lesson study in my school	Yes.	Yes. In order to solve problem it gives me clear idea how I can solve.	Yes.	Yes.
2f.	I found the pedagogical quality of the resource person helpful to develop my understanding of lesson study	Yes.	Yes. If possible if we do have time.	Yes.	Yes.
2g.	I found the methods used during the workshop helpful	Yes.	Yes. More understandable way of teaching and it team lesson planning it was attractive.	Yes.	Yes.
2h.	The Lesson Study workshop was conducted at convenient time for me	Yes.	No. Time consuming because we use we ends for different social lives.	No. it was supposed to take place at the beginning of a school year or at the break so that there could be enough time to try it or to make it practical.	No.
2i.	The Lesson Study workshop provided me enough time to develop my understanding of lesson study	No.	No. More time is needed to know more about the discussion.	Yes.	No.
2j.	I found the working atmosphere of the workshop to be suitable for me to understand the process of lesson study	Yes.	No. Sometimes it was confusing on understanding but we were sharing ideas all of the participants.	Yes.	Yes.
2k.	I found the technical organization of the workshop to be appropriate	Yes.	Yes. Except all the video show technics it was good.	Yes.	Yes.
3	What were the most effective sessions of this workshop?	Team work, group discussion as well as the instructor information.	To identify difficult themes/lessons. The way how to solve the problems. Sharing of experiences.	The group work that was given at the end of the session and the time when the video that shows the application of lesson study was shown.	The materials that we have received.
4	What were the least effective	Time management.	Identify problems in each topics	I think the least effective	

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No.	Statements	SCT1	SCT2	SCT3	SCPH
	sessions of this workshop?		students and how to solve them.	sessions of this workshop was the time between 8:00 up to 12:00 AM of Saturday in which instead of showing us the exact video that shows, the real implementation of case study, we were given on explanation of how to conduct it. so i think for the future it shouldn't be like this.	
5	Do you support the ideas of Lesson Study?	Yes. Give supportive ideas. Makes you to be confident in the lesson.	Yes. It helps me on my teaching.	Yes. Because I think it is helpful in making the students understand the lesson with different methods of teaching. Meaning new ways of solving problems can be gained from the teachers, if they could work collaboratively. Even the problems of the teaching process can be identified and solved on time that is because a member of the group could understand before all of them did and notify them to get a solution.	Yes. Teamwork (collaboratively) and improving teaching abilities.
6	Are you confident to implement lesson study in your department/school?	Yes. Because it is constructive, make you to be well organized with your lesson and your student. Since the school culture is convenient so I am confident to implement.	Yes. It there will opportunities I hope I will.	Yes. Yes I think it is possible that is because the teachers in my school have some aspects which make us work and implement lesson study. I think at least 80% of the teachers will be willing to cooperate in the lesson study, if I could	Yes. We need several very effective measures to implement, to teach the students.

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No.	Statements	SCT1	SCT2	SCT3	SCPH
				make them understand its significance. And i know that i could do that because i have understood the importance of lesson study.	
7	Would you recommend similar lesson study workshop to your colleagues? Explain	Yes. In order to make more awareness on their knowledge. Because it is learner.	Yes. Because it was helpful for my colleagues not only for them for the whole teachers in Eritrea.	Yes. As I have already mentioned above, it would be even better if all the teachers could participate in a workshop like this given all the accommodation provided. It will make them solve the teaching and learning difficulties the students are facing simply and effectively. So i think by all means a workshop like this must be given in the future that could involve all the teachers.	Yes. It would be more practical to all subjects.
8	What changes would you recommend, if any, to improve this workshop?	Time should have been extended a little bit. Length of time and day should be given priory. Other experts of other than science and mathematics subject should participate.	The MOE must provide areas for such workshops and it must be given for all teachers in Eritrea because it increases the strength of the learning and teaching process.	Everything in the workshop was great except that the objective of the workshop was not clear at first. So all the participants of the workshop should have a clear idea of the objectives needed to be gained at last.	School based workshop with assessment and follow up the lesson study.
9	Any comment that you would like to add	Should be given for others also. It has to be continued. It should have continuity.	I would like to thank out to invite for this workshop and also I wish you to be successful in your whole life.	This workshop was really great and it would be great if you could keep it up.	

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Appendix F:
Research Lesson Observation Form

School: ……..…….. Grade: ……..… Date ……..……..

General guidelines to be followed during research lesson

a. Reduce side conversations during the lesson observation.
b. Circulate freely when students are working, but move to the back of the room during whole-class discussion.
c. Make sure that you do not block students from viewing the blackboard.
d. Minimize interaction with the students. Refrain from teaching or assisting the students. Interact only to clarify your understanding of students' thinking.
e. Each observer should have a copy of the lesson plan and record observations throughout the lesson.
f. Assign members to observe and record specific type of data.

Take always a researcher role and write the summary of your observation on one/more of the following points or on your assigned focus of observation on the space provided below.

1. Look if the goal of the lesson is successfully achieved.
2. Take notes on how students collaborate with one another.
3. Take notes on how students engage in the learning process.
4. Take notes on how individual student respond to the instruction.
5. Record on the appropriateness of the content to the students' level of understanding.
6. Record on the usefulness of the resources used.
7. Record on how students work on particular tasks.
8. Record on the type and frequency of questions asked by different students and the teacher.
9. Document student-student and student-teacher interactions.
10. Record on common misunderstandings, errors, and the ways student use to solve problems.

Focus of your observation, if assigned:

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Summary of your observation:

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Source: Adapted from guidelines developed collaboratively by Global Education Resources LLC, Paterson Public Schools and Research for Better Schools.

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Appendix F

Summary of Research lesson Observation

School 'A'

F1 **SAT1 - F1:** The collaboration of the students with one another and answering questions by different students and teachers was good. In the teaching and learning activities, the students collaborate with each other and engage in the activities. However, there was dominance by the clever students. In conclusion the goal of the lesson was successfully achieved.

SAT3 - F1: The main focus of the observation was to look if the lesson is successfully achieved and whether the content of the lesson is appropriate to the student level of understanding. In my observation, I can summarize that it is very helpful for the students to teach them by the research lesson but the teacher must be prepared well. I have observed that 40 minutes (1 period) is not enough to teach by demonstration.

SAT4 - F1: The focus of the observation was participation of the students, collaboration with one another and individual student responses and students level of understanding. (1) The learning activities, the learner activities and the teacher's responses to the learner reaction were good. (2) Most students understood the lesson well, well engaged in the activity and gave responses with full confidence and some are passive. (3) Generally the goal of the lesson was partially achieved.

SAT5 - F1: The collaboration of the students was fair. Meaning not all were sharing their ideas as they were denominated by one or two students. On particular task, some worked in groups while others conducted on their own. Interaction was not much either. Over all the goal of the lesson have been achieved from the understanding where students were well incorporated into the lesson. Also the lesson summary and question asked from students referred to student theories. Thus the lesson was consistent with the lesson goal. And from my observation I observed that there were two extreme students. In which the class atmosphere were dominated by the outstanding students, others were just following.

F2 **SAT1 – F2:** The students participated well even though only clever students answered questions and reported. The teaching and learning was good. But to do the activities there were problems in handling the teaching and learning activities. For example, students kept the wire in the socket. This was not safe.

SAT2 – F2: The goal of the lesson was successfully achieved. The student collaboration was good. In some of the groups there was a subgroups formed. In most of the group discussions good students were more participant. The teacher asked some brainstorming questions. The students tried to answer the questions.

SAT3 – F2: The focus of my observation was to see how the students collaborate with one another and how students work on particular task, common misunderstandings, errors and the way students use to solve problems. In my observation I have seen that the lesson was getting developed from period to period. Students were becoming confident in their participation. But to teach using this kind of method, it is not enough by 40 minutes. It could be 1 hour or 50 minutes.

SAT5 – F2: The focus of my observation was on how students collaborate with one another, how students work on particular tasks and document on student-student and student-teacher interactions. The structure of the class was good. Student interaction with the lesson was also more than expected except that it was the ranking students. Their participation, question asked and response given were also satisfactory. Among the classmates, some were discussing using question and an answer method. Teacher interaction with his student was not enough. Should be able to motivate each group by circulating.

F3 **SAT1 – F3:** It was good. Learners participated more than the previous lesson. On 19/04/2013, the lesson which was given by teacher SAT3 was repeated by SAT5. At this time everything was improved. During this time there were guests besides science teachers from School 'A'. the guests admired the lesson in general and the cooperation of the students in particular. Finally we accepted their feedback.

SAT4 – F3: The focus of the observation was on activities of the students i.e. participation in the discussion time and responses to the questions. Generally on the presentation of the lesson. The lesson was good planned but not presented well. Most students did not understand the lesson well. Most students did not participate in the activity and did not present the lesson well. The classroom was not comfortable for teaching and learning activity. There were shortages of materials. The lesson summary was good. Generally the goals of the lesson were not achieved good.

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SAT5 – F3: The focus of my observation was on how students collaborate with one another, how students work on particular tasks and document on student-student and student-teacher interactions. Participation of the students was weak. There was less subgroups seen in this class. It was dominated by average students. It is not convenient that the teacher should leave all the work to the students. Students should speak loudly. The interaction between teacher and students was a bit losing because of language problem (should be able to connect a least by using some Tigrigna word in order for students to get motivation.

F4 **SAT1 – F4:** This is what I have observed during grade seven teaching. (1) The teacher who taught this lesson was a grade 8 teacher. It seems that it took some time for the students to adjust and cooperate with this new teacher. (2) The classroom was not suitable for conducting group work because the classroom was shallow and long. (3) The participation of the students was individual and focused mainly on giving definitions.

SAT2 – F4: In the introductory part of the lesson the students were confused these two questions: What are the parts of lever? What are the classes of lever? However, after the teacher clarified it things went well. The activity given in the form of diagrams was good, but it was too many and hence took a lot of time. The students had problems while presenting because they didn't have a chart of real object to base their presentations. The lesson was a bit beyond the given time. It would have been good if the teacher had given expected answers in the form of writing.

F5 **SAT1 – F5:** During the re-teaching of the lesson I have observed the following: (1) since the teaching and re-teaching were delivered by the same teacher there was not much improvement in the delivery of the lesson. However, there was significant improvement from the side of the students in the following areas: (a) In discipline and (b) participation. This is because the teacher used real objects as teaching aids such as wheelbarrow, broom. These real objects made the lesson effective. In general there was improvement during the re-teaching session.

SAT2 – F5: The lesson was re-taught lesson. The teacher didn't write date and topic on the blackboard. The students were making sound during the first time of group work. The lesson was effective because the activity was short and it was followed by practical activity. However, the students were not allowed to present the outcome of their discussion. The teacher simply concluded the lesson by using question and answer method. In general the lesson was more improved than the previous lesson.

SAT6 – F5: In general the goal of the lesson was very successfully achieved. The students were collaborating with one another. In the appropriateness of the content to the student level of understanding was good but the teacher was not written (given) brief notes on the blackboard and he was not controlled the class because it was noises in the class. In introduction, class participation and discussion it was good.

F6 **SAT1 – F6:** The lesson plan was well implemented within the specified time. There was collaboration between the students because they were working together. All the students were contributing their share to the activities. For example, when one writes the others were telling the spelling by referring to their textbook. Moreover, since the discussion was among peer group, the students were asking one another without any fear or pressure. When we look at this we could say that the teaching was student-centred approach.

SAT3 – F6: The focus of the observation was (1) to look if the goal of the lesson is successfully achieved, (2) take notes on how students collaborate with one another and (3) record on the usefulness of the recourses used. On my observation I have observed that most of the students participate well in their groups. But some students were having problems in pronouncing words like pivot, vertebrae, hinge and gliding.

F7 **SAT1 – F7:** On 13/11/2013 the lesson was re-taught again. During this lesson many improvements have been shown. This is because after the first teachings we always reflect on the weakness and strengths of the lessons and then we improve the weaknesses. Every teacher forwards his/her views about how to improve the lesson and also we put the suggestions into practice. Therefore, we followed student-centred approach and the lesson was effective.

SAT6 – F7: In general the lesson was completed within the specified time as planned. The goal of the lesson was successfully achieved. The lesson was according to the level of understanding of the students. The students were working in group and they were identifying joints in human body. They were describing their uses, their location and their degree of movement they allow i.e. allowing movement in all direction, some movement and no movement. The students were able to present the outcome of their discussion in front of their peer. The teachers were correcting the mistakes verbally. There were not questions from the students. The students were not correctly pronouncing the names of the joints. They have problems in pronouncing the words. Finally the teachers provided the students as homework to write the notes from page 32 and the diagrams of joints.

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F8 **SAT2 – F8:** The lesson has been implemented within the specified time. Only outstanding students were participating in it. Some of the students were not participating in the lesson. In general, a student-centred approach was used during the lesson. The content of the lesson matched the ability of the outstanding students but it was difficult for the weak students.

SAT3 – F8: I am not assigned a focus, but I am trying to observe almost all of the above points. Since the lesson was new for the students, they were participating well in the class. The teacher was trying to make the lesson student centred. The lesson itself was interesting it helps the teacher and the students to work cooperatively.

SAT6 – F8: In general the presentation of the lesson, handling of the students was appreciated. The students were doing their best by discussing and presenting the outcome of their discussion to their peer members. They were explaining and giving answers to questions. If students continue in such a manner then they would benefit a lot. From a total of 40-45 students only 5-8 students were actively participating. The lesson was about force and motion and specifically about combining forces i.e. force acting in one direction, force acting in opposite direction and forces acting at right angle to one another. The lesson was executed as planned. The students worked a class work as a group and then performed tag war. The students were asked about who won the war.

F9 **SAT1 – F9:** This lesson was re-taught the next day by teacher SAT2 after I taught is on 26/11/2013. I didn't see much improvement in this re-taught lesson when compared to the first lesson. This is because very few students were participating either practically or answering questions. The other students were not showing willingness to participate. They were only participating when they are obliged to.

SAT3 – F9: The lesson was about force and motion and specially about combining forces. Since the lesson was re-teaching, the teacher prepared it well and most of the students followed the lesson carefully.

SAT6 – F9: The lesson achieved its goal because it was completed with the specified time and it allowed students to participate. The lesson was about combining forces. The students learned that when two forces are in the same direction they should add the forces, if the forces are in opposite direction they find the difference of the forces and if they are at right angle to one another, then they should use Pythagoras theorem. The students were participating and sharing ideas with one another. The lesson was organized well. I would say that if such type of teaching the outcome would be very great.

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Appendix G:
Lesson Study Report Format (administered at the end of the lesson study cycle)

School: …… Name: ……..…….. Date ……..

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1. ኣብ'ዚ ለሰን ስታዲ ብምስታፍካ ንመዓልታዊ ስራሕካ ዝሕግዙኻ ነገራት እንታይ ረኺብካ ወይ ተማሂርካ? ብመሰረት ስዒቦም ዘለው ነጥብታት ድማ መልስካ ኣቕርብ። What did you learn through this cycle of lesson study that can be applied to other areas of your work? Write your report in terms of:
    a. ፍልጠት ኣብ ትምህሮ ዓውደ ትምህርቲ። Changes in your knowledge of subject matter

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    b. ለውጢ ኣብ ኣገባብ ኣመሃህራ። Changes in your teaching practice.

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    c. ለውጢ ኣብ ምክትታል (ምዕዛብ) ተማሃሮ። Changes in your ability to observe students.

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    d. ለውጢ ኣብ ምስ ብጾትካ (መሳርሕትኻ) ኮይንካ ብሓባር ምስራሕ። Changes in your ability to collaborate with colleagues.

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e. ለውጥ ኣብ መዓልታዊ ንጥፈታትካ ምስ ናይ ነዊሕ ዕላማ ኣብ ምዝማድ። Changes in your ability to connect daily practice to the long-term goals.

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f. ለውጢ ኣብ ድርኺት፣ ተበግሶን፣ ኣድማዕነትን። Changes in your motivation and sense of efficacy.

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g. ለውጢ ኣብ ኣገባብ ውጥን ምህሮ። Changes in your lesson planning skills.

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2. ለሰን ስታዲ ብምጥቃምካ ተማሃሮኻ እንታይ ረቢሖም (ተማሂሮም)። What did your students learn as a result of your participation in lesson study research?

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3. ኣብ ለሰን ስታዲ ብምስታፍካ ዝረኸብካዮ ተሞኩሮን ፍልጠትን ክሳብ ክንደይ ኣብ መዓልታዊ ስራሕካ ትጥቀመሉ ኣለኻ? To what extent are you applying the new knowledge and skills into your teaching?

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4. ሓገዝ ምምሕዳርን ማሕበረሰብ ቤት ትምህርትን ንትግባረ ለሰን ስታዲ ከመይ ነይሩ። ኣብ ምንታይ ሓጊዞምኻ? In what ways does the school administration and school community supported you in the implementation of Lesson Study?

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5. ኣብ ለሰን ስታዲ ብምስታፍካ ዝረኽብካዮ ጥቕምታት እንታይ ኢዮም? What are the benefits that you have gained by participating in lesson study?

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6. ዘጋጠሙኻ ብድሆታት እንታይ ነይሮም? እንድሕሪ ነይሮም ኣብ ምፍትሑም ዝሕግዙ እንታይ ሓሳባት ኣለካ? What are the challenges that you have encountered, if any? What are your ideas for overcoming the challenges?

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Thank you

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Appendix G

Summary of Lesson study report (administered at the end of the lesson study cycle)

School 'A'

1a. Changes in your knowledge of subject matter

SAT1-G1- I would say that I have learned a lot from this because I was only teaching the way I understand it and the way I feel it is the right was. But now I am using a teaching method which is developed and evaluated by all of us. Therefore I feel that I have changed.
SAT1-G2 - Since the subject that we teach is science is suitable with lesson study. I was able to understand that lesson study matches with the science.
SAT1-G4 - This has enabled me to increase the knowledge of the subject that I am teaching. For example while teaching "levers" the teachers used pictures and teaching aid materials (real objects) which helped me to gain some knowledge from that lesson.
SAT1-G5 - As a result of participating in lesson study I have obtained a lot of benefits that helped me in my work. I got these benefits because: a) I was able to get feedback from my colleagues during teaching and re-teaching sessions of the research lessons, b) since we were preparing lesson plans collaboratively I obtained ideas from colleagues and c) we were complementing the requirements of teaching aid by one another.
SAT2-G3 - Lesson study helped me to deepen my subject matter.

SAT3-G1 - a) I have learned that as a teacher I have to have enough knowledge about the lesson, b) I have to develop the lesson by researching other books and c) I have to ask other teachers about the subject matter (which are difficult for me).
SAT3-G3 - Lesson study helped me to have deep knowledge about the subject matter that I am teaching because before teaching I referred to several books in order to prepare for the lessons. As a result of reading books I have developed deep knowledge of the subject matter.
SAT3-G4 - Lesson study helped to have deep knowledge about the subject matter that I am teaching because before teaching students I was making sufficient preparation in collaboration with my colleagues. This is after participating in lesson study.
SAT5- G1 - I have gained the knowledge of experiencing new method of changing my learning-teaching method. In understanding of the subject matter in a broader way.
SAT6-G3 - I have made a lot of improvement for example I started to become careful and responsible.

SAT6-G4 - I have gained knowledge that helps in my teaching and learning process. This is very valuable approach because it enabled us to stick to what has been planned.

1b. Changes in your teaching practice.

SAT1-G1- A job that is done by sharing ideas and by cooperating with one another is more productive. The ideas that I have obtained from experienced teachers or the beginner teachers was helpful to me in work.
SAT1-G2 - It has brought a lot of changes in me. Before lesson study, my relationship was limited to me and the students. Now, I have started working with teachers collaboratively in designing lesson plan, observing research lesson and at the end providing constructive feedback. Really these have made a lot of changes in my practice.
SAT1-G4 - As we always say, since we were working collaboratively through discussion and sharing of ideas, we were improving the lessons by correcting the weaknesses. Therefore, I would say we have benefited a lot.
SAT1-G5 - a) We were making necessary preparation because the lesson was to be taught in front of colleagues and other guests who would be observing it and b) Unlike the usual teaching, I have started using teaching aid materials after participating in lesson study.
SAT2-G3 - Before participating in lesson study my focus was mainly on how to teach the students but not on how students learn. After participating in lesson study, I am taking the role of facilitator and enabling the students to participate more in the learning process.
SAT3-G1 - As a teachers I have changed my teaching practice by a) preparing good lesson plan, b) collaborate with colleagues, c) making students to actively participate in class and d) researching other books in order to develop the subject matter.
SAT3-G3 - I have made some changes in my teaching. I strive as much as possible to make my teaching student centred. Moreover, instead of allowing only outstanding students to participate I have started focusing on the weak and average students.

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SAT3-G4 - I have made some changes in my teaching. I strive as much as possible to make my teaching student centred. Moreover, instead of using pictures of charts I am trying to use real objects in the teaching and learning process.
SAT5- G1 - Sharing the experience of teaching with other teachers has helped me to ease in my teaching practice. For example I have been teaching for four years, the teaching that I have, have changed in more easy and comfortable way from which other teachers (sharing) gave me other ideas.
SAT6 – G4 - It helped us to identify weak and strong students. Since we prepared the lesson plan in the form of table, it helped us in facilitating the teaching learning process.

1c. Changes in your ability to observe students.

SAT1-G1- I have seen a lot of changes in the students. I have observed that: (a) They were able to ask their peer with feeling shy and (b) they developed a competitive spirit therefore they started asking and answering questions.
SAT1-G2 - In this respect, I have changed a lot. It enabled me to identify or observe participating students from non-participating students and work towards making all the students participate.
SAT1-G4 - Regarding observing students, even though there were some students who lacked discipline, their participation was good. They were discussing, arguing and asking one another.
SAT1-G5 - a) The students were attentively following the lesson because their teachers were observing them and b) the students who were sitting at the back of the classrooms changed from spectators to participants.
SAT2-G3 - Lesson study helped me to make big changes in following up the students. Before participating in lesson study my expectation was that the students should follow and listen to what I am presenting but after participating in lesson study I learned that I have to observe the students how they are learning while they are engaging in discussion with their colleagues.
SAT3-G1 - As a teacher I have to observe carefully my students: who is active, who is dormant and who is in the middle
SAT3-G3 - Since I have made changes in my teaching, I would say that I have also made changes in observing my students. Before lesson study, I was giving more attention to outstanding students only. But now I am focusing on all students including the weak and average students.
SAT3-G4 - I have made changes in ability to observe my students. Before lesson study I was giving more attention to outstanding students but now I am focusing on the weak and average students.
SAT5- G1 - A great deal of changes had occurred in my ability to observe students. I had observed that students understood the subject matter with ease through which explanation was followed by their discussion among themselves (theoretically and practically).
SAT6-G3 - While implementing lesson study it helps to identify the capability of the students. It helps us to identify which ones are outstanding, averages or weak students.
SAT6-G4 - Since we were giving them activities that are done in groups it was easy for us to identify the weak student from the brilliant student.

1d. Changes in your ability to collaborate with colleagues.

SAT1-G1- There was high collaboration and coherence between teachers especially in preparing teaching aids and generating ideas. Therefore, this made the lesson to improve and look attractive.
SAT1-G2 - I have started working with colleagues just with lesson study and I found it very productive.

SAT1-G4 - We were showing good participation during the collaboration process. One of the teachers was not willing to teach in front of their colleagues. Therefore, one teacher was obliged to teach both teaching and re-teaching sessions.
SAT1-G5 - I found it very useful, because after every teaching we sit together and provide our feedbacks.

SAT2-G3 - The best benefit that I have gained by participating in lesson study is it enabled me to work with colleagues collaboratively, teaching a lesson collaboratively and be able to observe how a teacher teaches a lesson and how students learn it.
SAT3-G1 - After this cycle of lesson study I have learned that I must collaborate with my colleagues always freely and confidently.
SAT3-G3 - Really I have made changes in this regard because we discuss collaboratively, plan lessons collaboratively and evaluate lessons collaboratively.
SAT3-G4 - Yes in confirmation with the rules of lesson study I was able to practice high level collaboration with my colleagues especially with those teachers who teach the same subject and the same grade.

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SAT5- G1 - As for me, this has helped me to collaborate with my colleagues which I had never been able to do before. For example colleagues which were much older and has lots of years of experience. This sharing of ideas helped me to ask, answer and give comment to my colleagues without any pressure.
SAT6-G3 - Working collaboratively helped us to share ideas and experiences with colleagues. Thus it helped us to do clear and productive work.
SAT6-G4 - It gives opportunity to work with colleagues collaboratively and share ideas with them.

1e. Changes in your ability to connect daily practice to the long-term goals.

SAT1-G1- I have gained invaluable experiences. According to my opinion, it is of great benefit if this process goes for longer period.
SAT1-G2 - It has contributed to my ability of linking my daily practice to the long term goals.

SAT1-G4 - I would say it has many benefits when we see it from long-term goal because there is a proverb that says, "Work done collaboratively and food chopped thoroughly into small pieces are worthy, because the former becomes better and the latter does not chock".
SAT1-G5 - It helped to me to make changes in my daily activities. Therefore, I am planning to continue it in the future. But support from Ministry of Education is required. This has to take creation of suitable classroom, class-size and time into consideration.
SAT2-G3 - I was able to understand that long term goals are based on daily activities.

SAT3-G3 - Before participating in lesson study I was focusing only on the short range aim but now I am doing my daily activities by focusing on long term goals.
SAT3-G4 - Before participating in lesson study there were no connection between the short term goal and long term goals, but now I have started connecting the daily practice with the long term goals.
SAT6-G3 - It helped us to remind one another overlooked experiences and thus it helped us to become happy and active in our work.
SAT6-G4 - Yes. All the procedures done using lesson study are very valuable for those who want to continue teaching in the long run.

1f. Changes in your motivation and sense of efficacy.

SAT1-G1- This new process is motivating for both teachers and students. Therefore it is a very good process. Since it is a new way of teaching, I would suggest for its implementation in Eritrea.
SAT1-G2 - It enabled me to make positive changes in this aspect.

SAT1-G4 - Really it increases our sense of efficacy because teachers give feedback to one another after teaching the lessons.
SAT1-G5 - It is efficient and it is important, but we are lagging behind when compared to other schools. This is because it takes time. It requires time for meeting, discussion and arranging timetable takes time.
SAT2-G3 - Lesson study helped me to identify that motivation lead to efficacy and it helped to develop that.

SAT3-G1 - I am motivated after the cycle of lesson study and due to that my students are motivated by me in their classes. For example, my students were becoming active participants.

SAT3-G3 - Before participating in lesson study, I was struggling and I was on stress on how to teach my students but after participating in lesson study things became normal to me and I am engaging classes with full confidence and without any pressure.
SAT3-G4 - Working collaboratively with colleagues helped me to develop motivation. This is a new development that has not been in me.
SAT5- G1 - In terms of my students a lot. Among many of my student Filmon (7-12) was a very shy and weak student. Dramatically he has changed for better. He and others had motivated me to use/practice this method of teaching.
SAT6-G3 - It is effective because in order to implement lesson study one has to work actively and read a lot of information.

1g. Changes in your lesson planning skills.

SAT1-G1- The lesson plan which we have used was very specific and therefore it helped us to stick to what we have planned. This makes the lesson plan format ideal for preparing teaching learning activity.
SAT1-G2 - Planning lessons collaboratively has brought a lot of changes in me and I enjoyed planning collaboratively.
SAT1-G4 - There are not many changes in lesson planning. The only difference is that we were not using table

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format. Using such type of lesson plan format could be considered as change.

SAT1-G5 - There are not many changes in lesson planning. The only difference is that we were preparing lesson plan individually but now we are preparing in group. Therefore, the plan becomes better plan.
SAT2-G3 - Planning a lesson collaboratively is more productive than a lesson planned individually. Therefore lesson study ensures this.
SAT3-G3 - Before participating in lesson study I was preparing very shallow and short lesson plan but now I am preparing a detailed lesson plan in collaboration with other teachers.
SAT3-G4 - Now I am preparing a detailed lesson plan that encompasses the needs of all students, namely outstanding, average and weak students.
SAT5- G1 - I started to observe and practice this lesson planning in more broader and explanatory ways. Meaning when I start a class, I started using ideas other than mine so in my lesson planning I share ideas with other teachers and vice versa in our every week lesson plan.
SAT6-G3 - I would say I have made a lot of changes in lesson planning because I have learned that by using simple teaching materials such as using pictures and tables, one can deliver effective teaching.
SAT6-G4 - This lesson plan is quite different from the lesson plans that we were using earlier. This lesson plan is written in the form of table and it uses teaching aids in the form of pictures it is advantageous for the teacher in saving effort and it is advantageous for the students as it allows them to participate actively during the lesson.

2. What did your students learn as a result of your participation in lesson study research?

SAT1-G1- The students have learned a lot from this: (1) It enabled them to get rid- off their shyness, (2) they were able to freely discuss in their language with one another and ask one another and (3) it enabled them to write a report on what they have observed.
SAT1-G2 - After participating in this study, the students have managed to perform better.

SAT1-G4 - The students have benefited because many teachers observe and evaluate them.

SAT1-G5 - a) The students were freely asking their colleagues questions and b) The students who were not participating before started participating.
SAT2-G3 - Lesson study helped me to use student-centred way of teaching. Since the students were active participants they have benefited from lesson study.
SAT3-G1 - Lesson plan should be prepared well by making it a) reflecting all the needs and thought of the teachers, b) needs and expectations of the students must reflect in the lesson plan and c) what are the students going to learn from the plan (goal of the lesson).
SAT3-G3 - a) The students were able to obtain deep knowledge on the subject matter b) since they are practicing student-centred approach they were able to share ideas with their colleagues.
SAT3-G4 - As a result of lesson study the students have obtained the following benefits: a) They were able to practice student-centred approach of teaching, b) they developed self-confidence and c) they were able to obtain deep knowledge on the subject matter.
SAT5- G1 - Most students were motivated and excited for the next lesson even which we as teachers don't encounter every day. Through my experience in this lesson student research likely 7-12 were able to participate thus they were uplifted with the new changed so it had a positive impact.
SAT6-G3 - By conducting discussion on activities given, the students developed self-confidence and their ability to speak and answer bravely.
SAT6-G4 - Even though working in groups was common teaching such type of lesson supported with pictures that allows student participation is not common.

3. To what extent are you applying the new knowledge and skills into your teaching?

SAT1-G1- It enabled me to use new ways of using teaching aid and new ways teaching methods.

SAT1-G2 - I have started just now and I will use it in the future.

SAT1-G4 - I would say I have gained ideas and opinions from many teachers which I could use in my day to day activities for example I have benefited in the utilization of teaching materials.
SAT1-G5 - Participating in lesson study helped me a) to teach freely without shyness in front of my colleagues, b) feedback from the students was helpful for me and c) the teachers were complementing teaching aids that I usually lacked.
SAT2-G3 - At this time, I could not say that I am using the knowledge that I have gained from lesson study in daily activities because there are obstacles. The main obstacle is the vastness of the syllabus.

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SAT3-G1 - They have learned that they must participate actively in the class. They have learned that they must prepare well before the teacher explains the lesson. They have learned that they have to be able to learn in student-centred instead of teacher centred.
SAT3-G3 - Even though there are obstacles such as class size and vastness of syllabus I am trying to implement in my daily teaching as much as possible.
SAT3-G4 - I am using it in my daily teaching. Since it has benefits I tried to produce impact on other teachers.

SAT5- G1 - Especially in 7-12 I am applying it in my everyday teaching and also in other classes to some extent. Overall, I try to apply it as much as I could.
SAT6-G3 - The experience that I have gained from lesson study coupled with my earlier experience helped me to do my daily work effectively.
SAT6-G4 - Working in collaboration is beneficial because it helps you to improve your weaknesses in the future.

4. In what ways does the school administration and school community supported you in the implementation of Lesson Study?

SAT1-G1- They supported us in (1) providing teaching aids, (2) in preparing and choosing suitable classrooms for teaching the research lessons and (3) the teachers cooperated in exchanging periods with us. Moreover, those teachers whom we invited to observe the research lesson encouraged us. They shared their ideas with us and they appreciated our work.
SAT1-G2 - The school administration was cooperative in supplying us suitable classrooms and necessary teaching aids.
SAT1-G4 - The school administration was providing us support whenever we ask them. They were showing good collaboration.
SAT1-G5 - The school administration was helpful in preparing the classroom, providing materials which we requested and arrangement of timetable. The school community was giving us their opinion and advice. I would say I have benefited from them because i found some feedbacks.
SAT2-G3 - The school administration was very cooperative and helpful in all aspects but due the obstacles mentioned above it is difficult to implement it.
SAT3-G1 - The administration helped us a) in preparing teaching materials, b) in arranging timetable, c) informing other teachers to cooperate with me in order t participate freely in the implementation of lesson study.
SAT3-G3 - The school administration was supportive. First, they were allowing us to make changes in the timetable. Second, they were providing us with necessary teaching aids. Third, they were coming to the classrooms to demonstrate their support.
SAT3-G4 - The school administration was supportive. First, they were allowing us to exchange periods with our colleagues. Second, they were providing us with necessary teaching aids. Third, they were coming to the classrooms to provide us moral support.
SAT5- G1 - The school administration and school community support and encourage us a lot. For example a) updating us in new meetings b) supporting with teaching aids like flipchart and other materials in need.
SAT6-G3 - The school administration and my colleagues supported me through allowing us to conduct lesson study at suitable timings and also exchange the periods with other teachers to make up the lost lessons.
SAT6-G4 - The school administration was supportive by allowing us to conduct lesson study at suitable timings and also exchange the periods provide us with resources. Parents who follow the situation of their students are very few in number.

5. What are the benefits that you have gained by participating in lesson study?

SAT1-G1- I have benefited from the teachers a lot. For example before participating in lesson study I was teaching series and parallel circuits theoretically, but now lesson study enabled me to teach it practically.
SAT1-G2 - It enabled us to give lively lesson to our students.

SAT1-G4 - Both teachers and students benefited from the process especially after teaching a research lesson all teachers who were observing give their feedback to the teacher who taught the lesson. Therefore it was helpful in improving teaching learning process.
SAT1-G5 - a) Preparing lesson plan in collaboration (working in collaboration with colleagues) and b) the feedback and constructive critique that I have received after teaching a research lesson helped me a lot.
SAT2-G3 - I have benefited working collaboratively, planning collaboratively and observing/reflecting collaboratively.
SAT3-G1 - a) I have learned how to prepare lesson plan well, b) I have gained more confidence to speak in front

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of my colleagues, c) I have learned that as a teacher I have to make my students to participate actively in the class and d) over all I have gained (learned) collaboration with my colleagues.
SAT3-G3 - a) I was able to develop deep knowledge on the subject that I am teaching, b) it helped me to collaborate with my colleagues and c) I was able to prepare teaching aid materials that I could use in the future.
SAT3-G4 - a) I was able to develop deep knowledge on the subject that I am teaching, b) it helped me to collaborate with my colleagues and c) I was able to prepare teaching aid that I could use it for the future.
SAT5- G1 - As inexperienced teacher I have gained a lot. For example sharing ideas with colleagues, how to use resources (teaching aids) appropriately and interaction with my students has grown a lot. Overall I have grown as a teacher too.
SAT6-G3 - Lesson study enabled us to collaborate with colleagues and discuss on how to teach the lesson, discuss about situation of students, discuss on the teaching method that has to be used and preparing teaching aid materials.
SAT6-G4 - The benefits are a) allows collaboration with colleagues and share ideas with them, b) helps to improve weaknesses, c) lesson planning was made in the form of table, d) it allows student participation and e) it enables to identify the behaviour and the degree of participation of students.

6. What are the challenges that you have encountered, if any? What are your ideas for overcoming the challenges?

SAT1-G1- The challenges: (1) The classroom was not convenient and (2) There were excess benches in the classroom that created a problem. In order to solve this problem a) we were moving to classes that are convenient, b) moving the extra benches out of the classroom and c) We encouraged the inactive students to make active participation.
SAT1-G2 - Lack of suitable classroom with all its resources.

SAT1-G4 - There were not many challenges. We were solving some of the challenges through discussion and therefore we were teaching the re-teaching session without problem.
SAT1-G5 - The challenges were a) The classrooms were not suitable. In order to solve the problem we were shifting to another suitable classroom. b) Finding common time for all the teachers was problematic. We were solving this problem by exchanging our periods with other subject teachers. c) Some resources were not easily available in the school for example rope for tag war was brought by one of our teachers.
SAT2-G3 - The challenges were narrowness of the classroom, number of students in a class and vastness of the syllabus.
SAT3-G1 - The challenge that I have faced in this lesson study was: It takes too much time for me to prepare, to discuss and to collaborate with my colleagues. To overcome these challenges if it is possible teachers shall work one shift only and the administration of the school must help the teachers.
SAT3-G3 - The challenges were a) vastness of the lessons (syllabus), b) class size and c) participating in lesson study takes time.
SAT3-G4 - The challenges were a) vastness of the lessons (syllabus), b) large class size and c) participating in lesson study takes time.
SAT5- G1 - The challenges that I have encountered were 1) class arrangement 2) number of students (many students in one class) and 3) time consuming. The ideas for overcoming the challenges are 1) A single class or lab should be prepared, 2) Number of student or class size should be appropriate /manageable and 3) If teachers are motivated or helped with their daily life economically, they can be fully devoted to their time in their teaching practice.
SAT6-G3 - The challenges were: lack of interest of the students, lack of English language proficiency, large class size and load. The means of overcoming them: this has to be experimented with few interested students and those teaching them should be exempted from other duties.
SAT6-G4 - The challenges are a) large number of students in a classroom, b) lack of interest in education by the students as a result they misbehave in classroom. The means of overcoming them: this has to be experimented with few interested students and the teachers should be given incentives for participating in lesson study.

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Appendix H1:
First teacher focus group interview scheme

1. Was the lesson study process successful in terms of improving your content knowledge, pedagogical knowledge/ teaching practice, working and sharing ideas with colleagues, observation skill, and lesson planning skills? If yes please describe the improvements.
2. In what ways are the instructional strategies that you have used in the lesson study process similar or different from the strategies that you have used in the past? Please explain.
3. In what ways is the collaboration that you have experienced in the lesson study process is similar or different from collaboration that you have experienced in the past? Please explain.
4. What elements of lesson study can lead to stronger collegial development?
5. How do you know whether or not that your students are learning and your lesson is successful? What are the indicators?
6. To what extent are you applying the new knowledge and skills gained into your teaching?
7. What kinds of benefits, if any, have you received by participating in lesson study?
8. What kinds of challenges have you encountered, if any, by participating in lesson study? What are some ideas for overcoming them?
9. Recalling to student activities, what advantages do you think your students have profited?
10. Did you get enough time to prepare the lessons and also reflect on them?
11. Was the administration and school community helpful in supporting you through the lesson study process? How? Describe the type of support which was available.
12. Does the school encourage your experimenting with lesson study?
13. Do you see any impact of lesson study on your school? Describe.
14. What are you doing differently now from what you were doing before participating in this study?
15. Do you have any plan of continuing lesson study? Why? If yes what opportunities are available? If no, why not?
16. Do you recommend lesson study as an appropriate professional development strategy for other Eritrean middle school teachers? Why? Why not?
17. Are there any other comments that you would like to add?

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School 'A'_ First teachers' focus group interview (*Tigrigna)*

Teachers interviewed: SAT1, SAT3, SAT4 and SAT5

Date interview taken 23/04/2013

Interviewed and transcribed by Researcher

Researcher (00:00:12) ፥ ከመይ ሓዲርኩም። መጀምርያ እንቋዕ ብደሓን መጻእኩም። ነዚ interview ፍቓደኛታት ብምኽንኩም የመስግን።

Researcher (00:00:17) ፥ ስለዚ እታ ናይ መጀምርያ ሕቶ ኣብ'ዚ Lesson Study ብምስታፍኩም ዝተማሃርኩሞ ነገር ኣሎ ዶ? ንኣብነት ዝረኸብኩሞ ሓድሽ content knowledge, pedagogic knowledge ዝረኸብኩሞ ኣሎ ዲዩ, working and sharing ideas with colleagues, ከምኡ'ውን observation skill ዘማዕበልኩሞ ኣሎ ዲዩ? Lesson planning skill? Was the lesson study process successful in terms of improving your content knowledge, pedagogic knowledge, working and sharing ideas with colleagues, observation skill, and lesson planning skill? ኣብዚታት'ሲ ለውጢ ወይ ከኣ improvement ዘርኣኹሞ ወይ ዝረኸብኩሞ knowledge ኣሎ'ዲዩ? ብመምህር SAT1 ክንጅምር'ዶ?

SAT1 (00:01:26) ፥ ዝረኸብናዮ knowledge ብዙሕ ኢዩ 'ምበር። ብዙሕ'ምበር። ንሕና ንገዛእ ርእስናስ ተማሂርና'ውን ክንበል ንኽእል ኢና። እንታይ ማለተይ ኢዩ። ንኣብነት መጀመርታ SAT2 ከቕርባ ከሎ እቲ ዝነበረ ጉድለት ርእይ ኣቢልካ ተኣሪሙ፣ elaborate ኮይኑ፣ መማህራን'ውን ነቲ ቀዳማይ ዝማሃረ ኩላትና ኢና suggestion ንህቦ ነይርና። ኢዝኣ እንተትንብራ ነይርካ እዚኣ፣ እቲ ሓደ ዳኣ ይምሃር 'ምበር ናይ ኩላትና ሓሳባት ኢዩ ነይሩ። ገለና ንኣብነት ሕጂ directly ክንጅምር ዝደለና ኖኖ motivation የድልዮ ንብል፣ ገሌና 'ውን ከምዚ ንገብሮ ዝነበርና Physically 'ውን እንተራእካ ንዝኾነት ነገራት። ስለ'ዚ ካብ'ቲ ቀዳመይቲ እታ ካልኣይቲ እንዳተማሓየሸት መጺኣ ኢያ። ስለ'ዚ ንሕና ዝኸሰብናዮ ከማን ብዙሕ ኢዩ። ብዙሕ ንገብሮ ዝነበርና። ዝያዳ'ውን ትማሊ ሕጂ ንኣብነት እንድዒ ናትካ'ውን ሓጊዙና ክኸውን ይኽእል ኣብ ናይ ሳይንስ ናትና ነይሩ practically ኣብ'ቲ ትማሊ ዝተገበረ። እንታይ ኢዩ ሓጊዙና ሕጂ ኣብ'ዚ እቲ ዝገበርናዮ ምትሕብባር እቲ ዘርኣናዮ collaboration፣ እቲ ዘርኣናዮ ጉድለት ሓደ ነቲ ሓደ ክነግሮ ከሎ። ጉድለቱ ጥራይ ዘይኮነሲኢ፣ ጉድለት ኣይኮነን ግን'ሲ እዚ እንተትንብር ነይርካስ ዝያዳ መድመዐ ነይሩ፣ class ከምዚ እንተትንብር ነይርካ፣ እቲ grouping ንኣብነት ቅድም ካልእ ነይሩ፣ ዳሕራይ እቲ grouping system ቀይርና፣ ዳሕራይ እቲ ናይ ኣመሃህራ ነገራት'ውን (ቀይርና) ኣ ኣ ኣ ካብቲ ቀዳማይ ካልኣይ እንዳተማሓየሸ ስለዝኸደ'ስ successful ነይሩ ሓፈሻዊ ኣነ ክብል ዝኽእል። ስለዚ lesson plan 'ውን ኩላትና ከምኡ ክኸውን ከምዘለዎ፣ lesson plan እንዳራእና ንንብሮ ዝነበርና ካብኡ ኣይወጻእናን፣ስለ'ዚ ዕውት ኢዩ ነይሩ፣ እቲ ዝድለ goal'ሲ ተሃሪሙ ክብል እኽእል፣ ኣብ ኩላትና ኣብ ተማሃሮን ኣባናን።

Researcher (00:03:07) ፥ መምህር SAT5 ናባኺ።

SAT5 (00:03:13) ፥ ብሓፈሻ ኣእኣ በዛ ነብሰይ ንዓናስ ዕብየት ዝረኸብና ኮይኑ ተሰሚዑኒ፣ especially ኣምም experience ዘይብልና መማህራን፣ ሕጂ ንጅምር ዘለና ማለት ኢዩ፣ ዝያዳ ካብቶም experience ዘለዎም በዚኣ (ብ lesson study) ድማ ተሓብኒዝና፣ ብዙሕ'ውን ክንርኢ ኪኢልና። ካብ'ቲ content knowledge ጀሚርካ ዝነበረ ካብ መጀመርያ ካብ grade 8 ጀሚሩ skills develop ብምግባር፣ እቲ content ብምርዳእ ከመይ ገይርና elaborate ከምንብር፣ እዚ pedagogic knowledge ንባዕሉ እንታይ ዓይነት ኣገባብ ክንጥቀም ንኽእል፣ instead of just lecturing method ከመይ ገይርና demonstrate ንገብር? In the form of easy way ኣብ ክንዲ lecturing method ሲኒ እንታይ ክንጥቀም ንኽእል ብምባል ንሱታት ተማሂረ። ካልእ working and sharing ideas with colleagues፣ ናይ ብሓቂ እቲ ዘሑጉስ ነገር ስኒ criticize ንገባበር ነይርና። እቲ positive ከማን ኩሉ ፍሉጥ እንድዩ ንሱ ኣሎ፣ እቲ negative ዝንገረና ዝነበረ personally ከይወሰድና ንዓቢ ከምዝነበርናስ ንርእዮ ነይርና፣ ነፍስወከፍ መምህር ማለት ኢዩ። እዚኣስ ከምዚኣ ክትግበር ኣለዋ፣ ክስቶ ከዳልዋ ከሎ ከምዚኣ ንግበራ። ማዕረ ይኹን ክንዲዚ ዓመት ሚሂርና ድዩ ሚሂርና ዲና ኣይመሃርናን ድና (ናይ ስራሕ ተመኩሮና ብዘየገድስ) criticism ዝነበረ ብpositively ንወስዶ ነይርና። ዕብየት ከምንርኢ ዝነበርናስ ይርእዮ ነይረ። observation skill ዝነበረ ካብ መጀመርታ ክሳብ ሕጂ ዘሎ እንዳዓበየ ከይዱ። መጀመርታ observe ክንብር ከለና፣ ዳር.ጋ ተሓጺርና ኢና ነይርና። ዳሓር ካብቲ sharing ideas ዝነበረ እቲ ናትና skills observe ገይርና እንታይ ክነውጽእ ከምንኽእል ክንዘራረብ ጀሚርና። እቲ ዝርርብ ድማ more detailed እንዳኾነ መጺኡ ማለት እዩ። More detailed ክኸውን ከሎ ድማ more ስራሕ ክንሰርሕ ሓጊዙና ኮይኑ ይስማዓኒ። Lesson planning skills ንብሎ ዘለና ኣ ኣ ኣ እንድዒ ኣይራእኹሉን። ኣብዚ Lesson planning skills ንብሎ ዘለና፣ ምውጻእ ኣውጺእና ኢና፣ ግን ኣይተዘራረብናሉን ይመስለኒ። እቲ lesson ከመይ ኣውጺእናዮ፣ ከመይ ክትከውን ኣሎዋ Researcher ንዓና ሓጊዙና ነይሩ። እቲ ዘውጻእናዮ ኣስፈሑልና ነይሩ፣ ግን ብዙሕ ብዛዕባ እቲ ዘውጻእናዮ lesson ብዙሕ ዝተዘራረብናሉ ኣይነበረን ኮይኑ ይስማዓኒ። ካልእ ብሓፈሻ ብጣዕሚ ብዙሕ ሓጊዙና ኮይኑ ይስማዓኒ።

Researcher (00:05:35) ፥ መምህር SAT3

SAT3 (00:05:41) ፥ እወ ናይ ብሓቂ እዚ ዝገበርና ናይ ብሓቂ ሓጊዙና እንድዩ፣ ኣነ ግን ብፍላይ ኣብ'ቲ ኣነ ዝረኸብኩዎ (ዝተማሃርኩዎ) ክዛረብ እንተኾይነ፣ ኣብ'ቲ pedagogical knowledge, working and sharing ideas with colleagues, ዋላ እታ lesson plan'ውን። ድሕሪ እዛ ዎርክሾፕ'ሲ ክንስከፍ ጀሚርና ኣብቲ lesson plan ኣወጻጻኣ። ገለዶ ኮን እንተወሰኽናሉ ይሓይሽ ካብ'ቲ ዝተማሃርናዮ ኢልና'ሲ (ክንስከፍ ጀሚርና)። ከምዚ SAT5 ዝበለቶ እቲ lesson plan ምሉእ ብምሉእ ኣይቀየርናዮን እቲ

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lesson plan (lesson ኣወጻጻኣና ኣይቀየርናዮን) ግን እስከ ቅድሚ ሕጂ እንታይ ዲና ንብል ነይርና፣ class size ከጽግመና ኢዩ፣ ዋላ 40 mintutes ድማ ብዙሕ ኣኻሊ ኣይኮነን ኢና ንብል ነይርና ቅድም። ሕጂ ግን ኣብታ 40 mintutes ስኒ ዋላ እቲ grouping ከምቲ ዝገበርናዮ ሰድያታት ኣውጺእካ ድዩ ገለ፣ ቁሩብ ኣመሃህራናስ ክንቐይር ኪኢልና ኣለና። ዋላ ነቶም ናትና colleagues እቶም ዝተዓዘቡ ፈቲዮሞስ ለውጢ ከምዘለዎ ኣሚኖምሉስ ጽቡቐ ንኽይድ ከምዘለና ኢዩ ከዛረብ ዝኽእል።

SAT4 (00:06:58) ፥ ሕጂ ብዝያዳ ኩሎም ኢሎሞ እንድዮም ሕጂ ግን ኣነ ሓፈሻዊ ከብል ከለኹ ከም ምኩርቲ መምህር መጠን ማለት ኢዩ (ሓፈሻዊ ከዛረብ እንተኾይነ)፣ ንሕና ዝያዳ ምኩራት ተባሂልና'ኳ ከማን'ሲ ብዛዕባ lesson study ዝያዳ ኣፍልጦ ኣይነበረናን ብዛዕባ'ዚ። ሕጂ ኣብ'ቲ content knowledge ንገዛእ ርእሱ (ኣገባብ ኣመሃህራ) ኣነ ብናተይ ኢየ ጥራይ ዝኸይድ፣ መምህር SAT1 ብናቱ፣ እቲ ሓደ ብናቱ ኢዩ ዝኸይድ ነይሩ። ሕጂ ኩላትና ተኣኪብና ብዛዕባ እታ ንምህራ content እዚኣ ከምዚኣ፣ እዚኣ ከምዚኣ ክንብል ከለና ዝያዳ ነቲ ፍልጠት ክነስፍሒ ኪኢልና ማለት ኢዩ። ኣብ'ቲ ናይ ምምሃርን ምስትምሃርን ንገዛእ ርእሱ ዋላ ልዕሊ 20 ዓመት ንምሃረሉ ኣነ ካብ'ዚ ክንማሃሮ (ክንሰርሖ) ዝቐነናስ ዝያዳ ልዕሊ ካልእ ኢየ ማዕቢለ። ኣነ እንታይ ክብል ኢየ ደሊየ ኣብ'ቲ ናይ ኣመሃህራ ዋላ እቲ ፕላን ከምዘሎዎ ይኹን ደኣ'ምበር እቲ observation ንገዛእ ርእሱስ ኣብ ተማሃሮ ብዙሕ focus ኣይንብርን ነይርና፡ ኣነ ከም መምህር መጠን። ኣነ introduction ሂበ development ኣቲየ ስቐ ኢለ ልዙብ ኢየ ዝኸይድ ነይረ። ሕጂ ግን ተማሃሮና ዝያዳ focus ክንብረሉም ከለናስ ዝያዳ ከድምዑ ከምዝኽእሉ ንሶም፣ ንሕና ከኣ ኣብኡ እንድሕሪ ንጥምት ኮይና ከኣ ዝያዳ ብዛዕባ እቲ lesson deeply ኣቲና ተመራሚርና ድዩ፣ ዋላ ኣስፈሕና knowledge ሒዝና ድዩ፣ ፍልጠት ሒዝና ድዩ መጺእና ከንምህሮም ከሎና ጽቡቐ ውጺኢት ክህልዎም ከምዝኽእል ኢየ ተረዲኡ ዘለኹ። ብተወሳኺ ኣነ ዘይፈልጦ መምህር SAT1 ዝፈልጦ፣ መምህር SAT2 ዝፈልጦ ኣነ ዘይፈልጦ፣ እዚ ኩላትና ተሓጊዝና ነቕርቦ plan ብጣዕሚ ሓጋዚ ኮይኑ ኢየ ረኺበዮ ዘሎኹ። ስለዚ ዝያዳ ነዚኣም ጥራይ ዘይኮነስ ነዞም ሓደሽቲ መማህራን ንዓና። ኣነ ከም መምህር ንገዛእ ርእሰይ ዓቢ ለውጢ ክገብር ኢየ ዝብል ኣነ። ኣብ'ዚ ሕጂ ዝምህሮ እቲ ፕላነይ ጠቕላላ ክቕይሮ ኢየ ዝብል ሓሳብ ኢዩ ዘለኒ። ምኽንያቱ ጽቡቐ ነጥቢ ኢና ሕዝና ዘሎና። ኣገዳሲ ኢዩ።

SAT1 (00:08:49) ፥ እወ ተወሳኺ ካኣ ምስኣ፣ እዚ lesson plan ናይ ብሓቂ ጠቒሙና ኢዩ። እዚ ከምቲ ክትብሎ ዝጸንሐት፣ ኣብ ክንዲ ገለና ንገብሮ ገለና ድማ ዘይንገብሮ ዝነበርና ሕጂ ግን ዝግበር ምኽኑ። እቲ መጽሓፍ'ውን ናይ ብሓቂ ጽቡቐ መጽሓፍ ኢዩ፣ ናይ ሳይንስ። ልክዕ ከምዛ lesson plan ኣቐሪብካያ ዘለካ ከምኣ ኢያ። ምኽንያቱ let us discuss፣ motivation ብኣቶም (ብተማሃሮ) ኢዩ ዝጅመር። ምስቲ ናታቶም daily life activities ምስኡ relate ኢዩ ዝገበር። ንሕና እንድሕሪ ገይርናያ እታ lesson plan 'ውን ብስርዓት ናብኣ ኢያ ትወቅዕ። ንድሕሪት ተመሊስና ከንርእዮ እንትኾይና let us discuss ትጅምር፣ activity ትገብር፣ እዛ ዝገበርናያ ኣብኣ ከላ ኣብ'ታ መጽሓፍና ኣላ። ንስኻ ስለዝሃብካና ዘይኮነስ ኣብቲ መምርሒ'ውን ከምኡ ኢዩ ዝእዝዝ። ግን ሕጂ ግድነት ክግበር ከምዘሎዎ ዝያዳ ንዓና ከምዚ መተባብዒ ረኺብና ማለት ኢዩ። ከምኡ ኢና ንገብር ዘሎና። ከምዚ ዋላ ነንሕድሕድና ክንመሃሃር ከሎና'ውን ብኽምኡታት ስለዝነግር ኣብ'ቲ መጽሓፍ፣ grouping, discussion ኣለዎ። ናትና መጽሓፍ እንድዒ ፍሉይ ኢዩ። ኣብ ቀደሙ ንሕና ከምኡ ኢና report ነቕርብ። ኣብ ዝኾነ ኣኼባን ጽቡቐ ኢዩ ናይ ሳይንስ።

Researcher (00:09:52) ፥ activity-based ኢዩ።

SAT1 (00:09:53) ፥እወ activity-based ኢዩ። Yes

SAT5 (00:09:57) ፥ ብተወሳኺ ኣነ እንታይ ተማሂረ፣ ኣብ'ዚ lesson ኣኣኣ ok እታ topic ይፈልጣ ይኸውን እንድየ እታ topic ግን ኣብ'ታ ሓንቲ lesson subtopic ስኒ ማዕረ ክንደይ ምድላው ከምዘድሊ ኢየ ተማሂረ፣ ናይ ብሓቂ። more confidence ከምዝህልዎ ይገብር ነቲ መምህር ። ዝኾነ ሕቶ ድዩ ዋላ motivated ይኾኑ ተማሃሮ። እቲ ናታቶም capacity ትዕቅነሉ confidence ይህበካ። ካልእ እዚኣ ልክዕ ከም ዎርክሾፕ እንተትዋሃብ ነይራ፣ ኣኣኣ 7ይ ክፍሊስ ኣነን SAT3ን ኣለና፣ ኩላትና ብሓንሳብ ከምዚኣ disscuss እንተንገብር ነይርናስ ማዕረ ክንደይ ምጸበቐ ነይሩ። እዛ ቤት ትምህርቲ really ለውጢ መምጸኣት ኮይና ኢያ ትስማዓኒ። እቲ ጊዜ ተዋሂቡና እንተዝህሉ ነይሩ፣ ኣብ ሰሙን ሓንሳብ እታ lesson plan ብሓንሳብ እንተነውጽእ ነይርና፣ ሕጂ lesson plan ክነውጽእ ከለናስ ኣኣኣ SAT3 ጓል ገሬ ክሳብ ኣበይ ኢኺ ክተውጺኢ እንተዝብለኒ ok ክሳብ ኣብዚኣ ክንውድእ ኢና እብል፣ እንታይ ንገብር ግን ኣይንዘራረብን። ስለ'ዚስ that is እቲ ናቱ ዘሎ ፍልልይ ማለት ኢዩ። ከምዚኣ ኮይና እንተትሰርሕ ስኒ more effective ምኾነት ኮይና ትሰሚዓትኒ።

Researcher (00:11:07) ፥ ሕጂ ናብታ ካልኣይቲ ሕቶ ክንከይድ ኢና። ናይ ግድን ብምምላስ ብሪጋ ዘይኮነስ፣ ሕጂ እዚኣ ናይ መጀመርታ ሕቶ ስለዝኾነት'ምበር ከም ድላይኩም ክትዛረቡ ኢኹም። ሕራይ ኣብ'ቲ ዝተጠቐምኩምሉ teaching strategies ከምዚዝበልኩኹም ሕቶታት ክደጋገም ስለዝኽእል ኣይተብሉ። ሕራይ። ክደጋገም ይኽእል ኢዩ ማለት ኢዩ። ሕጂ ሓደ ዓይነት instructional strategy ትጥቀሙ ነይርኩም ማለት ኢዩ። ሕጂ መብዛሕቲኡ ናይ demonstration ኢና ተጠቂምና ማለት ኢዩ። ሕጂ ኣብ'ዚ ለሰን ስታዲ እዘን ዝመሃርኩመን lessons ዝተጠቀምኩምሉ strategy'ስ ካብ'ቲ ኣቀዲሙ ትጥቀምሉ ዝነበርኩም strategy'ስ እንታይ ፍልልይ ኣለዎ ማለት ኢዩ። In what ways are the instructional strategies that you have used in lesson study process similar or different from the strategies that you have used in the past. ካብ'ቲ ትጥቀምሉ ዝነበርኩም እንታይ ፍልልይ ኣለዎ እንታይ ከ similarities ኣለዎ። እቲ ኣገባብ ኣመሃህራ ማለት ኢዩ።

SAT1 (00:12:21) ፥ እወ ኣነ ክጅምር። እቲ (ንጥቀመሉ) instructional 'ኳ (strategy) ሓደ ኢዩ። ሓንቲ difference ንሕና ዝገበርናያ more emphasize ገይርና ኣብዚኣ፣ ንኣብነት expansion ኣብዛ ንሕና ዝማሃርናያ ናይ 8ይ ክፍሊ፣ expansion of materials እንድያ ትብል።

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Researcher (00:12:35) ፥ እወ

SAT1 (00:12:36) ፥ expansion of materials in general and in particular in gases ኢና ገይርና ሕጂ ንሕና። ስለዚ ነታ gases ዝያዳ ኣድህቦ ስለዝገበርናላ 40 ደቂቐ ዝያዳ emphasize ገይርና ክብል እኽእል። እቲ ዕብጥ ዕብጥ ዝነበረ ንኣብነት (;;;;;;;)። ካበይ ኢዩ ዝኸይድ ነይሩ፣ እቲ gas፣ ሕጂ ንኣብነት ኣብታ ናይ SAT2 ዝዝከረኩም እንተኾይኑ፥ እቶም ጋዛትሲ ካባይ ኢዮም ዝዝርግሑ ነይሮም፥ ካብቲ ሸሓኒ ካብ'ቲ ማይ ይገብሩዎ (ይመስሎም) ነይሩ። ትማሊ ግን ጽቡቐ ተረዲኣቶም ካብ'ታ ጥርሙዝ ዝነበረት ደኣ'ምበር ኢሉ ገለጹልና ነይሩ። ስለ'ዚ እንታይ ኢና ገይርና ዘሎና ሕጂ፥ ዝያዳ exaggeration ገይርና ኣለና ማለት ኢዩ። ኣብ ክንዲ ናይ ሰለስቲኡ ብሓደ መዓልቲ ንውድኡ ዝነበርና ናይ solid ንበይኑ፣ ናይ liquid ንበይኑ፣ ናይ gases ንበይኑ ናይ ሰለስቲኡ ኢና ኣቕርብና። ትማሊ select ገይርና ኢና ናይ gases ወሲድና'ምበር ናይ ኩሉ (ብሓንሳብ) demonstrate ክትገብር ተኽእሎ ኣሎ። ስለዚ እቲ instruction ሓደ ደኣ ይኹን'ምበር እቲ ክስታይ (instruction) ዝያዳ ከምዝሰፍሕን ከምዝዓሙቕ ገይርና ነታ ሓንቲ ኣርእስቲ ነታ ሓጻር'ሲ ኣእኣ ምሉእ period ተዋሂቡዋ። ስለዚ ብኡ ምኽንያት ካብ'ቲ ናይ ቀደም ኣመሃህራ ምምሕያሽ ኣርኢና ኣለና። ኣብ ክንዲ'ቲ answer ጥራይ፣ inflates the balloon ገለ መለታት ኢልና ንሓልፎ ዝነበርና ሕጂ ግን ዝያዳ ተረዲኡዎም፣ ምኽንያቱ ንፉዓት'ውን ነይሮም፥ ጊዜ ስለዝረኽብና ማለት ኢዩ። እምበር እቲ ኣገባብ ንሱ ኢዩ ዝተቐየረ የለን ዝተለወጠ ነገራት ኣይነበረን፣ ግን ብዝያዳ ኣድህቦ ሂብናዮ፣ ስለዚ ዋላ እቲ ከይተረዶኡ ዝጸንሐ'ውን ክጥቀም ኪኢሉ ከምዚ revision ዓይነት ኮይኑሉ፣ጊዜ ኣጥፊእናስ ዝያዳ ተጠቒምና ማለተይ ኢየ።

Researcher (00:14:16) ፥ ዝኾነ ክዛረብ ዝደሊ microphone ክወስዳ ይኽእል ኢዩ።

SAT3 (00:14:18) ፥ ብኽመይ ይፍለ እቲ ስትራተጂ እንድዩ ዝብል ዘሎ፣ actually ከምዚ መምህር SAT1 ዝበሎ እቲ ስትራተጂ ሓደ እንድዩ፥ ግን እንታይ ዝፍለ ነገር ኣሎ ሕጂ ኣብቲ ኣገባብ ኢዩ (እቲ ሕቶ)። ኣብ ሰንበት ዎርክሾፕ ነይሩና ኣብ'ዚ ቤት ትምህርቲ ስኒ፥ 75% ተማሃራይ ክዛረብ ኣለዎ 25% ከኣነ መምህር ክዛረብ ኣለዎ እንድዩ፣ ግን ብኣንጻር ኢና ክንከይድ ጸኒሕና። ሕጂ በዚ ዝወሰድናዩ ኣገባብ more chance ነቶም ተማሃሮ ክንህቦም ጀሚርና። ኣእኣ እቲ 75% ሲ ክዛረቡ ከምዝኽእሉ plus ከኣነ teaching aid ከኣ። ቅድሚ ሕጂ ከምዚ መምህር SAT1 ዝበለሉዎ ዋላ ኣምጺእካ teaching aid'ሲ ባዕልኻ ኢኻ ተርእዮም ነይርካ። ምስታ period ጉያ ጉያ ኢልካ ከምዚ ከምዚ ኢዩ ኢልካ ሕልፍ ትብላ። ሕጂ ግን ብስርዓት ኩሉ እቲ materials ቀሪብካ ተማሃራይ ባዕሉ ወጺኡ demonstrate ከምዝገብር። ሕጂ ነቲ ተማሃራይ ዕድል ብምሃብን ብዙሕ teaching aids ብምቐራብን ገይርናስ ካብ'ቲ ቅድሚ ሕጂ ከኽይድ ዝጸንሐ ፍልይ ኣብልናዮ። ዋላ እቲ ኣገባብ ሓደ ዓይነት እንተጸንሐ ማለት ኢዩ።

SAT4 (00:15:33) ፣ ሕጂ እንታይ ክብል ደልየ ኣነ፣ እቲ ክስታይና (ርእቶና) ኩሉ ኣብ'ቲ ወረቐት ጽሒፍናዮ እንድና ንኣብነት class size, እቲ classroom ንገዛእ ርእሱ ምቹእ ኣይኮነን። ሕጂ ግን ኣብዛ ናይ lesson study ንሕና ካብ'ቲ ቀዳማይን እዚ ናይ ሎሚን እንታይ ፍልልይ ሪኤሉ ኣነ ኣብ'ቲ ናይ ቀደም ከምዝዝበልኩኻ ኖርማል ኢና ንኣቱ ብዙሕ ኣይንዳሎን፣ ብፍላይ ከምዚ ንሕና ለሚድናዮ ስለዝኾናስ ኣነስ መጽሓፍ ከማን ከይገንጸልኩ ዝኣትወሉ ጊዜ ኣሎ። እዛ ናይ lesson study research እዚኣ ግን ብጣዕሚ ኣገዳሲት ኢያ። ስለምንታይ ተጠንቒቐ ኢያ ዝኣቱ ኩሉ ጊዜ ማለት ኢዩ። ጥንቐቕቲ ኢየ። ኣብ ተማሃሮ ዘለኒ ኣረኣእያ ጥንቐቕቲ ኢያ ማለት ኢዩ። ስለ'ዚ ሕጂ እቲ ፍልጠት'ሲ እቲ ለሰን ብግቡእ ኣብ ተማሃሮ ብኽምይ ይመሓላለፍ ትብል ነጥቢ ኩሉ ጊዜ ምሳይ ኣላ። ካብ'ታ መጀመርታ ዝኣትወላ ኣትሒዘ ማለት ኢዩ። ከመይ ገይረ ኢያ motivate ዝገብሮም? ከመይ ገይረ lesson flow ይገብራ? ተማሃሮ ከመይ ገይረ ናባይ ይስሕቡም፣ ብኽመይ ብግብሪ ብ theoretical ዘሎ ብኽምይ ብግብሪ የርእዮም? እዚ ኩሉ እዚታት'ሲ በቃ የጠንቐቕካ ኢዩ ብሓጺሩ። Ready ኮይንካ ኢኻ ትኣቱ። ስለዚ'ሲ negligence ትብሃል'ሲ ኣብዚኣ'ሲ ኣይትራኣይን ኢያ። እዚኣ ኢያ።

SAT5 (00:16:54) ፥ ኣብዛ ናተይ ክመጽእ እንተኾይና ክልተ ነገራት ተማሂረ ማለት ኢዩ። ሓንቲ ኣብዛ parallel and series circuits ክምህር ከሎኹ ቅድሚ 3 ዓመት ማለት ኢዩ፣ ሱፐርቫይዘር ኣቲዩኒ ነይሩ። ኣብኡ ምስኣተወ (ኣብ'ቲ ጊዜ'ቲ) wrong information ሂበ ማለት ኢዩ፥ ምኽንያቱ ብኽምኣ ስለዝተማሃርኩ። መጺአ ንstaff ከማን ሓቲተ። ነተን bulbs ናይ street (ንደና) ስኒ እንታይ ኢየን series ድየን ወይስ parallel ። i remember ንዓይ መምህረይ ዝመሃረኒ and ኣነ ኣይቕለብኩሉን ወይ ድማ research ኣይገበርኩሉን፥ ኣይተዳለኹን መጺአ። እንታይ ኢለዮም ኦኣእ series 'ዩ ገለ ኢለ ምህረዮም ማለት ኢዩ። Are you sure ኢሉኒ ዳሕራይ ምስወጻእና feedback ክህበኒ ከሎ። እወ sure'የ መጺአ ሓቲተ መማህራን ከማን'ሲ series 'ዩ series 'ዩ ኢሎምኒ። ሓቲተኪ ይኽውን መምህር SAT4። series 'ዩ ተባሂልና ብዝኾነ ሱፐርቫይዘር መጺኡ ብዙሕ explanation ሓጊዙና፣ ኣነ ድማ ኣብ internet search ገይረ ከምዝተጋኹ ፈሊጠ፣ ስለዚ research ከምዘድልየኒ ተማሂረ። ካልእ እንታይ ነይሩ demonstrate (ንገብረሉ መሳሪሒ) ኣይነበረናን፣ ማለት እተን bulbs ኣይነበረናን ንሱ (bulbs) ሱፐርቫይዘር ሓጊዙና ማለት'ዩ። ካብ ቤት ትምህርቲ ተክኒካል ኣብ'ዚ ትሪኡ ዝነበርካ ብምምጻእ ሓጊዙና፣ ክንሰርሕ ክኢልና። Still ግን ምምሕያሽ ኣየርኣኹን በዛ ነብሰይ ምስዛ መጽናዕቲ ከተሓሕዛ ከለኹ፣ እታ demonstration still ብኣ ኢያ ትኽይድ ነይራ። እቶም ተማሃሮ ነቲ parallel ን series circuit ቀሪቦም ክርእዩ ከለው ኢዮም ዝኣምኑ። one path, different path ክንብሎም ከሎና ሲኒ still wires ይርእዩ ኣለው but they don't know the difference። ሕጂ more ዕድል ንህቦም ኣለና። እነሀለ ነት path ይርእዩ ኣለው፣ እቶም ተማሃሮ ክሰርሑ ከለው ማለት ኢዩ። ስለ'ዚ they feel at ease ኮይኑ ይስማዓኒ። ካልእ እንታይ ዘየቐልበላ ዝነበርኩ ካብዚኣ ዝተማሃርኩዋ sub-groups ኢያ ነይራ። sub-groups ሓሲበዮ ከማን ኣይፈልጥን ኢየ። Groups ንገብር discuss ይገብሩ ኣለው ኢለ ኢየ ዝሕስብ ነይረ። ካብዚኣ ጀሚረ ዝተማሃርኩዎ ነገር እንተሎ sub-groups ከምዘይፍጠር ንምርግጋጽ circulate ምግባር ከምዘድልየኒ። ዋላ ዝኾነ ተማሃራይ left out ከይከውን dominated ከይከውን ካብዚኣ ዝተማሃርኩ ኮይና ትስማዓኒ። ክቐይራ ዝፈተንኩ ማለት'ዩ።

Researcher (00:19:03) ፥ ሕራይ የቐንየልና። ከምዚ ቅድም መምህር SAT4 ዝበለቶ ቅድሚ ሕጂ'ሲ ኣነ በይነይ፣ መምህር SAT1 በይኑ፣ እቲ ሓደ መምህር በይኑ በበይንና ኢና ንሰርሕ ነይርና ኢልኪ ነይርኪ። ኣብዚ lesson study ግን መምህር collaborate ገይሩ

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ኢዩ ዝሰርሕ ዝብል ማለት ኢዩ። ግን ኣብቲ normal እዋን collaboration የለን ማለት ኣይኮነን። መምህር ምስ መምህር'ሲ collaborate ይገብር ኢዩ። ስለዚ ኣብ ጊዜ ለሰን ስታዲ experience ዝገበርኩሞ collaboration ምስ'ቲ ቅድሚኡ ዝነበረ collaboration ብምንታይ ይፍለ ብምንታይ'ከ ይመሳሰል?

SAT4 (00:19:55)፥ collaboration እንድሕሪ ርእና ሕጂ ኣብዛ ቅድሚ'ዛ ናይ lesson study መጽናዕቲ ምውሳድና (ምስታፍና) ኣነ ኣብ'ቲ unit ብካልኦት ኣይውሰንን ኢየ ነይረ። ኣነ ብድላየይ ዓይነት መገዲ ከምህሮም፣ የጽሕፎም፣ ይሓቶም፣ የብሎም። ካብ'ዛ ድሕሪ lesson study ግን ንሓንቲ lesson ክንምህር ከለና ኣብ'ዛ lesson እንታይ እንታይ ክመሃሩ ኣለዎም ንብል። እንታይ ይጽሕፉ፣ እንታይ exercise ይዋሃቡ፣ እንታይ ሕቶታት ይሕተቱ፣ እንታይ experiment ንሰርሕ፣ እዚ ኩሉ ውሱን ኮይኑ ናይ ሰለስተና ሓሳባት ዝኣተዎ ኮይኑ ዝወደቐ ኮይኑ እቲ lesson plan ድዩ ዋላ እቲ lesson note ይዳሎ። እቲ ናይ ቅድም ዝነበረ ግን ዋላ ውሱን collaboration ይሃሉ unit ክንድዚ ኢና በጺሕና እዛ sub-topic ኢና ንምህር ንብል፣ ግን ኣነ እንታይ ዓይነት note የጽሕፎም፣ መምህር SAT1 እንታይ ዓይነት note የጽሕፎም፣ መምህር SAT2 እንታይ ዓይነት note የጽሕፎም ኣይንፈልጠን ኢና። Oral ኣነ እንታይ ይሓቶም፣ ወይ ኣብ motivation እንታይ ይጥቀም፣ SAT1 እንታይ ይጥቀም፣ SAT2 እንታይ ይጥቀም ኣይንፈልጠን ኢና። እዛ collaborate ኮይንካ ኣብዛ lesson study ኮይንካ ምስራሕ ግን ዋእ ብጣዕሚ ኣነ'ሲ ካልእ ነጥቢ ኣነ ዝሓስባ ሓሳብ ንSAT1 ረኺበ ክነግሮ ከለኹ እታ motivation ንሱ ይጥቀመላ፣ እታ SAT1 ዝተጠቐመላ motivation SAT2 ክጥቀመላ ከሎ ሓደ ዓይነት plan follow ንገብር ኣለና ማለት ኢዩ። ስለዚ ንተማሃሮ ሓደ ዓይነት ነጥቢ ኢና ነመሓላልፈሎም እንድሕሪ collaboration ኣሎ፣ እንድሕሪ ዘየሎ ግን የለን ማለት ኢዩ። ስለዚ ቅድሚ ሕጂ ብዙሕ collaboration ኣይነበርናን። ኣብኡ ከሎ ጥራይ ክምዚ ንግበር ንበሃሃል። ኣብዚኣ ግን ኮፍ ኢልና እዚኣን እዚኣን፣ እዚኣን እዚኣን፣ እዘን ሕቶታት እዚኣን፣ demonstration: እዚ experiment ንበሃሃል። ስለዘ'ሲ ፍልልይ ኣለዎ። ዝያዳ ኣድማሚ ከኣ እዛ ኣብ ጊዜ lesson study ተኣኪብካ ትሰርሓ collaboration ኢያ።

SAT1 (00:22:12) ፥ ካብ ቀደም ካብ ቀደም እዚ lesson plan ካብ ቀደም ብሓንሳብ ኢና ነውጽእ ናይ ሳይንስ። እቶም ናይ 8ይ ተሰማሚዕና እዛ ሰሙን እንታይ ንምህሮም፣ test ኣለና'ዶ quiz ኣለና'ዶ እንዳበልና እቲ lesson ፕላና ካብ ቀደሙ ሓደ ኢዩ ነይሩ። ከምዛ ዝበለታ ግን ናይ ሕጂ እንታይ ፍልልይ ተረኺቡ፣ ነዚኣ ናይ ሎሚ collaboration ከምትህሉ ንኣብነት እቲ ቅድሚ ሕጂ ኣይግድስናን ኢዩ ነይሩ፣ ንኣብነት ሎሚ SAT2 ኣብኩሩ ኣሎ፣ ኣብዛ ሰሙን እዚኣ ክንውድኣ ዝግበኣና ክውድእ ክብል ኣነ እትደኣ demonstration ገይረ ንሱ ኣይገብርን ክኽውን ይኽእል ኢዩ። ምኽንያቱ ዋላ በቲ ላዕለዋይ ኣካል ብሱፐርቫይዘራት እንታይ ኢዮም ዝብሉና ነይሮም፣ ሓደ መምህር ካብ ሓደ መምህር ክፈላለ ይኽእል ኢዩ። ናይ ሓሙሽተ መዓልቲ ምቅድዳም ወይ ምድሓር'ሲ ክህሉ ይኽእል ኢዩ። ሓደ ቅልጡፍ ክኽውን ይኽእል ሓደ ድማ ዝሑል ክኽውን ይኽእል። ሎሚ ግን ነዚኣ (lesson study) ተጠንቂቕና ኩላትና ሓቢርና ምሂርና እንታይ ክንገብር ኢና ኢልና ነቕርቦ ስለዝነበርና ከምዚ ደኣ ኣበይ ክርከብ፣ እቲ ጊዜ ግን ኣሎ ድዩ ንዳሕራይ ከምኡ እንተዘይኮይኑ። እዚ ንኣብነት ካብዞም grade 7 ክምሃሩ ከለው ዝገብሩዎ ዝነበሩ ነዚ ኣቕሑት ኣምጺእካ እዚ ኣምጡል ዶ ገለ መለ ገለ መለታት፣ ዋይ ውራይ ጨኒቁኒ ኢልካ ገዲፍካዩ ኢካ ትኽይድ ነይርካ፣ ኣኣኣ

ኩሎም፥ ሳሓቕ

SAT1 (00:23:14) ፥ እቲ ሓቂ ክንዛረብ እንተኾይና'ሲ፣ ሕጂ ግን practically ዝኣሞ ድዮም ባዕላቶም፣ ወይ እቶም ተማሃሮ ድዮም ኣምጺኦሞ። እቶም ተማሃሮ ድማ interested ኢዮም ኣብ ከምኡ። ኣኣኣ ኣበይ ኢኻ ትሰርሕ እንተኢልካዮም ኣብዚ ከምዚ ስለዝብሉኻ፣ ነዚ practical 'ውን ይደልዩዎ ኢዮም። ስለዚ እቲ ዝነበረ ብጣዕሚ ተመሓይሹ ኢዩ ዝቐርብ ነይሩ። ምኽንያቱ ንዓኣ ኩላትና ኢና ንዛረበላ፣ እዚኣም ክልቲኦም ብፍላይ ኣብታ ናቶም ንሕና ከኣ ሰለስተና ኣብታ ናትና ኣብታ ገግሬድና ዝያዳ ተሓጋጊዝና ስለዝገበርናዮ ዝያዳ ዕምቆትን ፍልጠትን ሂቡዎ ኢዩ። ተማሂርና ኢና ንሕና'ውን ካብ'ዚ። መን ክቅርቦ ኢዩ ነዚ ዝተቐረበ ኣቕሑት፣ እዞም ክልተ ዝቐረቡዎ ንኣብነት I don't know ካበይ ኣምጺኦሞ ፣ ሳሓቕ፣ ንስኻ ብስእሊ ገይርካ እትው ኢልካ ከምዚ ገይርካ ከምዚ ገይርካ ኢኻ እኮ ትሓልፎ። ከምዚ ዝበለቶ ኣብ ጽርጊያ ዘሎ series ኢዩ፣ ኣብ ገዛ ዘሎ parallel ኢዩ። ኣብ ጽርጊያ ዘሎ parallel ኣይኮነን ኢና ንበል ነይርና ብጌጋ ኩላትና። ሕጂ ግን ዝያዳ ክርዳኣና ኪኢሉ ኣሎ። ስለ'ዚ ከምዚ ደኣ ኣበይ'ሞ ክርከብ፣ ጊዜን፣ ስልጣኔን፣ satisfaction ናይ መምህርን፣ ናይ ክስታይን ክህሉ ኣለዎ ከምኡ ክትገብር። ዝተማልአ facilities 'ውን ክህሉ ኣለዎ። በቲ ፕላን ደኣ ይግበር እንድዩ። lesson plan ብሓንሳብ ኢና ነውጽእ። Test ብሓንሳብ ኢና ንህብ፣ ኩላትና ናይ ሳይንስ ብሓንሳብ ኢና ንሰርሕ፣ እዞም ናይ ሳይንስ ዝተመስገና ኢና ብoffice ኩላትና ካብ A – Z። ግን ከምዚ ናይ ሎሚ ከኣ ዝያዳ ዕምቕትን ስፍሓት ሂቡዎ ኣሎ ማለት ኢዩ።

SAT3 (00:24:45) ፥ ሕጂ እቲ collaboration ብኽመይ ይፈላለ እንድዩ እቲ ሕቶ፣ ዋእ ከም መምህር'ሲ እቲ collaboration ነይሩ ኢዩ። ዋላ ሕጂ SAT5 ከትጠቐሶ ጸኒሓ ኢያ። ሕጂ ኣነ lesson plan ከውጽእ ከለኹ ዓርቢ መዓልቲ እንተኾይና lesson plan ከውጽእ ከለኹ ጓል ገሬ ኣበይ ንብጻሕ ንበሃሃል ኢና። ሳሓቕ። እዚኣስ ከምይ ገይርኪያ ንብል ኢና። ግን ድሕሪ'ዛ lesson study ዘሎ collaboration እንታሽሙ ኮይኑ detailed ኢና ንገብሮ ዘለና ዕሙቕ ዝበለ ። ሕጂ ሓደ ሓደ መምህራን ኣለው ንፈልጦም ኣብዚ ምሳና መሳርሕቲ፣ ዋላ እቲ ሕቶ ጠፊኡዎም ከሎስ ነቲ መምህር ክሓቱ ዘይደፍሩ ኣለው። ኣነ ከም ሰብ መጺእ ንመምህር SAT4 ወይ ንመምህር SAT1 ክንደይ መዓልቲ እሓቶም ኢየ። ከምኡ'ውን ንSAT5 ምጽእ ኢለ እዛ ኣርእስቲ በርቲዓትኒ'ሞ ንገርኒ እብላ። ድሕሪ'ዚ ከኣ more , more confident ኮይነ ኣነ። መምህር'ሲ ከም ሰብ ክጋገ ይኽእል ኢዩ። ። ሕጂ collaborate ከኣ ክገብር ኣለዎ ስለዝተማሃርና ነጻ ኮይነ መጺኤ ኣነ ከም ተማሃራይ ኮፍ ኢለ ኣነ ንዓይ SAT4፣ መምህር SAT1፣ SAT5 ይምህሩኒ ንዓይ። ሕጂ'ሲ እቲ collaboration ነዕምቐ ኣለና ድሕሪ'ዛ study እዚኣ። ነይሩ'ዩ ግን ቅድሚ ሕጂ። ብዝያዳ ከኣ ሕጂ ንጥቀመሉ ኣለና ማለት ኢዩ።

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Researcher (00:25:59) ፥ ሕራይ። ሕጂ እንታይ ይብል ኣሎ። ስራሕና ንተማሃሮ ምምሃር እንድዩ፣ እቲ ዝማሃርናዮም ከም ዝተማህሩን ከምዝተረድኡ ከምይ ጌርና ነረጋግጽ። ሕጂ ንኣብነት ሓደ goal'ሲ successfully achieved ኮይኑ ክንብሎ ከለና'ሲ ከለና'ሲ ብኽመይ ነረጋግጽ፣ እንታይ ሓበርቲ ኣለው?

SAT3 (00:26:36) ፥ እንታይሽሙ፣ እቶም ንፉዓት ተማሃሮ ጥራይ ክሳተፉ ከለው'ሲ እቲ ውጥን ዕላሙኡ achieved ካኣ ንብል ነይርና። ግን ከምዚ ረስዕናዮ ነይርና ደሓር ዝዐረናያ። ኣብዘን ክልተ ደሓር ዝገበርናየን ግን (ዝማሃርናየን) ዳርጋ እቲ ለሰን'ሲ achieved ኮይኑ ክንብል ንኽእል ኢና። ምኽንያቱ'ሲ እቲ average ዝኾነ ተማሃራይ'ሲ ኣብ'ቲ class participate ይገብር ነይሮም። ዋላ እቲ ናቶም level of understanding ከማን ጽቡቕ ነይሩ። ዋላ'ኳ ተማሂሮሞ እንተነበሩ ኣብ ድግማ'ኳ እንተኾነ። ግን ሓዳስ ዘይተማህሩዋ lesson ኣይፈተና'ምበር ከምይ ከምዝኾኑ። ሕጂ እቲ goal acheieved ምኳኑ'ሲ በቲ ኩሎም ተማሃሮ ዝነበሩም participation ዕውት ነይሩ ኢልና ክንዛረብ ንኽእል። ብፍላይ እቶም ማእከላይ ዓቕሚ ዘለዎም ተማሃሮ present ክገብሩ ከለው።

SAT5 (00:27:43) ፥ ሕራይ ኣነስ ብምንታይ ይመዝኖም ነይረ ዋላ ካብ ቀደም ጀሚረ more ዘድህበሉ ኣብቶም weak students ኢዩ። ካብኡም ቁሩብ satisfaction እንተረኺቦ ዋላ ኣብ ኖት ድዩ ዋላ ኣብ sub-topic ይስጉም ማለት ኢዩ። ኣብዚኣ ዝጀመርና ካብ'ታ መጀመርታ መምህር SAT2 ዝመሃራ of course ነቲ presentation ስለዝነበረ mostly pressure (ጸቕጢ) ነይሩና እቲ atmosphere ናይቲ class ንኽይመውት እናበልና ንፉዓት ተማሃሮ ከምዝሳተፉ ንገብር ነይርና። እቲ goal achieved ከምዘይኮነ ስለዝራእናያ (ማለት ብዙሓት ተማሃሮ left out ኮይኖም) ግን እቲኡም ድኽም ዝበሉ ነቶም outstanding ተማሃሮ eliminate እንዳገበርና እቶም ድኽም ዝበሉ ንገብር ነይርና ማለት ኢዩ። ሕጂ mostly እቲ outstanding ተማሃራይ ናቱ research (ተበግሶ) ይህልዎ ይኽውን፣ ሓገዝ (ኣብ ገዛ) ይህልዎ ይኽውን። Of course potential ስለዘለዎ ብኡ ክትዕቅኖ ቅሩብተይ ይኽብደካ ይኽውን። እቲ ሓገዝ ዘይብሉ potential ዘይብሉ ኢልካ weak ተማሃራይ ሓደ ክልተ ነገር ካብቲ ዓሰርተ ዝማሃርካዮ ከነግረካ ከሎስ I think እቲ goal achieved ገይረዮ ኣለኹ (ክብል እኽእል)። If he able to tell you እንታይ ኢዩ at least parallel ን series circuit ምስ መሃርካ at least ተረዲኡዎ እቲ ፍልልይ ናይ parallel and series ciruit እንተነጊሩካስ እቲ goal achieved ኮይኑ ክንብል ንኽእል። Of course እቲ ንፉዕ ተማሃራይ'ውን ሽምዲዱ ከነግረካ ይኽእል ኢዩ። ተረዲኡዎ ዝነግረካ እንተኾይኑ ሓደ ማእከላይ ተማሃራይ እቲ goal of the lesson can be achieved ኮይኑ ኢለ ይሓስብ።

SAT4 (00:29:20) ፥ ብዛዕባ'ዛ ናይ participation ናይ ተማሃሮ ከኣ ብምንታይ ክንውስኖ ንኽእል ሓደ time ኢዩ። ጊዜ። እኹል ጊዜ እንተለኻ ንኹሎም ተማሃሮ ክተሳትፍ ትኽእል። ካልኣይቲ ቦታ ኢዩ፣ ቦታ ሕጂ ኣብ ክንዲ ኣብ class ኮይና demonstration ነርእዮም ሓደ ውሱን ቦታ ሓደ hall ድዩ ሓደ laboratory ንኣብነት እንተዝህሉ ነይሩ ኩሉ እቲ material (ኣቕሑት) ኣዳሊኻ እቶም ተማሃሮ በቃ ከምድላዮም ምራኣዩ። ከምድላዮም ሪኦም ከኣ ዝኾነ ነጥብታት እንዳሓዙ ዕድል ረኺቦም ክጽሕፉ፣ ክሓቱ፣ discuss ክገብሩ ምኻኣሉ። ስለ'ዚ ኣብ'ዛ ሓጻር ጊዜ እሞ ኣብ ምቹእ ዘይኮነ፣ ውሕስ ዘይኮነ ቦታ፣ እሞ ምስ ቁጽሪ ተማሃሮ ብዝሒ ተማሃሮ ንገዛእ ርእሱ፣ እዚታት ነቲ participation ናይ ተማሃሮ ይጸልዎ ኢዩ። ስለ'ዚ ንሕና ነታ 40 ደቒቓ እታ ለሰና (lesson ና) ክትውዳእ ጥራይ ስለንደሊ ነቶም active partipant ዝኾኑ ተማሃሮ ንዖኡም ጥራይ ኢና motivate ንገብሮም። ንሳቶም ቀልጢፎም ስርሕ ስርሕ ኣቢሎም የምጽኡ። ሕጂ ግን ነቶም ድኹማት ተማሃሮ ከነሳትፍ እንተኾይና፣ ጊዜ ክህሉ ኣለዎ፣ ምቹእ ቦታ ክህሉ ኣለዎ ብተወሳኺ class size ናይቶም ተማሃሮ ክውሕድ ክኽእል ኣለዎ። እዚኣን እንተተማሊኣን ንኹሉ ተማሃራይ ምስታፍ ይካኣል ኢዩ። እዚኣ ኢያ እታ ጸገም።

Researcher (00:30:38) ፥ ሕራይ ክንቅጽል። ሕጂ ንኣብነት ክሳብ ሕጂ ከክልተ lesson ብጠቕላላ 4 lesson ምሂርና ኣለና። ሕጂ ነናትኩ (ናይ ውልቕኹም) ከኣ ትምህሩ ኢኹም ብዘይካ እታ lesson study ማለት ኢዩ። ሕጂሲ ካብ'ዚ lesson study ዝረኽብኩሞ ሓድሽ knowledge ወይ ድማ ሓድሽ skill ኣብ'ቲ ብውልቕኹም ትምህሩዎስ ክሳብ ክንደይ ትጥቀምሉ። ሕጂ ንኣብነት SAT5 እንታይ ኢላ፣ sub-grouping ቅድሚ ሕጂ ኣድሂበሉ ኣይነበርኩን ሕጂ ግን ምድሃብ ጀሚረሉ ኣለኹ ኢላ። ሕጂ ከምዚታት ማለት ኢዩ ካብ'ዚ ዝረኽብኩሞ ሓድሽ ነገር ማለት ባዕልኹም discover ዝገበርኩሞ እንድዩ ኣብ'ቲ ናትኩም teaching ትጥቀምሉ እንታይ ኣሎ?

SAT4 (00:31:32) ፥ ንድሕሪ ሕጂ ዲዩ?

Researcher (00:31:36) ፥ ኖኖ ዋላ ንድሕሪ ሕጂ ይኹን ዋላ ንሕጂ እንዳመሃርኩም ከለኹም ይኹን።

SAT4 (00:31:40) ፥ ሕጂ እቲ ዓመት ተወዲኡ እንድዩ ሕጂ'ኮ already እቲ ዓመት ተወዲኡ ኢዩ።

Researcher (00:31:48) ፥ ዋላ ንድሕሪ ሕጂ ኸ?

SAT4 (00:31:40) ፥ ንዝመጽእ ግን ኣነ ከም ርእይቶይ ማለት ኢዩ እዛ lesson study ካብ መጀመርያ ትምህርቲ ክትጅመር ከላ ከም plan ክተሓዝ ክኽእል ኣለዎ። እቶም subject teachers ብሰክሽንን ብsubjectን group ኮይኖም እታ plan የውጽዋ። እታ ኣብኡ ዘላ experiment ድዩ ካልእ ብደንቢ ክትወጽእ ኣለዋ። ብተወሳኺ ኣብዛ ናይ ሳይንስ ሓንቲ ክፍሊ ክትህሉ ከምዘለዋ፥ ሓደ መምህር ከማን ኣብኡ ኮፍ ክብል ኣለዎ። Time table ኣውጺኡ ንነፍስ ወከፍ grade በብሳብጀክቱ በብፐሪዱ ሰሊዑ ኣብዝኣትውላ ጊዜ ይተሓባበር። መብዛሕቲኡ experiment ኢዩ ዝበዝሐ ሓደ ሓደ ኢዩ ዘሎ theoretical 'ምበር ዝበዝሐ experiment ኢዩ። ገሊኡ ንሓልፎ ኣሎ experiment ከይሰራሕና። ስለ'ዚ ኣዳሊኻ ብሕጂ ክስራሓሉ ይኽእል'ዩ ዝብል ተስፋ ኣለኒ። ንዓመታ ክንስርሓሉ ኢና ዝያዳ። ግን ገዛ ክዋሃበና ኣለዎ። ክፍልታት ክዋሃበና ኣለዎ።

Researcher (00:32:50) ፥ ዋላ ሕጂ ትጥቀሙሉ እንተልኹም ከምኡ'ውን ውጥን እንተለኩም ማለት ኢዩ። ካብ ክልቲኤን ሓደ።

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SAT3 (00:32:55) ፥ ንቅድም መምህር SAT1'ዶ ከዛረቡ፣ እህእ (ሳሓቕ)።

SAT1 (00:32:59) ፥ ሕራይ፣ እዚ ትብሎ ዘላ ልኽዕ እንድዩ፣ ከምዛ lesson study እንተደኣ ከምዛ ንምህራ ዘለና ክትካየድ እንድሕሪ ኮይና ሓደ ፍሉይ ገዛን lab technichian የድሊ። lab technichian እንትዝህሉ ኩሉ ነገራት ኣዳልዩ ስለዝጸንሕ ዋላ ሓንቲ ጸገም ኣይህልወናን። ንስኻ ከምዚ ናይ university level ኢዩ ዝኸውን ዘሎ። ንስኻ instruction ጥራይ ትህቦ lab technichian ዝቅርበልካ። ኣነ ይእዝዞ ልኽዕ ከም መምህር መጠን። ኣብ'ዚ high school 'ውን ንጥቀመሉ ነይርና ኢና። ኣነ instruction ይህብ። ንኣብነት ባላንቺናን እዚኣን እዚኣን ትቕርብ ማይ ውዑይ'ውን ከህልወካ ኣለዎ እብሎ። ከምታ ዝገበርናያ ንኣብነት። ኣነ ነቶም ተማሃሮ instruct ይገብረሉ። ንሱ ኣዳልዩዋ ይጸንሕ። ንሱ ዝፈልጣ ነገራት የብሉን ምቕራብ ጥራይ ኢዩ።እቲ questionning and answering ኣነን ተማሃሮን ኢና ንገብራ። ስለዚ lab technichian ተፈልዩ እንተዝህበር'ሞ ከኣ ኩሉ እዘን ዘሎዋ ግሬድስ ናተይ፣ ናይ SAT2 ናይ SAT4 ተማሃሮ በብተራ በብፐሬዶም እንዳኽዱ ምስርሑ። ምስለጠን ምጸበቕን ነይሩ። ሕጂ ግን ከምኡ ኣይኮነን ኣብ ከክላስና (ኢና ነካይዶ)። እቲ ቤት ትምህርቲ'ውን ድላይካ እኮ ኣይህበካን ኢዩ። ግዝኡ ክንህበኩም'ዶ ኢዩ፣ ከምኡታት'ዶ ገለ መለታት'ዶ! (ይብለካ)። ንስኻ'ውን ቀደመኒ፣ SAT4 ቀደመትኒ፥ ኣነ ኣብኩረ ነይረ ትማሊ ገለ መለታት እንዳበልና (እቲ ዝድለ practical ኣይስራሕን) ንነኒ ንገድፍ። lab technichian እንትዝህሉ ነይሩ ግን ግድነት (ተማሃሮ) ኣብኣ ትሰዶም ንስኻ ከይድካ ትስዕቦም። ንሳ ወሳኒት ኢያ። ብተወሳኺ እዛ plan (Lesson study) ሓድሽ ነገር እንድዩ (ኣብ ቤት ትምህርትና) ክትተኣታቶ እንተኾይኑ እዚታት ከማላእ ክኽእል ኣለዎ። ምጽእ ኢልካ ከትገብሮ ኣይስራሕን ኢዩ። ዳርጋ ፍርቁ ንገብሮ'ኮ ኢና። ንግበሮ ኣይነጸብቕ ይኸውን'ምበር፣ ኣነ ይገብሮ ንሳ ትሰግሮ፣ ሓደ ድማ theoretically ገሊጹ ይሓልፎ። ሓደ ከኣ ብስእሊ ገይሩ ከምዚኣ ከምዚኣ ኢሉ ከምዚኣ እንተኾይና እታ ባላንቺና ትትኮስ፣ ከምዚኣ እንተገይርናያ ድማ እታ መብራህቲ ትበርህ ኢልካ ትሓልፎ እንዲኻ። ገሊኡ ከኣ ከምዛ ዝስራሕናያ ገይሩ ይምህር። እድሕሪ እዚ ጉዳይ laboratory ተፈጺማ ግን፣ ንዓኣ ዝምልከቶ ስብ ኣለዋ፣ ከምዚ ናይ high school ዝምደብ እንተዝምደብ እቲ ስራሕ ኩሉ ምስለጠ። ንስኻ ጊዜ ኣይተጥፍእን ኢኻ፣ ኣብኡ ከይዶም (ተማሃሮ) ርኣም ይመጹ። ንስኻ ከኣ ምስኦም ትኸይድ ትገልጸሎም። ስለ'ዚ ንlesson study ትጠቕማ እዚኣ ኢያ። ኣብዛ ሃገርና ክትተኣታቶ ምናልባሽ ዓቕሚ ከድሊ ኢዩ። ገዛውቲ ነይሩ ግን፣ እቲ ባዕልና ዝሰኣልናዮ ስእሊ ከማን መቐመጢ ኣይረኽብናሉን ተደርቢዩ ኣሎ።

SAT5 (00:35:25) ፥ ንሱ ኢዩ እቲ ጸገምና፣ ዓመት ዓመት ንሰርሕ ንዓመታ የላን። ኣይዕቀብን ኢዩ። ክንደይ ጊዜ ተዛሪብና ኢና መዐቀቢ ግበሩልና ኢልና። ዳሕራይ እቲ ጊዜካ ብኡ ኢኻ ተጥፍኡ። እቲ teaching aid እንከሎ ይሰኣን። ኣበይ ተሓዋዊሱ ኣሎ ኣይፍለጥን ኢዩ። ብኡ ኢዩ እቲ መምህር ዝገድፎ ንሓንሳብ። መታን ክሰልጠካ ድሕሪኡ በታ ኣብ textbook ዘሎ እዚ ስእሊ ከምትሪኡዎ ዘለኹም ኢልካ ትሓልፎ። ድሮ ክልተ ኣርቲስት ነይሮም ተሳኢሉ ዝተወደአ ኣሳእል ነይሩ ብፍላይ reproductive organs። በዛ ነብሰይ ኣነ ዝኾነ ቻርት ኣይተጠቕምኩን። ተጠቒምካ ዲኻ SAT3?

SAT3 (00:35:56) ፥ ኣይተጠቀምኩን

SAT5 (00:35:57) ፥ ኣሎ ግን (እቲ ቻርት)። I don't know where, some where ግን። ምኽንያቱም ቅድሚ ክልተ ዓመት ምሂርናዮም ነይርና። እቲኣን (reproduction) በቲ መጽሓፍ ኢና ምህርናየዎም። It could have been more interesting እቲ ቻርት ከምቲ ቅድሚ ሕጂ ዝገበርናዮ ተዓቂቡ እንተዝኸውን ነይሩ። ከምዚዝተባህለ'ውን ሓንቲ ክፍሊ lab እንትትህሉ ነይራ easily እቲ መምህርም እንታይሽሙ (ምረኽባ ነይሩ) መበለ። ሕጂ ምስ ጊዜ እንታይ ይኸውን ኣሎ ዋላ እቲ መምህርም ይስልችዎ። መምህር SAPH ኣበይ ኣላ (ኢልካ ትሓትት)? ስለዚ ዋላ እዚኣ (lesson study) ክትግበር እንተኾይና እቲ visual aids ተዓቂቡ ኣብ laboratory ከምዚዝተባህለ emphasize ክንገብር ኢና ክንፍትን next year. I hope ሓንቲ class ከምኣ ክትዋሃበና።

Researcher (00:36:36) ፥ ሕራይ ሕጂ ክልተ ሕቶታት ብሓንሳብ ኣጠቓሊለ ክሓተኩም ክፍትን ኢየ። ኣብ'ዚ መስርሕ ዝረኽብኩሞ ረብሓ (መኽሰብ) benefit ወይ ድማ ዘጋጠመኩም challenges ወይ ዕንቅፋታት እንታይ ኣሎ። ለሰን ስታዲ ክንሰርሕ ከለና ሕጂ ንኣብነት ኣርባዕተ ሓሙሽተ ሰባት ብሓንሳብ ኮይንኩም ኢኹም ትሰርሑ ማለት ኢዩ። ኣብ'ዚ ክትሰርሑ ከለኹም'ሲ እንታይ benefit ረኺብኩም እንታይ ከ challenges ኣጋጢሙኩም?

SAT3 (00:37:07) ፥ እወ ክስታይ በቲ benefit ክንጅምር ጽቡቕ እንድዩ ኣብታ ቀዳመይቲ ሕቶካ ዳርጋ ጠቒስናይ ኮይኑ ተሰሚዑኒ። እቲ benefit ማለት'ሲ እቲ ኩሉ ኣመሃህራና ተቐይሩ ኢዩ፣ ድግማ ከይከውን'ምበር።

Researcher (00:37:22) ፥ ደሓን ዋላ ይደገም እንተተደግመ ዋላ ሓንቲ የብሉን።

SAT3 (00:37:23) ፥ Ok ጽቡቕ። ናይ ብሓቒ፣ እቲ way of teaching እቲ ኣመሃህራና ብጣዕሚ ተቐይሩ ኢዩ። More chance ንተማሃሮ ክንህብ ከምዘለና፣ well prepared ኮይና ክንመጽእ፣ ዘድሊ materials ክነዳሉ፣ collaboration ክንገብር ከምዘለና፣ ማዓት'ዩ ብዙሕ'ዩ እቲ benefit። እታ challenge ግን ጊዜ ይወስደልካ ኢዩ እዚ ኣነ። እህእ (ሰሓቕ)። ክስታይ (ጀህራ) ደኣ ከይትኸውን'ምበር ድሕሪ'ዛ ዎርክሾፕ እዚኣ ሳይንስ ማራ ፍቕሪ ገይርና ኢና፣ እህእ (ሰሓቕ)። ካብ ቀደምና ነይሩና እንድዩ፣ ዓንተቦይ ጠቂሶማ ነይሮም መምህር SAT1፣ ኩሉ ሳዕ እና ከምኡ ንገብር ግን more ሕጂ ክንደይ ጊዜ ኢና ክስታይ ገይርና። ከምዚ ዓይነት ትምህርቲ ሕጂ ጊዜ ይሓተካ ኢዩ። ናይ ጊዜ እንተዘይኮይና ካልእ ጽቡቕ ኢዩ።

SAT5 (00:38:17) ፥ ሕራይ ምድጋም ጽቡቕ ኢዩ ተባሂልና ኣለና፣ ኣኣኣ for me ነቲ መምህር evaluation ኮይኑ ተሰሚዑኒ፥ ማለት ነብሰይ ስኒ ማዕረ ክንደይ የዳልዋ ኣለኹ? ከምቲ መምህር SAT4 ዝበሉዎስ፣ ok ንሳ ከማን ልዕሊ (ተሞኩሮ ክትጠቕስ ደሊያ ነይራ)፣ she was my teacher፣ እታ መጽሓፍ ስኒ እወ ንሳስ of course she knows everything ዋላ ኣነ በተን ዓመታት ዝማሃርኩወን ስኒ

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ይፈልጠን ኢየ ነተን መጻሕፍቲ ኢልካ ሓሓንሳብ ከይተዳለኻ፣ lesson plan ኣውጺየዮ ኢየ ኢልካ፣ ዋላ ሓሓንሳብ lesson plan ዘይነዳልወሉ ጊዜ ኣሎ። ሕጂ ግን ናይ ብሓቂ ንነብሰይ ሲኒ ከም መምህር SAT5 መጠን ስኒ am I ready to interact ኣብ'ታ class።

SAT3 (00:38:58) ፥ self-evaluation፣

SAT5 (00:38:59) ፥ እወ self-evaluation ኮይና ተሰሚዓትኒ። How well am I prepared to teach the students? ኣኣ ዋላ ዘይፈልጦ እንተኾይኑ ዋላ ጽባሕ ሓቲተ ከመጽእ ኢየ ምባል ጀሚረ፣ If I ዝጠራጠሮ እንተኾይነ። More advantagous ኮይኑ ተሰሚዑኒ especially for me ማለት'ዩ። ከምቲ ዝበሎ ኣብ ጊዜ ዋላ ካልኦት መማህራን ከማን፣ እዊይ ሕጂ ድማ ክትእከቡ ኢኹም (ይብሉና ነይሮም)።

SAT3 (00:39:23) ፥ ሳሓቕ

SAT5 (00:39:24) ፥ እዋእ ገለ ኢሎም፣ ሳሓቕ፣ ብዙሕ እንታይሽሙ (ጭርቃን) የብልሉልና ማለት ኢዩ። ሕጂ ቁርብተይ may be ኣብታ ጊዜ እንታይሽሙ የብል (ጸገም) ይህሉ ይኸውን። ግን ኣይጸላእኩዎን ዋላ ምክንያቱም ንዓይ benefit ስለዝኾነ as an inexperienced teacher ስለዝኾንኩ ማለት ኢዩ።

SAT1 (00:39:46) ፥ እወ እቲ ቀንዲ ሕጂ ቀንዲ ከማን ዝኸሰብናዮ ነገራትስ ኣሎ። ኣብ life-skill እንታይ'ዩ ዝብል ከም introduction ice breakers ኣሎ ኣብ life skill ንጥቀመሉ፣ ሕጂ ንኣብነት እዚኣ ትሓፍረኒ ነይራ ትኸውን ኣነ'ውን ከምኡ ሓቂ ዘረባ። ሕጂ ግን እዚ lesson study ከም ice breaker ኮይኑ ጠቒሙና ኣሎ። ሕጂ ንሕና ዝኾነ ነገር ክንተሓተት ከምንኽእል፣ ኣብ ሳይንስ ሓደ ዝፈልጦን እቲ ሓደ ዘይፈልጦን ነገር ከምዘሎ። ዘምበቦ ኣሎ ዘየንበቦ ኣሎ፣ ብሽም ኣነ ተሞኩሮ ኣለኒ ዝበሃል ነገር የለን። ዝያዳ ከኣ ንሳቶም (እቶም ተሞክሮ ዘይብሎም) ኣብ modern technology የድህቡ ኢዮም። ስለ'ዚ እታ ቀንዲ ዝኸሰብናያ ሕጂ እዛ ምትሕፍፋር ትብሃል ice breakers ካብ ሓድሽ ጋሻ ኮይንካ ታዓብ ዝነበረ፣ ዋላ ኣብ'ቲ መስከረም ክትጅምር ከለኻስ ብኽምኡ ጀምሮ ኢዩ ዝብል ነቶም ተማሃሮ'ውን። ሕጂ ከኣ ንሕና ነንሕድሕድና ብሽም ናይ ሳይንስ ኣብታ ዲፓርትመንት ፈርም ይብሉ፣ ኣነ'የ ዲፓርትመንት ሀድ ዘሎኹ፥ ዓመት ንዓመት ንቀያየር ኢና፣ በቃ ኣነ እዚ ክብላ ኣይክእልን፣ መጺእና ኣይንፈልጥን፥ ሕጂ ግን ክትሓትት ትኽእል፣ ክሓተኒ ይኽእል፣ ኣነ'ውን ክሓትት እኽእል፣ እዚ ስለምንታይ ገይርክዮ ክብል እኽእል፣ ምኽንያቱ ምትሕፍፋር ትብሃል ጠፊኣ ኣላ። እዚኣ ተጠቒምና ኣለና። ዝያዳ እዛ ናትካ ንስኻ ካብ ትመጽእ እዛ lesson study ገለሲ ነዚ (ብዘይሕፍረት ክንተሓተት) ክንብር ኣኽኢሉና ኣሎ። ያው ምስቶም ተሪፎምና ዘለው (ካልኦት ናይ ሳይንስ መማህራን) ከማን ሕጂ ዋላ ሓንቲ እዚ ከምዚ እንድየ ኮይነ ክብሉኻስ ወይስ ክትብሎም'ሲ ዝያዳ ትደፋፈር ማለት ኢዩ።

Researcher (00:41:07) ፥ ሕራይ። እቲ challenges ኽ? ዕንቅፋታት እንታይ ዘጋጠመ ነይሩ? ጸገማት ማለት ኢዩ።

SAT1 (00:41:3) ፥ ጸገማት ዝተጓነፈኒ ጸገማት የለን። ኣኣኣ ከምዚ ክትእከበና ከለኻ ብቐሊሉ ትረኽቦም። ኩሎም ከኣ voluntary ኮይኖም ይመጹ ነይሮም። ስለ'ዚ welcome ኢሎም ስለቐበሉዎ ስለዝነበሩሲ ነቲ ኩሉሲ ጸገም ኣጓኒፉኒ ሕጂ ክብል ኣይክእልን። ከም ኣነ ኣካቢ ንኣብነት ኣለኹም ዶ ገለመለታት ክትብል ከለኻ'ሲ፥ ንኣብነት ሕጂ ዓንተቦይ ዝሓተቱኒ ነይሮም፥ ሰዓት ክንደይ ኢያ ኢሎም። ኣብ'ዚ'ውን ብጣዕሚ they were in a hurry to ክስታይ ክገብሩ ጊዜ ከይጠፍእ ጊዜ ቆጸራ ገይርካ'ውን ብኣኽብሮት ይቐበሉዋ ነይሮም። ብዙሕ ጸገማት ኣየጓነፈናን። ናይቲ collaboration ከኣ ሓደ ክስታይ የምጽእ፥ እቲ ሓደ ገለ ይገብር፥ እዚኣ ከምዚኣ ዘይትገብራ፥ እቲ ሓደ ጽሕፈቱ ጽቡቕ እንተኾይኑ ይጽሕፈልና፥ ዳርጋ እቲ collaboration'ሲ ነይሩ'ዩ፣ ዋላ እቲ ሓደ መምህር ዋላ ተማሃራይ ናይ ኩላትና ኢዩ ነይሩ። ብዙሕ challenge ኣይነበረናን በሃላይ ኢየ ኣነ። እንድዒ ዝተራእዮም ነገር እንተሎ እንታይ problem ኣጋጢሙና።

SAT4 (00:42:14) ፥ ዝያዳ ኩላ ኢሎማ እንድዮም፥ ኣብ'ታ benefit፣ confidence ኣሕዲርና ኢና ምሉእ ብምሉእ። ኣብ'ታ ናይ problem እየ ኣነ ክደፍ ኣላ ደሊየ ዘሎኹ። እንታይ'ያ እዚ lesson study ዕውት ክትከውን እንተተድልዩ መምህር ሓደ ሽፍት ክሰርሕ ክኽእል ኣለዎ፣ ብናተይ ኣረኣእያ።

Researcher (00:41:07) ፥ መምህር እንታይ?

SAT4 (00:42:31) ፥ ሓደ ሽፍት ክሰርሕ ኣለዎ። ፍርቂ ሽፍት እንድሕሪ ኣብ class ንኣቱ ኮይና እቲ ፍርቂ ሽፍት ነጻ ኮይና፣ ሕጂ ነጻ ኮይና ደገ ክንውዕል ዘይኮነስ ኣብዚኣ መጺኻ

SAT3 (00:42:41) ፥ preparation

SAT4 (00:42:42) ፥ ብዛዕባ እቲ ፕላን ድዩ፣ ብዛዕባ እቲ lesson ኣቀራርባ ድዩ ዋላ ብዛዕባ exercise ኣወሃህባ ድዩ ገለ መለ ዝያዳ ምስ'ቲ መምህር ተራኺብካ ክትሰርሕ ትኽእል። ስለ'ዚ እዛ ንግሆ ኣቲኻ፣ ምሸት ካልኣይ ክትደግም ከለኻ free (ነጻ ፔሬድ) ኣለኻ ድዩ ንስኻ ገለ (ትበሃል ንኽትራኽብ)፣ ስለ'ዚ ኣብ'ቲ collaboration ክንተሓጋገዝ ንደሊ'ሞ እቲ ፔሬዳትና ስሩዕ ኣይኮነን። ስለዚ እዚኣ ጸገም ኣላ እታ ለሰን ስታዲ ብግቡእ ክትከይድ እንተኾይና። ስለዚ ኣባና'ኳ ኣብዚ መንግስታዊ'ኳ ምሉእ መዓልቲ ኢና ንሰርሕ፥ ኣብዘን ናይ private እንድሕሪ ርእካ ግን ከም በዓል School 'C' ሓንቲ shift ኢዮም ዝምህሩ፣ እታ ፍርቂ ሽፍት እንታይ'ዮም ዝገብሩላ ንተማሃሮኣም ብደንቢ ኢዮም ዝግምግሙዎምን ዝእርሙሎምን።

SAT3 (00:43:21) ፥ ዝእርሙሎም

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SAT4 (00:43:22) ፥ ጥራዞም daily ኢዩ ዝእረም። ተማሃራይ ኣየናይ ኢዩ ድኹም፣ ኣየናይ'ዩ ሕማቕ ብምሉእ ኢዮም ዝፈልጡ። መን ይሰርሕ፣ መን ኣይሰርሕን ንገዛእ ርእሱ።

SAT3 (00:43:29) ፥ እኹል ጊዜ ኣለዎም።

SAT4 (00:43:30) ፥ ሕጂ እዚ (lesson study) ክኽውን እንትኾይኑ መምህር loaded ክኸውን የብሉን። እዚኣ'ያ እታ problem 'ምበር ካልእ ደሓን ኢዩ።

Researcher (00:43:41) ፥ ሕራይ። ሕጂ ተማሃሮ benefited ዝተጠቕሙሉ እንታይ ዝተዓዘብኩሞ ኣሎ? ተማሃሮኹም ተጠቒሞም'ዶ ትብሉ። What advantages do you think students have benefited?

SAT3 (00:44:20) ፥ ክስታይ እንድዩ፣ እንታይ ተጠቒሞም እንድዩ እቲ ሕቶ፣ እንድሕሪ መምህር ተጠቒሙሲ መን ተጠቒሙ ማለት ኢዩ? ተጠቒመ ኣነ ንገዛይ ሒዘዮ ክኸይድ ዘይኮንኩስ፥ ኣነ ዝጥቀም ዘለኹ'ኮ ንተማሃሮ ክብል'የ። ድሕሪ መምህር ተጠቂሙ ተማሃራይ ተጠቒሙ ማለት እንድዩ። እቲ lesson ነቕርቦ ዝነበርና ቅድሚ ሕጂ ሽፈፍ! ኢልካ ምሕላፍ ኢያ ነይራ። ጣዕ! ጣዕ! ኣቢልካ፣ እህእ እህእ (ሰሓቕ)። ሕጂ እቲ ሽፈፍ ምባል ተሪፉሲ ዕሙቕ ዝበለ ይኸውን ስለዘሎ ተማሃሮ more chance ተዋሂቡዎም፣ ኣኣኣ፣ ዋላ ሕጂ ነቶም ሕማቓት'ሲ ብዙሕ ኣይንኦምን ኢና ነይርና። Is there any new hands ገለ ኢየ ዝብል ሕጂ ኣነ። ሓሙሽተ (እእዳው) ኣለዋ ኩሉ ሻዕ ከምዚኣ ዝብላ። Is there any new participant ኢኻ ትብል፣ በዚ ኣለው ይብሉኻ ሽዑ (ሰሓቕ)። ሕጂ ነቶም ሓደስቲ ከኣነ ክነሳትፎም ጀሚርና ኣለና። ሕጂስ ኩሎም ስለዝሳተፉ ዘለውስ እንድዒ ኣነ benefited ኮይኖም ኣለው ይብል እቶም ተማሃሮ።

SAT5 (00:45:20) ፥ ኣኣኣ በታ ሓንቲ class (lesson) 'ኳ Of course ክንግምግም ኣይንኽእልን እንድና፣ ኩሉ ጊዜ group discussion ኣይንገብረሎምን ኢና ማለት ኢዩ። ግን በዛ ኣነ ሓንቲ class ዝማሃርኩዎ እንታይ ኮይና ተሰሚዓትኒ ሓደ ሓፋር ተማሃራይ ኣለኒ፥ ክልተ ዓመት ዝደገመ ኣሎ። ሕጂ always ፍጹም participate ኣይገብርን ኢዩ። ንሱ ጥራይ ዘይኮነስ ምስቶም class interaction የብሉን። ሕጂ ብቕዳማይ ውጻእ ገለ ምስበልኩዎ ከምዚ motivated ዝኾነ ኮይኑ ተሰሚዑኒ። ኣነ ክመጽእ ከሎኹስ ጽቡቕ ክቕበለኒ ጀሚሩ። ጽሒፈ ወዲኡ ኣሎኹ ክትእርመለይ'ዶ ገለ ይብለኒ። ብሓንቲ መዓልቲ እታ ብቕዳማይ ናዓ ውጻእ'ሞ ኣብ'ዛ circuit board ግበር ስለዝበልኩዎ ማለት ኢዩ። ከምዚ motivate ዝገበርኩዎ ኮይኑ ተሰሚዑኒ።

SAT3 (00:46:05) ፥ ብኻ ካብ ፈለማ ኣብ መስከረም ገይርናዮ።

SAT5 (00:46:06) ፥ እህ እህ (ሳሓቕ) ya! I know! እወ ናተይ ጌጋ ምኳኑ ተረዲኡኒ፣ ግን ኩሉ ጊዜ Of course እንታይ ኣሎ ምስቲ ዕድምኡም ኣኣኣ እቶም ምስኡም ዘለው ናእሽቱ ስለዝኾኑ ክተሕፍሮም ስለዘይትደሊ ደሓን እንዳበልካ ሱቕ ትብል ነይርካ። ሕጂ ግን እቲ chance ብምሃበይ ስኒ ንዕኡ motivate ዝገበርኩዎ ኮይኑ ተሰሚዑኒ። ኣኣኣ ሕጂ ከምዚ ፍኹስ ዝብሎ ኮይኑ ይስማዓኒ። ሕጂ I was really happy ሎማዓልቲ ከምኡ ኢለ (I was really happy) feedback ሂበዮ። ካልኣይ ሰሚስተር ጽቡቕ ትኸይድ ኣለኻ Mussie። ደጋግሚ ኢዩ። ኣኣኣ ከምኡ ኮይኑ ተሰሚዑኒ ማለት ኢዩ። ኣኣኣ ካልእ እንታይ ዕድል ንህቦም ኣለና። ንነብሶም explore ናይ ምግባር፣ እንታይ ይፈልጥ ስኒ ዕድል ኣይንህቦምን ነይርና። Lecturing method እንትኾይኑስ ብዛዕባ ናቱ እንታይ ይፈልጥስ ኣይፈልጥን ኢዩ ኖ። ስለዚሲ እንታይ ዕድል ንህቦም ኣለና ኣብ'ዚ discussion method ወይ ድማ ዕሙቕ ዝበለ class ብምሃብ ንሓንቲ ንእሽተይ ከምታ ዝበሉዋ መምህር ስኒ ነታ gas expansion ስኒ ብዙሕ ዕሙቕ ዝበለ ስለዝነበረስ ኣኣኣ እንታይ ability ሂቡዎም explore ናይ ነብሶም ምግባር። ሕጂ ሰለስቲኤን ስኒ እተን type of matter ኣብ ሓደ lesson እንተትውድኣን ነይርካ (ከም ልሙድ ዝግበር) ንዓቶም ዕድል ኣይምሃብካዮምን ንስኻ ግን እተን lesson ይውዳእ ማለት ኢዩ። ስለ'ዚስ ሓደ motivation ዘለዎ ኮይኑ ተሰሚዑኒ ነቲ ተማሃራይ። ካልእ ድማ ዕድል ንህቦም ኣለና ንነብሶም ክግምግሙ explore ክገብሩ እንታይ ይፈልጥ። Of course እሱ ድማ ባዕሉ ዝተዛረቦ ነገር እሞ teacher! You are right ዝበሎ ነገር ድማ ኣይርስዖን'ዩ እቲ ተማሃራይ። So እዚኣን ኮይኑ ተሰሚዑኒ።

SAT1 (00:47:45) ፥ እወ እቶም ተማሃሮ እንታይ ተጠቒሞም እንድዩ እቲ ቀንዲ፣ እቲ ነገራት ከምዚ ዝበለካ ስላዕ በጣዕ እንዳገበርና ንገበሮ ነይርና እንዲና። ሕጂ ግን self-confidence ኣሕዲሮም (ተማሃሮ)። ከምዛ ዝራእናያ ብቕዳማይሲ ኣብ group discussion ሕጂሲ መን ይገልጽ ክትብሎም ከለኻ ዋላ እቲ ንፉዕ ይምጻእ ጽሒፉ'ዩ ዝገብራ ነይሩ። ትማሊ ግን ባዕላቶም፣ ንሕና ጽሓፉ ኢና ዝበልናዮም'ኮ። ኣይሰምዐኻን ኢዮም ግን።

ኩሎም (00:48:08) ፥ ሳሓቕ።

SAT1 (00:48:09) ፥ ክራኣዩ ስለዝደልዩ ክጃሃሩ ስለዝደልዩ My name is ይብሉ። ኣይትበሉ ኢለዮም ኣነ።

ኩሎም (00:48:12) ፥ ሳሓቕ።

SAT1 (00:48:13) ፥ ስለ'ዚ self-confidence ስለዘሕደሩ፣ ይደልዮዎ ኢዮም። ትሰምዖም ነይርካ በታ ስቕ ኢልካ ድላዮም ይዛረቡ ነይሮም። ይኽእሉዎ ነይሮም ከኣ ዋላ እቲ እንግሊኾም'ውን (their English was good) ጽቡቕ ነይሩ። ዋላ እታ moderate ዝነበረት ጓል Rahwa ድያ ገለ ትብሃል ከማን ንሳ ሕጂ ተገዲዳ ኢያ፣ ርእካ ሕራይ ንሳ ሕጂ ኢያ ትጅማምር ዘላ ንሳ። እቶም ካልኦት ግን ናይቲ ቅድም ዝነበሮም ተመኩሮ ባዕላቶም ኣቕረብኩ ክብሉ ጀሚሮም። ስለዚ self-confidence ኣጸቢቆም develop ገይሮም፣ ኩሎም'ኳ እንተዘይበልና መን ደኣ ወጢሩዎም ብቓልኩም ተዛረቡ ኢሉ፣ ኣይበልናዮምን'ኮ፣ ባዕላቶም ግን My name is ኣብ ተሌቭኾን ዝቕድሑ ይመስሉ፣ ሰሓቕ። ስለዚ ከምዚ self-confidence ኣጥሪዮም ኣለው ብሓጺሩ።

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SAT4 (00:48:58) ፥ ኩሉስ ወዲአሞ ኢዮም። ሓንቲ እታ self-confidence የጥርዩ ኢዮም። relax ይኾኑ፣ ኣብዘን ሓጺር እዋናት ኣብዘን ኣርባዕተ lesson ከምዚ ዝገበሩስ daily እንተንጥቀመሉ ነንኽውንሲ ባዕሎም ከም teachers act ምገበሩ ነይሮም ተማሃሮ። ንሳ'ያ እታ ቀንዲ advantage። ስለዚ መዓልታዊ እንድሕሪ ተማሃሮ present ዝገብሩ እንድሕሪ ኮይኖምስ ሕፍረት ዝበሃል የለን። ኣእኣ ባዕሎም ተዳልዮም'ዮም ዝመጹ ማለት ኢዩ። ንዝመጽእ ዘሎ lesson ሲ ካባና ኣይጽበዩን ኢዮም። ባዕሎም ready ኮይኖም present ክገብሩዎ ክኽእሉ ኢዮም። ስለዚ እታ confidence ከጥርዩ ይኽእሉ ማለት ኢዩ።

Researcher (00:49:32) ፥ ሕራይ፣ ከምዝተባህለ እዚ lesson study ሲ ጊዜ ይወስድ'ዩ ንምእካብን discuss ምግባርን ጊዜ ይወስድ ማለት ኢዩ። ስለ'ዚ ነዚ ጊዜ ንኽትረክቡ ከመይ ገይርኩም ኑቲ ዝነበረ ጸገም ተቃልልዎ ነይርኩም፣ ሓንቲ ትራኽቡላ ጊዜ ንምርካብ።

SAT3 (00:50:05) ፥ ክቕድመኩም ኣነ ኣብኡ ከለኹም። እህእ (ሰሓቐ)። ሎሚ መዓልቲ ሕጂ ኣነስ ምስ ሓንቲ መምህር ተቐያይርና ነይርና። ሳይንስ ኩላትና ብሓደ ሸፍት ኢና ንኣቱ። ሕጂ ግና ኣነ ንሓንቲ መምህር ማሕበራዊ ጸገም ኣለዋ ምሳይ ትኣቱ ፔሬደይ ቀይረያ ነይረ። ሎሚ መዓልቲ ግን ኣእኣ ደዊለ ኣነ ክኣትዋ ኢየ ኢለያ። እህእ (ሰሓቐ)። ሕጂ ከምዚታት እናገበርና። ኣእኣ ዋላ ዓርቢ ሕጂ lesson ናተይ ክምህራ ከለኹ ክእ ከምኡ ተቐያይርና ኢና። ዓርቢ ክትገድፍለይ እኺ ኢለያ። ወይ ቀዳመይቲ ስፖርት ነይሩዎም መጺአ ገለ። ከምዚታት ሸፍት እንዳቀያየርና፣ ኣብ free period እንዳኣተና ገለ፣ ወይ ውን ሓደ ሓደ ማሕበራዊ ጸገማት ቀብሪ ድዩ ገለ፣ እህእ (ሰሓቐ) እንዳሰገርና ኣና ኣብዚ በጺሐ እብል ኣነ።

SAT1 (00:50:53) ፥- ንሱ ኢዩ እወ። ንቅድም ንቅድም ከምዚ ሓደ ሓደ ጸገማት ከምኡ ገይሮም ይፈትሑዎ። ካብኡ ዝተረፈ እቲ ፔሬድና በቃ ጽቡቕ ኢዩ፣ ብሓንሳብ እዛ ናይ ሳይንስ፣ mostly ማለተይ ኢየ። Mostly ሲ ወይ ቅድሚ ዕረፍቲ፣ ወይ ድሕሪ ዕረፍቲ ኢያ። ንኣብነት ኣነ first ፔሬድ ኢዩ ነይሩኒ፣ ሕጂ ነዚ problem ክፈትሕ ክብል ኣነ ተጸቢየ፣ ኣዚ'ውን second ፔሬድ ነይሩዎ ይኽውን ዝደንጎየስ 3ይ ፔሬድ ነይሩዎ። ስለ'ዚ ኣብ'ቲ free ፔሬድና ኢና ዋላ ሓንቲ ካብ ናይ ተማሃሮ ጊዜ ዘጥፋእናዮ ነገራት የለን። ስለ'ዚ ኣብታ free ፔሬድና ኢና፣ ኣእኣ። ስለ'ዚ ንዓኻ ኮነ ኢልና ኢና ረቡዕ ዝቆጸርናካ። ድሕሪ ዕረፍቲ ናጻ ኢና'ሞ ኣብኡ እቲ ጊዜና ክንስውእ ኢልና። ስለ'ዚ እቲ ጊዜታት ካብ'ቲ ዘለና ጊዜ ኢና ንጥቀም ነይርና። እቲ ፔሬድና ፋሕ ስለዘይበለ ጽብቕቲ ኢያ። ሕጂ ናይ ሳይንስ መምህር ኣይተረከብን ኢኻ ኣብ ክፍሊ፣ ወይ ገዘኡ ከይዱ ኣሎ፣ ወይ ኣብ'ዚ ኣሎ ወይ እንሄና። ስለ'ዚ ብከምዚ ጌርና ማነጅ ገይርናዮ እቲ ናይ ጊዜ። እንተዘይጣዓመና ከኣ ንቀያየር።

Researcher (00:51:51) ፥ ሕራይ ኣብዚ lesson study ንክትሳትፉሲ support ናይ administration ከመይ ነይሩ። ኣብ ምንታይ ይሕግዙኹም ነይሮም? ነይሩ'ዶ ሓገዝ ናይ ምምሕዳር? እንታይ ዓይነት ሓገዝ ነይሩ?

SAT3 (00:52:16) ፥ ቆብ ዶ ከብለኩም ኣነ። ሳሓቐ። እወ፣ ናትና administration ደኣ እንቋዕ ኣብታ ዎርክሾፕ ዓደምካዮም።

SAT5 (00:52:22) ፥ እወ ናይ ብሓቂ።

SAT3 (00:03:13) ፥ SADን SAPHን ኣብ ዎርክሾፕ ምንባሮም ኩሉ እቲ ዕላማ ናይ'ቲ ዎርክሾፕ ስለዝተረድኦም፣ ዋላ እንተዘይነብሩ ናይ ብሓቂ ዝርድኡ administration ኢዮም። መምህር SAPH ዋላ መምህር SAD ብዓበይቶም ዋላ እንተዘይነብሩ፣ ግን ስለዝነበሩ ከኣ more እቲ ምትሕብባሮም (ሓገዝ) ወሲኹስ ዋላ ሓንቲ ዕንቅፋት ኣይገጠመናን።

Researcher (00:52:46) ፥ እንታይ ዓይነት support ነይሩ?

SAT3 (00:52:50) ፥ Ok ሕጂ ክስታይ እንድሕሪ ከምዚ clash ዝገበር ፔሬድ ኮይኑ ኣእኣ ኣነ ሕጂ lesson study ከቕርብ እንተኾይነ ነቲ ናይ ስፖርት ድያ life skill ድያ ዋላ ካልእ ምሳይ ዝኣቱ ነዚ መምህር'ዚ እዚኣ ፔሬድ ክትገድፉሉ ከምዘለኩም ኢሎምሲ ኣብ'ቲ ክትጽግም ዝኽእል ኮይኑ እቲ ፔሬድ ይሰርዐልና ነይሮም። Materials ብዓቢኡ ነቲ store keeper ዓርቢ መዓልቲ ሕጅስ ንዓና እንተድልዩና ተደዊሉዎ ይመጽእ store keeper መታን ከይንቦክር። ከምዚኣ ኣላ መደብ ከይትብክር ተባሂሉ ይመጽእ ይቕርበልና ነይሩ። ሓንሳብ ሓንሳብ እቲ material ኣብዚ ይሓድር ነይሩ ካብቲ store ወጺኡ። ብኽምዚ ገይሮም support ይገብሩና ነይሮም።

SAT4 (00:53:36) ፥ እዛ ናይ administration እንድሕሪ ርእና ንሕና ኣብ'ዚ ሕጂ ዝገበርናዮ ፕላን ብዙሕ ዝሓተትናዮ ነገር ኣይነበረን። ካልእ ባዕልና ንገብሮን ኣብ'ዚ ቤት ትምህርቲ ዘሎ ሓደ ሓደ ነገራት። ካልእ ግን ብመሰረቱ እዛ ቤት ትምህርቲ ዓመት ከመጽእ ከሎ ብፍሉይ ንነፍስወከፍ ዲፓርትመንት ገንዘብ ከይተረፈ ሰሊዑ'ዩ ዝቕርብ። እንታይ እንታይ ከምዘድልየና ንመጻሕፍቲ ድዩ ካልእ ማተርያል መግዝኢ ገንዘብ ከይተረፈ ተሰሊዑ ዝተቐመጠ ገንዘብ ኣሎ። ስለ'ዚ ዝያዳ'ሲ ዝዋስኡ ኢዮም። ዝኾነ ሓቲትናዮም'ሲ ከምልሱልና ዝኽእሉ ኢዮም administration ዘለና።

SAT1 (00:54:21) ፥ እወ ምትሕብባር ይተሓባበሩ ኢዮም። ዘይተሓባበሩ ኣይኮኑን። ድላይኩም'ውን ግበሩ ይብሉ ኢዮም። ሕጂ'ኳ ንኣብነት'ሲ ክትመጽእ ከለኻ ንስኻ SAPH ኣታ ንስኹም እእእ (ሳሓቐ)። እዚ'ውን ሓደ support ኢዩ። ኣብ'ቲ ናይ ማተርያልስ'ውን ቻርት'ውን ንኣብነት ናቶም ኢና ንጥቀም ነይርና። ካብዚ ንወስድ ነይርና። እዚ ካልእ ግን ናይ ባሉንስ (ባላንቺና) ሕጂ ምገዝኡልና ግን ነይሮም። ንሕና በባዕልና ገለ መለታት (ነምጽእ) ኢና። እዚ ተርሞስፍላስክ ቤት ትምህርቲ ስለዘይብሉ ካብ ገዛና ነምጽእ። እዚ dishes ገለ መለታት ብተማሃሮ ዶ ብገለታት ገይርና ስለዘየለ ኢዩ። እእእ እዛ Bunsen burner (ስለዘይብልና) ኣብ ክንዳኣ እዛ (ዳፉር) ኣላትና ንሳ'ውን ኣላትና ንሳ'ውን ክትጥቀምሉ ትኽእሉ ኢኹም ኢሎምና ግን ኣብ'ዚ ኣውሲኻ ጊዜ ክትቀትል ኢኻ ስለዝኾነ'ምበር ክተሓባበሩና ይኽእሉስ ነይሮም። I don't know about grade 7. ናትኩም ድዩ ወይስ ናይ'ዚ ቤት ትምህርቲ?

SAT3 (00:55:15) ፥ ናይ'ዚ ቤት ትምህርቲ። ዘስራሕናዮ ኣሎ ብዙሕ ሎሚ ዓመት፣ እተን ከልተ ግን ናይ'ዚ ቤት ትምህርቲ'ዩ።

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SAT1 (00:55:19) ፥ ስለ'ዚ ዘለዎም'ሲ ይተሓባበሩና ኢዮም። ደሓን ኢዩ እዚ ቤት ትምህርቲ።

Researcher (00:55:28) ፥ ዝኾነ ለውጢ ክመጽእ ከሎ እቲ ምምሕዳር እንድሕሪ ዘይተቐቢሉዎ ኣይሰርሕን'ዩ። ሕጂ እቲ ምምሕዳር እንተዘይተቐቢሉዎ ክላስ ምቅያር ኣየፍቐድን ኢዩ። ኣየፍቐድን ክብለካ ይኽእል ኢዩ። ስለዚ ምምሕዳር እንድሕሪ ኣሚኑሉ ግን ባዕሉ ይከታተሎ። ሕጂ ንኣብነት ኣብ ሰለስት ቤት ትምህርቲ ኢየን ዘለዋ። ኣብታ ሓንቲ ቤት ትምህርቲ ። ፣ እቶም ካልኦት ኣባላት ናይ'ዚ ቤት ትምህርቲ'ከ ክም መምህራን ናይ ምምሕዳር ስራሕተኛታት ናቶም ሐገዝ ከመይ ኣሎ። እዚ ማሕበረ ሰብ ናይ ቤት ትምህርቲ ትገብሩዎ ዘለኩም ይፈልጦ'ዶ፣ እንታይ ሓገዝ ይገብረልኩም። ነዚ ትገብሩዎ ዘለኩም ስራሕ support ይገብሮ'ዶ እቲ ምምሕዳር ወይ ድማ የኣእሶ ድዩ ወይ እዚ ትገብሩዎ ዘለኹም ጽቡቕ ኢዩ ኢሉ ይሓስብ?

SAT4 (00:57:16) ፥ መጀመርያ እንታይ ይብሉና ነይሮም እቶም መማህራን፣ እዚኣ ናይ ገንዘብ ኮይና'ምበር እንታይ ኢኹም ከምዚ እትው ውጽ|እ ትብሉ ዘለኹም ገለ ይብሉና ነይሮም። ሕጂ ግን ዝያዳ ኣበይ ኣቢልናያ ንሕና SAT5 present ክትገብር ከላ በዓል መምህር ዓምር፣ መንግስትኣብ፣ ኣዜብ ኣትዮም፣ ሕጂ ካብቶም መማህራን ነዚ ኢኹም ትእከቡ ነይርኩም እዚ ደኣ ዝያዳ ኣብ ገንዘብ፣ ገንዘብ ደኣ እንታይ ኣለዎ ኢሎምና። ሕጂ ንሕና ከይተረፍና ኢና ሕጂ ሓድሽ ፍልጠት ሒዝና። ፕላን ከመይ ገይርካ (ተውጽእ) ንተማሃሮ ከመይ ገይርካ introduce፣ ከምይ ገይርካ present ከምትገብር፣ ከመይ ገይርካኣ motivate ከምትገብር'ሲ ሕጂ ኢና ዝያዳ ተማሂርና ንሕና። ስለ'ዚ ሲ ቧእ እዚኣ ኣገዳሲት ኢያ ክብሉ ስሚዐ እቶም መማህራን። ስለ'ዚ support ገይሮምና፣ ብጽቡቕ ዓይኒ'ዮም ርኣሞ።

SAT1 (00:58:08) ፥ እወ ምርኣይ ምእማን እንድዩ፣ ስለዝራኣዩ ንሳቶም ሕጂ (ኣሚኖም)'ምበር እቲ ቅድም ከምዚ ዝበለቶ ጆክ እንዳ ኣምሰልካ ዓሻ እንዳመሰልካ ድራርም ወዳኣሎም ኮይና፣ ኣይ ዝበልዐት ከብዲ ኮይና፣ እምባሶይራ ሓቕኻ! ቢራ ከኣ ነይሩ ሪኦሞ (ሰሓቕ)። ዋእ ኣብዚኣ ኢኻ'ባ ንስኻ ዝያዳ ትግደስ ኣብዚኣ ኢሎም ይቕልዱልና ነይሮም። ትማሊ ከምዚ ዝበለቶ ምስ መጹ ከኣ (ኣብ class observe ክገብሩ ምስ ኣተው) ዋእ ኣታ ጽቡቕ'ባ ኢኹም ትገብሩ ንሕና ከማን ተማሂርና፣ ኣብዛ ቅድመና ኢሎም'ዮም። ስለ'ዚ ንሳቶም'ውን ንሰርሕ ከምዘለና (ኣሚኖም) ስቕ ኢልካ ወደኽ ደኽ ይመስሎም ነይሩ። ሕጂ ግን ኣሚኖም ማለት ኢዩ። ነንሕድሕድና ንመሃሃር ከምዘለናን ተማሃሮ'ውን ዝያዳ ነምህር ከምዘለናስ ክርድኡ ኪኢሎም ኣለው ኢየ ዝብል ኣነ።

SAT5 (00:58:50) ፥ ኣነ ድማ እንታይ'የ (ዝብል) መጀመርታ ዋላ ምሳና ዘለውስ እንታይ ኢኹም ትገብሩ ዘለኹም፣ እንታይ ኢኹም ሳይንስ ትእከቡ ዘለኹም ገለ ኢዮም ዝብሉና ነይሮም። እንታይ ከምንገብር ከማን ኣይፈልጡን'ዮም ነይሮም። ምኽንያቱም ሓቆም'ዮም ድማ ኣይንዕድምን ኢና ነይርና። ማለት እንታይ ጸገም ድማ ኣሎ ምስ'ቲ ናይ ማሕበራዊ ጸገም ዘሎ፣ እእእ እቲ ሽፍት ድማ ሓደ ዓይነት ስለዝ'ኾነ ኣብቲ ንምህረሉ ሰዓት ወይ ገለ ክትዕድም ቁርብተይ ከቢድ'ዩ ነይሩ፣ ምጹ ክትብሎም ኣብታ ዘይፔሬዶም ማለት'ዩ። እእእ ብዝያዳ ግን ከምቲ መምህር SAT4 ዝበለቶ ጽቡቕ ካብ ዝተፈላለየ ዲፓርትመት ስለዝነበሩ at least ኣሕሊፎምልና ኣለው መረዳእታ (ክብል እኽእል)። ካልእ ኣነ ዝያዳ ኮይና ትስማዓኒ እብዛ መምህር SAT1 (ዘቕረቡዋ) ሰንበት ዎርክሾፕ ዝነበረት፣ ቧእ እዚኣስ ናይታ ሓድሽ ትምህርትኹም ኢኹም (ተግቢርኩማ)፣ ብጣዕሚ! Enjoy ገይሮሞ፣ ናይ ብሓቂ! Enjoy ገይሮሞ። እዚኣ እንታይሽሙ (ናይ ሳይንስ ነይራ)

SAT3 (00:59:44) ፥ ናይ ሳይንስ

SAT1 (00:59:44) ፥ ናይ ባላንቺና እዛ ዝገበርናያ

SAT5 (00:59:45) ፥ እወ እዛ ዝገበርናያ ነይራ። ዋእ they enjoyed it፣ ምኽንያቱም ቅድሚኡ እንታይ ነይሩ social ነይሩ

SAT1 (00:59:51) ፥ ሳላ ተሞክሮ ኢያ

SAT5 (00:59:52) ፥ እወ ሕጂ social እንታይ'ዩ ነይሩ ከምዚ

SAT3 (00:59:55) ፥ lecturing

SAT5 (00:59:54) ፥ እህእ እህእ (ሰሓቕ)፣ ከምዚኣ ሕሜታ ከይትኸውን'ምበር lecturing method ኮይና እህእ እህእ (ሰሓቕ)። ሕጂ lecturing method በጃኹም ደው ኣብልዎ ዳሕራይ ዳርጋ ስብ ደቂሱ ነይሩ መምህር SAT1 መጺኦም እእእ ኣበራቢሮምናስ ስሒቕና ገለ ሕጂ ዳሕራይ ዋላ እቶም ምሳና ዘይነበሩ ሳይንስ ተኣኪብና እእእ ንሕና እቲ motivation ዲዩ ገለ ብዝኾነ ዝያዳ ኣብ'ዚ ዝሰራሕናዮ ስኒ ኣብቲ ኣንጸባሪቕናዮ፣ ምስ ወጻእና ድማ ቧእ እዛ ትምህርቲ'ምበር ጠቕማትኩም፣ እዛ ትእከቡዋ ዘለኹም ኢሎምና። ብጣዕሚ ጽቡቕ response ረኺብና ኮይኑ ተሰሚዑኒ።

SAT3 (01:00:29) ፥ እቲ ማሕበረሰብ ወይ ድማ ካልኦት መማህራን ከመይ ይተሓባበሩኹም እንድዩ እቲ ሕቶ፣ ክስታይ ኣነስ ኣእእ እንታይ ዓይነት ክኽውን ነይሩዎ ቅድም ብምልኡ staff እዚ aim (ዕላማ) ናይቲ ዎርክሾፕ ይሕበሮ፣ ደሓር selected መማህራን ገይርካ እቲ መደብ ትቕጽሎ። እቶም መማህራን እቲ ዕላማ ስለ ተረዲኡዎም ዘሎ ክተሓባበሩኻ ምኻኣሉ። ሕጂስ ዓርቢ 3ይ ፔሬድ ክትገድፈለይ ኢኻ ይብላ ነታ መምህር ዋእ እንታይ ኣለኩም ድዩ ይብሉኻ። ኣበይ ድኻ (ኢሎም ይሓቱኻ)። ኣብዛ ናይ ሳይንስ ኣኼባ ኣለና (ትብሎም)። ዋእ ሳይንስ እንታይ ኣለኩም ድዩ ይብሉኻ። ዝበዝሐ ዋላ ሓንቲ ኣፍልጦ ናይ'ዚ ንገበሮ ዘለና የብሎምን። ሕጂ ቅድም ይሕበር'ዶ ደሓር መማህራን መሪጽካ ምተኻየደ። ግን ስለ ከምኡ ዘይኮነ እቶም ዝፈለጡ ግን እንታይ ይተሓባበሩ ነይሮም። እምቧእ ኩሉ ይተሓባበሩና ነይሮም፣ ፔሬድ ይቕይሩና ዋላ ምምሕዳር ከይበሎም፣ ካልእ ዘድሊ ማተርያል፣ ዋላ'ውን እቶም ዝዓደምናዮም ኣቲዮም ዝራኣዩዎ፣ ቧእ ብኻ ምሳኹም ስሪሕና ገለ ኢሎምሲ ክስታይ እእእ ነይሮም።

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Researcher (01:01:34) ፥ እዚኣ'ኳ ቅድም ተመሊሳ ኢያ። ዝኾነ ፕላን ወይ መደብ ኣለኩም'ዶ ኣብ'ዚ lesson study ንኽትቐጽል? Do you have Do you have any plan of continuing lesson study? ይብል ኣሎ፣ ስለምንታይ? If yes what opportunities are available if no why no?

SAT3 (01:02:36) ፥ ክትቅጽሎ ዕላማ ኣለካ ድዩ?

Researcher (01:02:37) ፥ ሕጂ ንኣብነት next semester ለሰን ስታዲ ክንስርሕ እንተኾይና ድሌት ኣለካ ድዩ ንኽትሰርሕ?

SAT3 (01:02:45) ፥ Of course እቲ opportnunity እንተዳኣ ኣሎ ኣብ'ቲ ባይታ ዓንተቦ መምህር SAT4 ጠቒሳቶ እንድያ እቲ class size ወይ ድማ እቲ situation ናይ class እንድሕሪ ተማዓራሪዩ ኣነ surely ኣብ'ዚ lesson study ክቕጽል ኢየ። እንተዳኣ ኣብ'ቲ ስራሕ ሃሊየ፣ እንድሕሪ ዕድላት ተፈጢሩለይ ኣነ ዋእ ዋላ ካብ ሎሚ መዓልቲ፣ እህእ (ሰሓቕ)፣ ጀሚረያ ኣሎኹ፣ እህእ (ሰሓቕ)።

SAT5 (01:03:14) ፥ ኣነ ድማ እንታይ ይብል Of course ኣብ'ዚ ዲፓርትመንት እንተለካ ጽቡቕ እንድዩ especially ከምዚ ሕጂ መምህር SAT1 ዝበሎ ice breaking ስለዘላ we can say anything, we can ask anything። ኣፍልጦ። ተባራብርና ቁሩብ ዶርማንሲ (ነይሩና)፣ እቲ መምህር'ኳ ዘይፈልጦ ኣይኮነን እቲ ዝገብሮስ ዘይፈልጦ ኣይኮነን። ግን ምብርባር ኩሉ ጊዜ የድልዮ ኢዩ። ዋላ እቲ experienced ይኹን ዋላ እቲ unexperienced ይኹን። እእእ እንታይ ምበልኩ፣ ዎርኽሾፕ የድልዮ ኢዩ። At least department head ካብ'ቲ department ድማ ሓደ ሓደ ሰባት። ዳሕራይ ደዲፓርትመንት ኮይኖም ስኒ እታ lesson study ከም revision ድዩ እንደገና ከምዛ ንገብራ ዘለና'ስኒ ክትገብር ክትኽእል ኣለዋ። ኣነ ሕጂ next year እእእ ኣብ ቡኮ ዘለዋ class maths መሃሪ ተባሂለ maths ኢየ ክኣቱ። ኣብ'ታ maths እታ lesson study collaboration ክገብር እንተኾይነ ግን Idon't have እቶም ኣፍልጦ ናይ lesson study ዘሎዎም፣ ዕሙቕ ዝበለ (ፍልጠት ዘሎዎ) ሰብ ስለዘየልስ ክኹለፍ ክኽእል'የ። በይነይ ክነይይ ኣይክእልን ኢየ። collaborate ክገብር ክኽእል ኣለኒ። Of course እቲ ኩሉ ጊዜ ዝግበር ክግበር እንድዩ፣ collaboration ድዩ ኣብ ጊዜ ፈተና ንሱ ሕጂ ኩሉ ጊዜ ናይ collaboration ኩሉ ጊዜ ናይ ግድን ኣሎ ኣብኣ። ከምዚኣ ዕሙቕ ዝበለ ክትከውን እንተኾይና ግን ኣነ እንታይ ምበልኩ at least ከማን ካብ'ዚኣ ንሕና ዘሎና መምህራን ድዩ ዎርክሾፕ ክዋሃብ ክኽእል ኣለዎ። Department Heads ድዮም ገለ ዳሕራይ ዳሕራይ እንተዝኸውን ማለት ኢዩ፣ ኣብ ዝደለኻዮ ዲፓርትመንት ከይድካ ስኒ እቲ collaboration ድዩ እቲ lesson study ድዩ ክትስጉም ክትምዕብል ትኽእል ማለት እዩ።

SAT1 (01:04:41) ፥ እወ ሕጂ ንሕና ዳርጋ ሓሙሽተ ጥራይ እንድና ፈሊጥና ዘለና ኣብ'ዛ ዎርክሾፕ። ከምዚ ዓይነት ዎርክሾፕ ኣድላይት ኢያ። እወ ክንምህር (ክንቅጽል) ንደሊ ኢና። ክንደሊ ከለና ግን ኩሉ ነገራት ክማላኣልና ክኽእል ኣለዎ። ዋላ እንተዘይተማላኣልና'ውን ዝኾነ ይኹን ኣፋፍኖት ክንገብረሉ ምእንቲ እቲ ኩላትና ናይ ሳይንስ'ውን ፍሊጥናዮ'ኮ ኣለና። ናይ ሳይንስ መጽሓፍ ሓንቲ'ያ ኩላ ካብ 6ይ ጀሚርካ ክሳብ 8ይ እቲ ኣስራርሓኣ እታ structure ናታ ሓንቲ ኢያ። መጀመርታ ኢንትሮዳክሽን (introduction) ትህበ፣ ደሓር let us discuss ትብል፣ ዳሕራይ activity ትህበ፣ ዳሕራይ ገለ መለ ትብል። ግን ኩላትና apply ንገበሮ ድና? ሕጂ ግን እዚ ዎርክሾፕ ከምቲ ክትብሎ ዝጸንሐት (SAT5) ዎርክሾፕ ኣድላይ ኢዩ ንኩላትና። ዎርክሾፕ ካልእስ ይትረፍ እታ ናይ ሳይንስ ጥራይ'ኳ፣ ሕጂ ዎርክሾፕ ንገበር ኢና'ኮ፣ ንገበር ኢና። ቀዳማይ ሰመስተር ገይርና ኢና፣ ኣብ ዓመት ክልተ ጊዜ ንገበር ኢና። ግን ሳይንስ ንበይንና ተፈሊና ንገበር ነይርና፣ እቶም ቁጽሪ'ውን ከምኡ፣ ዳሕራይ ኣነ ኢየ ከማን ንSAD ዋእ ንመማህራንሲ ነንሕድሕድና (ዘይንማሃሃር ኢለዮ)። (ስለ'ዚ) ትማሊ ንመጀመርታ ጊዜ ገይርናያ። ኣብኣ ከምቲ ዝበሉዋ ካኣ ዋእ እቲ ዊክነስን (weakness) እቲ ክስታይ (strength) ነንሕድሕዱ ተፈላሊጡስ ከም'ዚ ክኸውን ኣለዎ (ተባሂሉ)። ሕጂ ናይ ምቅድዳሕ ክጅመር ተጀሚሩ ኣሎ። ኣብ ናይ ሳይንስ'ውን እዚ ዎርክሾፕ ቀጻሊ ክኸውን ኣለዎ ም'ክንያቱ እዛ lesson study ንሳ ኣብ ኩላትና ክትተኣታቶ ኣለዋ። ሕጂ ከምሰቦም ኢዮም ሰሚዖም ዘለው። ንሕና ከኣ ክነጋንና ኢና'ሞ፣ ኣብ ዝመጽእሲ እንድሕሪ ኩሉ ተፈቒዱልና እንድሕሪ ተማሃሮን እቲ ጊዜ እቲ class 'ኮ ከምዝራእካዮ ኢዩ። ተማሃሮ እንዳዋሓዱ ኢዮም ዝኸዱ ዘለው፣ ስለዚ ሕጂ ጸገም የለን። እቲ በንችታት እንዳኣውጻእና ኢና (ንምህር ዝለና)። በንች ዝያዳ ኢዩ ዘሎ። ናይ ቀደም 70-80 ዝነበሩ፣ ሕጂ እንተበዝሑ ካብ 40 ዘይበዝሑ ተማሃሮ ኢዮም ዘለውና። ብኡኡ ምክንያት በንችታት እንዳውጻእና ኢና convenient ንገበሮ ነይርና እቲ ክላሳት። ሕጂ'ውን ካብ ንዓመታ ድሕሪ ሕጂ እዚ በንችታት ኣውጽእና ኣቐምጡዎ እንተደሊኹም ኢልና ክንጥቀመሉ ኢና ንgroup discussion። ስለ'ዚ ንበይንና ከይንፍለ ጥራይ እንተዘይኮይኑ፣ ንዝመጽእ ሰሚስተር ጽቡቕ ነይሩ። ክንጅምራ ኢና፣ ክትተኣታቶ ኢያ ከኣ complete 'ኳ እንተዘይኮነትሲ እእእ።

Researcher (01:07:06) ፥ ኣብ ካልእ ቤት ትምህርቲኽ?

SAT4 (01:07:10) ፥ Already እዛ lesson study ኣላ ትብላ ኣለኻ ሓንቲ፣ ሕጂ እዛ lesson ዘላ ናይ ሳይንስ መማህራን ንኹሎም ዘሳተፈት ክትከውን እቶም subject teachers ናይ 6ይ ድዮም ናይ 7ይ ድዮም ናይ 8ይ ኩሎም ኣብኣ participate (ክገብሩ) observers ኮይኖም ኮፍ ክብሉ ካብ ካልእ ዲፓርትመንት ድማ ሓሓደ ኣቲዮም ከምቲ ንዓና lesson study ዝያዳ ክሪኡልና እዚኣ ከም ሓገዝ ኮይና ትስማዓኒ።

Researcher (01:07:40) ፥ ከምዚ ንሕና ንጥቀመሉ ዘሎና ኣገባብ ናይ lesson study ኣብ ካልእ ቤት ትምህርትታት ዘሎው መማህራን ክጥቀምሉ recommend ዶ ትገብር? ጽቡቕ'ዩ ዶ ትብል? Do you recommend lesson study as a strategy for other middle school teachers?

SAT3 (01:08:37) ፥ እእእ ዓንተቦይ ተንኪፍናዮ እንዲና፣ ሕጂ lesson study እንታይ ጠቒሙካ ትብል ሕቶ ነይራ። ዋእ ከምዚ ዝጠቐስናዮ ኩሉ confident ክኸውን ኣኽኢሉኒ። ተቐሪበ ክመጽእ ከምዘለኒ ኢልና ብዙሕ ዓንተቦይ ጠቒስና እንዲና፣ ካልኣይ ከኣ ካብ

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lesson study ኣመሃህራ ተማሃሮ እንታይ ከሲቦም ከኣ ኢልና። ነጻ ኮይኖም ክዛረቡ፣ እቶም ሕማቓት ከበራበሩ ገለ ኢልና ዓንተቦ ጠቒስና። እዚ ኩሉ ረብሓ እንዳሃለዎ ዳኣ why not ካልኦት ቤት ትምህርቲ ተማሃሮኦም ክበራበሩ ዘይንደልየሉ ምኽንያት የለን። መማህራን ዕሙቕ ዝበለ ትምህርቲ ክህቡ ድሌት ኣለና። ስለ'ዚ ኣብ ኩሉ middle schools ኣብ ኩሉ ኤርትራ ወረ እንተዝተኣታቶስ ጽቡቕ ምኾነ (እህእ) ኢና ንብል።

SAT5 (01:09:27) ፥ ሕራይ እእእ እወ Of course I would recommend ግን ቅድሚ recommend ምግባር ግን ኣፍልጦ still። ምኽንያቱ ምሳይ ዘለው ሕጂ ኣብ ቤት ትምህርቲ School 'C' ካልኣት መማህራን ኣለው (ንዝቲ ኢና)። እዝስ ዘይከውን ነገር'ዩ፣ እዝስ ምስ ብዝሒ ተማሃሮ ዘይከውን ኢዩ ንብል። እወ እዚ ብtheory 'ምበር ኣብ ዓድናስ ኣይከውንን ኢዩ። 3rd world ስኒ ከም እንታይሽሙ ውጉዝ ኮይኑ እዩ ተቢሉ። Again ድማ እቲ መምህር'ከ እንታይ motivation ረኺቡ ኢዩ ማዕረ ክንድዚ ዝደክም? እእእ ካልእ Of course ብዘይድልየትካ ገለ ገለ ኣሎ እንድዩ፣ ንሱ ካልእ እንታይሽሙ ኢዩ። ስለዚ'ስኒ መጀመርታ ኣፍልጦ ነዛ lesson study፣ ዳሕራይ እንታይ ከብበር ይኽእል ማለት ኢዩ፣ ነቲ ናቱ skills ምስ ኣብ ሞንጎ collaboration ዘሎ develop ስለዝብበር ነቲ መምህር benefit ኢዩ። ነቲ instructor ስኒ benefit ኢዩ ዝብበር ዘሎ። ካልእ ድማ ነቲ ተማሃራይ motivation ይስድድ ኣሎ። ዋላ ነቲ መምህር ከማን motivate ይብሮ። ክምህር ከሎስ ደስ እናበሎ ይምህር። ምኽንያቱም እታ ተሰክፎ ነገር ዝነበረት ስኒ ካልእ መምህር ነጊሩዎ ኣሎ፣ ኣረዲኡዎ ኣሎ። ካልእ ነገር ice breaking ንብለን ብጣዕሚ (ጠቓሚ ኢዩ)። ብዝኾነ ነቲ መምህርን ተማሃራይን ነት benefit ስለዘሎዎ ስኒ ከተኣታቶ ይላቦ ማለት ኢዩ።

SAT1 (01:10:44) ፥ እወ ክተኣታቶ ተቓውሞ የብልናን ጽቡቕ'ምበር፣ ምኽንያቱ እተን ስልጡናት ሃገራት ከማን ተጠቒመናሉሲ ኣብ'ቲ ስልጣንኤን እዚ በጺሕናዮ ኢና ኢለን ከማን ኣይገደፎኦን። ንሱ ዝሓሸ ስለዝኾነ። ቅድም በታ ብቴክኖሎጂ ላዕሊ ዝኾነት ጃፓን ተጀሚሩ፣ በዓል ኣሜርካ ክሳብ ሕጂ ብዘይካ እግዚኣብሔር ገለ ዝካትዖም ዘየሎ፣ ዝወዳደሮም ዘየሎ'ውን ንድሕሪት ተመልሰን apply ይብበርኦ ኣለዋ። Ten years ከማን። ንሕና ከኣ ኣብ'ዚኣ ከም ሞዴል ሰለስተ ቤት ትምህርቲ ተመሪጸን ጽቡቕ ምኻኑ ከኣ ኣረጋጊጽና ኣለና። ስለዚ ቀጻልነት ክህልዎ ንሕና ንደልዮ ኢና። ግን ግን እንዳኾነ ኩሉ ጊዜ 'ምበር፣ እቲ ዓቕምና ስለዘየሎ፣

SAT3 (01:11:22) ፥ ባይታ

SAT1 (01:11:23) ፥ እወ ኣብቲ ባይታ ንሕና እቲ መምህር ስርሐይ ኢሉ ሕዙዎ፣ ንሱ'ውን satisfied ኮይኑ (ዝስራሕ'ዩ) 'ምበር (ሕጂ) ጉያ ጉያ ኢያ (ዘላ)። ሕጂ ንኣብነት ንሕና ተገዲድና ኢና ኣብዚኣ ኮፍ ኢልና ዘለና'ምበር እዚኣ ክትሓጽብ ድያ፥ ኣነ ካልእ ቆልዓ ክምህር ድየ ዘብ ዘብ ኢዩ ነይሩ። ስለዚ ከምዚ ገይርካ ንኽትካታዕ ጊዜ (የድሊ ኢዩ)። ዋእ ዝያዳ ይጥቀሙ ኢዮም ዘለው እቶም ተማሃሮ። እቲ plan (lesson study) ኣዚዩ ጽቡቕ ኢዩ። እንተዝተኣታቶ ንሓዋሩሲ ዋእ ናይ ሎሚ ተማሃሮ'ኳ እንተዘይበልና ጽቡቕ ምዕባለ ከምጽእ ዝኽእል'ዩ ዝመስል። ጽቡቕ ኢዩ ከኣ!

Researcher (01:11:57) ፥ ሕራይ ዝኾነ ክትውስኹዎ ትደልዩ ሓሳብ እንተሎ። Any comments

SAT1 (00:12:06) ፥ ኣብዛ ናይ SAT4'ሲ ሕጂ ክትግበር እንትኾይና ክትምህር'ሲ፣ መማህራን ክዕደሙ ኣለዎም ናይ ሳይንስ ኢላ'ሞ፣ ናይ ሳይንስ ኩላትና 13 እንድና፣ እቲ ገዛ ይጸበና'ዶ 'ምበር ምዓደምናዮም። ካልእ'ውን ይበሃል ስለዘሎሲ፥ ንተማሃሮ ዲና ክንምህር ወይስ?

Researcher (01:12:28) ፣ እወ ንተማሃሮ

SAT3 (01:12:29) ፥ Observers ከይበዝሑ። ዕልቕልቕ ከይትኸውን።

SAT1 (01:12:33) ፥ እሞ'ሲ ከይንበዝሕ ማለተይ ኢየ።

SAT3 (01:12:35) ፥ At least ሓደ ካብ 6ይ፣ ሓደ ካብ 7ይ፣ ሓደ ድማ ካብ 8ይ።

SAT1 (01:12:36) ፥ ከምዚኣ እንተኾይና ከምታ ናይ በቐዳማይ ንመማህራን ኣብ'ዚ staff ትካኣል'ያ።

SAT4 (01:12:39) ፥ ኖ ኖ ንሶም'ሞ ክበዝሑ ኢዮም። ብምሉኣም እንድዮም ንሶም'ዳኣ. ንናይ ሳይንስ መማህራን ብምሉኣም

SAT1 (01:12:45) ፥ 13 መማህራን ኢና። ደሓን ካብዚኣም 10 ይመጹ ይኾኑ፣ ወይ ድማ 7 ወይ 8 ይመጹ ይኾኑ።

SAT4 (01:12:49)፥ ካብ ነፍስወከፍ ዲፓርትመንት ከኣ ሓደ ሓደ

SAT1 (01:12:53) ፥ እሞ ኣይንበዝሕን

SAT5 (01:12:55) ፥ እንታይ ክንብር ንኽእል፣ ኣብዛ ገፋሕ class ዘላ ነቲ ደስክታት ኣቀራርብ ኣቢልና ንማእከል ገይርናም እቶም ተዓዘብቲ ብድሕሪት ኮይኖም ከምዝዕዘቡ ንብር።

SAT3 (01:13:10) ፥ እታ group ትዘውር፣ እቶም ዝጽዉዑ ግን ጸግዖም ሒዞም ጥራይ ይከታተሉ።

SAT4 (01:13:19) ፥ ከበዝሑ የብሎምን፣ ክንዲ'ቲ ቁጽሪ ተማሃሮ እንተመጺኦም'ሲ

ኩሎም (01:13:20) ፥ ሰሓቕ

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Researcher (01:13:23) ፥ ኣብ ጃፓን እንታይ ይገብሩ ይመስለኩም፣ ዋላ ብደገ ብመስኮት ኮይኖም ይዕዘቡ፣ class ከይኣተዉ ብመስኮት ይዕዘቡ።

SAT3 (01:13:32) ፥ Ok; ከምኡ'ውን ይካኣል ኢዩ።

SAT1 (01:13:32) ፥ well oriented; ዋእ እዚኣም! ንሳቶም'ኮ ላዕሊ'ዮም።እቲ ገዝኣም እእእ ፓላሶ፣ ንስኻ ሞስኮት ዓጺኻዮ እእ

SAT3 (01:13:38) ፥ ሳሓቕ

SAT3 (01:13:44) ፥ እንታይ ካልእ ትውስኾ ኣላ እንድያ ትብል፣ እዚ lesson study ኣብ ኩሉ ቤት ትምህርቲታት ከተኣታቶ ድሌት ኣለካ'ዶ እንድያ እታ ሕቶ። እወ ድሌት ኣለና፣ ግን ምስ ኩሉ ሕጽረታቱ ኢዩ። እቲ መምህር ሓደ ሽፍት ክኸውን ኣለዎ ምእንቲ ጊዜ ክረክብ። ከምኡ'ውን እቲ class size ዓዳሚ ክኸውን ኣለዎ። እንተዳኣ እዘን ሕጽረታት ንብለን ዘለና ተወጊደንሲ why not ካብ ጽባሕ'ውን ክንጅምራ ኢና። እህእ። ጥራይ እተን ሕጽረታት ይወገዳልና ኢና ንብል።

Researcher (01:14:15) ፥ እንተዘይተወጊደንከ?

SAT3 (01:14:16) ፥ ብዘለካ ዝከኣለካ፣ ከምዚንብሮ ዘለና ከኣ

ኩሎም (01:14:19) ፥ ሳሓቕ

SAT3 (01:14:22) ፥ We will do our best

SAT5 (01:14:26) ፥ መምህር Researcher'ኽ ናባኻ'ያ እዛ comment። Ok እእእ እዝስ introduce ገይርካዮ ኣለኻ፣ Are you going to try to apply it? እዚ ፕሮፖዛል'ስኒ ንሚኒስትሪ ትምህርቲ ተቐርቦ ዶ?

Researcher (01:14:42) ፥ ኩሉ ጊዜ ኣብ research ሲ ኣብ መጨረሽታ recommendation ተቐርብ ኢኻ። ነቶም policy makers እዚ ከምዚ ዓይነት መጽናዕቲ ገይረ ኣሎኹ። ከምዚ ዓይነት result ተረኺቡ ኣሎ። ስለዚ ከምዚ ዓይነት ለውጢ ከኣ ይገበር ኢሎም ኣለዉ።እዚ ክትግበር እንትኾይኑ ከምዚ ዓይነት ለውጢ ክግበር ኣለዎ። ከምዚ ዓይነት benefits ኣለዎ ኢለ recommendation የቐርብ።

SAT5 (01:15:09) ፥ ምኽንያቱ እቲ ዝዓበየስኒ at the end of the day ናትካ እእእ ተዓቢጣ ኣብ እንታይሽሙ (ኣብ ከብሒ) ኮፍ እንተኢላ መጽሓፍ'ስኒ it is nothing። ናትካ proposal ግን I think it can make a difference፣ ዋላ ቁሩብተይ።

Researcher (01:15:21) ፥ ይረአ ዲዩ ኣይረአን ካልእ ሕቶ እንድዩ፣ ነቲ ዝተገበረ መጽናዕቲ ኣብ ካልእ ቦታ እንተኾይኑ ይረአ ኢዩ ማለት ኢዩ። እንደገና ሓደ ሰብ ዝገበሮ መጽናዕቲ ብካልእ ሰብ follow-up ኣለዎ ኩሉ ጊዜ። ሕጂ ንኣብነት ኣነ ዘቕረብኩዎ recommendation ተኸቲሉ ካልእ ሰብ ነታ ኣነ ዝገበርኩዋ መጽናዕቲ ተኸቲሉ ካልእ መጽናዕቲ ገይሩ ከኣ ሓደ step forward ከኣ ይወስዳ ማለት ኢዩ።

SAT3 (01:15:53) ፥ ኢዚኣስ ናይ መውዳእታ መጽናዕቲስ ኣይኮነትን። ናይ መወዳእታ መጽናዕቲ'ውን ከይትኸውን ትኽእል ኢያ።

Researcher (01:15:55) ፥ እወ ከይትኸውን ትኽእል። ካልእ ሰብ'ውን ብድሕሪይ'ውን ከጽናዓ ይኽእል ማለት ኢዩ።

SAT3 (01:15:58) ፥ ሕጂ እዚኣ ተወዲኣስ ክትቀርብ ኢያ ማለት ኣይኮነትን?

Researcher (01:16:01) ፥ ይቐርብ እንድዩ፣ ከም ጽሑፍ ማለት ብሪፖርትreport ይቐርብ እንድዩ፣ እቲ ሪፖርት ዝቐረበ'ሲ ኣብ ሚኒስትሪ ትምህርቲ እቶም policy ዝሕንጽጹ ሰባት'ሲ ይኽተሉዎ ድዮም ኣይከተሉዎን ካልእ ሕቶ ኢዩ ማለት ኢዩ። ግን ዋላ ኣብዚ እንትዘይተኽተሉዎ'ውን ካልኦት ክከታተሉዎ ይኽእሉ ኢዮም። ሕጂ ኣነ ንኣብነት ዝጥቀመሉ literature ኣብ ጃፓን፣ ኣብ ደቡብ ኣፍሪቃ፣ ኣብ ክስቶ (ኣሜሪካ) ዝገበሩዎ መጽናዕቲ ናቶም መጽናዕቲ ተኸቲለ ይሰርሕ ኣለኹ ማለት ኢዩ። ናተይ መጽናዕቲ ተኸቲሉ ዝሰርሕ'ውን ክህሉ ኢዩ ማለት ኢዩ።

SAT3 (01:16:35) ፥ World wide 'ዩ ማለት ኢዩ?

Researcher (01:16:36) ፥ እወ World wide ኢዩ። ስለዚ'ሲ ኣበርክቶስ ክህልዎ ኢዩ ማለት ኢዩ።

SAT3 (01:16:37) ፥ Ok

Researcher (01:16:42) ፥ ስለዚ ወድእና ኢና ይምስለኒ። የቐንየለይ። ብዙሕ ብዙሕ ጊዜ ወሲደልኩም ኣለኹ። ሰዓት ክንደይ ወሲደልኩም?

SAT1 (01:17:01) ፥ ሓደ ሰዓትን 20 ደቂቅ፣ 25 ደቂቕን

Researcher (01:17:05) ፥ ሰዓትን 25? ብዙሕ ጊዜ ወሲድና። ስለዚ የቐንየልና።

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School 'A'_ First teachers' interview (English)

Teachers interviewed: SAT1, SAT3, SAT4 and SAT5
Date interview taken 23/04/2013
Interviewed and translated by Researcher

Researcher 00:00:12: Good morning. First of all I welcome you for this interview. I thank you for showing willingness for this interview.
Researcher 00:00:17: We will start the interview by this first question. Is there anything that you have learned as a result of participating in lesson study? Was the lesson study process successful in terms improving your content knowledge, pedagogic knowledge, working and sharing ideas with colleagues, observation skill and lesson planning skill? Do you feel any changes or improvement in your knowledge? I will give the chance to begin responding to SAT1.
SAT1-H1: 00:01:26: I can say we have gained a lot of knowledge. It is indeed a lot. I can say that we also have learned. What I mean by this is, for example, when SAT2 taught the first research lesson we identified and then rectified the shortcomings of the lesson. Afterwards we elaborated it. We provided suggestions for improvement to the teacher who presented the first research lesson. Even though it was taught by one teacher we consider the lesson as joint lesson. Some of us suggested to directly introducing the lesson while others indicated that the lesson has to be started with motivation. Therefore, the re-taught lessons became better than the first lessons. By participating in lesson study we have also profited a lot. From all of the lessons presented during the school day workshop which was conducted yesterday, the lesson presented by science group was more practical than the others. Participating in lesson study has helped us to do such presentation during the school day workshop. The collaboration that we have shown and the practice of informing weaknesses to one another. It is not weakness as such but telling one another how to do things in a better way. The grouping of students which we used in the first teaching was different from the groping system that we have used in the re-teaching. We have also changed our teaching strategy. Since the subsequent teachings became better than the previous teachings, I can say that the whole process was successful. We have agreed on the lesson plan. We have implemented the lesson according to the lesson plan. We have not deviated from the lesson plan. That is why the lesson was successful. I can say that both goals have been achieved. That is the goals for the students and us (teachers).
Researcher 00:03:07: Teacher SAT5 it is your turn to answer.
SAT5-H1: 00:03:13: In general, I could feel that we have developed, especially those of us who lack experience. Lesson study provided more support to those of us who joined teaching recently than the teachers who have many years of experience. We were able to see and experience a lot. I have gained content knowledge and developed skills since the first lesson was taught to grade 8. We agreed on how to elaborate on the content. We have also agreed on the type of pedagogic knowledge that is we have agreed on how to use alternative methods such as demonstration instead of just using lecturing method. I have also learned how to use other strategies in the form of easy way as substitute for lecturing method. This lesson study enabled me to work and share ideas with colleagues. To speak the truth we were criticizing one another. The positive comments were taken for granted. An indication that each of us was developing was that no one was taking the negative comments personally. We were suggesting that this has to be changed to this and prepared like this when it is prepared for the second time. Regardless of our teaching experiences, all of us were taking the criticisms positively. It was obvious for me that we were developing. Our observation skills developed since the first lesson. When we first started observing, I can say that our observations had limitations. Later on the sharing of ideas opened venue for discussion. The discussion became more and more detailed as time goes on. I feel that as the discussion became more detailed, it helped us to do work, that is more fruitful. We have

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prepared lesson plan but I feel that we did not discuss much on the lesson planning skills. The researcher helped us on the lesson plan. He elaborated it a little bit. Nevertheless, I feel that we did not discuss much on the lesson plan that we have prepared. Generally, I feel that the lesson study has supported us a lot.

Researcher 00:05:35: Teacher SAT3.

SAT3-H1: 00:05:41: Yes for sure the lesson study that we have experienced has supported us a lot. However, I want to share with you the experiences that I have learned. I have gained new experiences in pedagogic knowledge and working and sharing ideas with colleagues. In lesson planning as well.

After participating in this research, I have started to question my lesson plan preparation. I feel that it is important to modify it using the new experience gained.

Let us recall to what we were saying in the past. We were saying class-size is a hindrance to implement a student-centred teaching. We were also saying that 40 minutes are not sufficient for such type of teaching. Now, we used the same 40 minutes for teaching student-centred way. We used grouping by removing some benches out. We were able to change our teaching strategy to some extent. Our colleagues who observed our lesson acknowledged the changes that we are making and they liked the lesson. I can stress that we are progressing well.

SAT4-H1: 00:06:58: All the ideas have been forwarded. As an experienced teacher I want to give some generalization. Even though we have many years of experiences we were not better informed about lesson study. All of us were working alone. I was using my own way of teaching. SAT1 was using his own way of teaching. The other one also uses his own way of teaching. Now, we have started working together and discussing about the content that we intend to teach. Working collectively has helped us to broaden our knowledge. Even though we claim that we have worked in teaching profession for more than 20 years, I have learned a lot from the recent practice. What I wanted to say is that as a teacher I have never focused my observation to what students were doing. In my teaching, I usually start with introduction, provide development and then continue with the lesson without giving much attention to students. Now, I have understood that the students can make a difference if we focus on them. Focusing on the students would help us to deeply examine our lesson by making wide reading on content knowledge and then teach our students, so that our students better results. Moreover, there are things that I do not know but SAT1 knows them and there are also others that SAT2 knows but that I do not know. Therefore, I found the plan which was prepared by all of us through collaboration helpful. Such process has benefited not only the less experienced teachers, but the more experienced teachers as well. Both of us benefited. As a teacher I feel that I will make a lot of changes. My plan is to completely change my teaching in future. This is because we have earned good points. This is extremely important.

SAT1-H1: 00:08:49: Ok. I want to provide additional comment to what has been said. The lesson study has benefited us a lot. Some of us were teaching student-centred way while others were not. The science textbooks are extremely good textbooks. They prescribe exactly what we have done during lesson study. This is because the lessons in the textbooks start with “let us discuss” and then goes to motivation. The lessons give chance for the students to participate. The subjects are related to the students’ daily life activities. If we properly follow, lesson study will enable us to achieve the goals prescribed in the textbooks. If we go back and see the textbooks again, all lessons start with “let us discuss” followed by activity. What is in the textbook is what we have practiced in lesson study. This way of teaching has already been in the textbook before you (researcher) brought to us. The orders (from the Ministry of education) tell us to teach that way. This lesson study has provided motivation that we must start implementing what is proposed in the textbook. We are practicing it now. When we conduct peer teaching we prepare it that way. Our science textbooks are unique. We always used to report that in all our meetings. They are good textbooks. They are

Researcher 00:09:52: they are activity-based.

SAT1-H1: 00:09:53: Yes they are activity-based. Yes. In addition I want to indicate that I have learned

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a lot. I may know the topic and sub-topic of one particular lesson. Now, I have realized that extensive preparation is required to teach a particular topic. Such preparation makes teachers to have more confidence in their teaching. The students also get motivated. This enables you to confidently measure student capacity. SAT3 and I are teaching grade 7. There are other teachers who teach grade 7. Had this workshop been provided to all of them, we could have able to work together like this and discussed the lessons together. If sufficient time is provided to us we could have prepared a joint lesson plan. The result could have been better. I feel that we could have been able to see real changes in the school.
We were preparing lesson plans in isolation. Everyone was preparing his or her own lesson plans alone. The exchange of idea was limited. For example, SAT3 would ask me, how far we should go in the planning and I would reply that we should go up to this point. That is all. We were not discussing on how to teach the lesson. That is the difference between what we were doing and what we are doing now. If we were able to work in groups, I feel that we could have delivered more effective lessons.
Researcher 00:11:07: Now let us come to the second question. The procedures for answering should not necessarily be in sequence. Answer in any order. Some of the questions may seem to be repeating. Therefore, I beg your patience. Ok. The teaching strategy that you used was mainly demonstration. In what ways are the instructional strategies that you have used in lesson study process similar or different from the strategies that you have used in the past?
SAT1-H1: 00:12:21: Ok. Let me first answer this question. The teaching strategy that we have used in both cases is similar. The only difference is now we put more emphasis to the lesson. For example the lesson which we taught to grade 8 students was on expansion of materials.
Researcher 00:12:35: Yes.
SAT1-H1: 00:12:36: The lesson was on expansion of materials in general and in particular in gases. I could say that we spent all 40 minutes on expansion of gases. This means we gave more emphasis to gases. We avoided rushing and providing a bulk of information. We used to finish the three states in one period. Now, we presented the three states of matter at different times. We presented solids in one period, liquids in another period and gases in a separate period. This indicates that we have exaggerated on one. There was a possibility of demonstrating the three states in one period. Even though the instructional strategy that has been used now is similar to what has been used earlier, we have deepened and elaborated on a single topic. We spend a lot of time on a single topic. One topic was given one full period. For example, in the first lesson which was taught by SAT2, we asked the students to indicate the source of gas which is expanding the balloons and they assumed that it was from the bowl. But in yesterday's lesson they better understood the lesson and indicated that it was from the bottles and not from the bowl. For this reason, we feel that we have made some improvements in our teaching when compared to our earlier teaching. Instead of providing short answers such as the expanded air inflates the balloons and skip the lesson we elaborated on it. Thus, the students better understood the lesson. The students were also good students. We made such changes because we got time. The instructional strategy we used was the same. We did not make any changes in instructional strategy apart from giving more emphasis to one topic. We spent time on one topic. Spending more time on a single topic became a form of revision for the students. As a result the students understood the concept even those who did not understood it earlier. I can say that by spending time we benefited.
Researcher 00:14:16: When you feel that you want to respond to the questions please take the microphone and do so.
SAT3-H1: 00:14:18: The question is how the previous instructional strategy differs from the new strategy. As indicated by SAT1 there in no difference between the instructional strategies. They are the same. But there is one thing that we are doing differently. On Sunday we had workshop in this school. We were told to that 75% of the classroom speaking should be made by students and teachers 25%. But we were going contrary to it. After participating in lesson study we have started giving more chance to the students. The 75% of speaking was made by the students plus we have used teaching aids. As indicated by SAT1, in the previous practices the teacher may bring the teaching aids, but explains the

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concept and then proceed to the next lesson in a rush. In the current practice, teachers bring necessary materials and create an environment for the students to come forward and demonstrate themselves. Now we are giving more chance for the students to participate. We are preparing and using necessary teaching learning resources. Even though the method was the same, the way it was presented was different. By allowing students, to participate we made it to be different from our earlier practice. By allowing students, to participate we made it to be different from our earlier practice.

SAT4-H1: 00:15:33: What I want to say is that we have already provided all our opinions in writing on the papers that you have provided us. For example we have mentioned that class size and the classrooms are not suitable for teaching in this way. I can see that there is a difference between what we were doing previously and what we are doing now. As I told you we walk into a classroom, normally, without doing much preparation especially those of us who claim to be experienced teachers. There are times when we do not even use textbook. After practicing in lesson study, I started taking thing seriously. I have started making maximum preparation. I started taking the way I see students seriously. From the time I enter into a classroom I constantly think about how I could effectively transfer the knowledge to the students, how to motivate them, how keep the lesson flowing, how to attract students towards the lesson and how to show what is in theory practically. In short all these points make me to take things seriously and go to classroom ready with maximum preparation. Therefore, lesson study is important, because negligence does not come close to it.

SAT5-H1: 00:16:54: If I am to speak about my own experience I can say that I have learned two things. First, while teaching a topic on parallel and series circuits three years ago, I provided the students with wrong information. That time supervisor was with me. I taught what I have learned it myself. Before the commencement of the lesson, I asked some of the staff members whether the bulbs in the street are connected in series or parallel. I taught the students that the bulbs in the streets are connected in series. I remembered that my teacher provided me the same information. I did not check and did not do further research on it. I did not take it seriously and I conducted the lesson without much preparation. The supervisor was with me. After the lesson, the supervisor asked “are you sure” while giving me feedback. I replied that I am sure. I told him that the staff members also told me that the bulbs are connected in series. Teacher SAT4, I might have asked you the question. The supervisor helped me a lot and he provided me with explanation. I also searched in the internet. I also verified that I was wrong. I learned that I have to read more and search for information. Secondly, the supervisor provided us the circuit board and the bulbs with which we could demonstrate. We did not have one to demonstrate our lessons. He brought the bulbs from a technical school and provided us, the one that you saw it. Now we are able to demonstrate. I admit that I did not do much improvement since then. The demonstrations were done by the teacher. The students believe the parallel and series circuits when they see it themselves. We tell them that there is one path, different paths and they are seeing the wires but they do not know the difference. After lesson study we are giving them more chances. Now they can see the paths by observing themselves. Now I assume that they feel at ease.

Another thing which I learned after participating in lesson study is about the creation of subgroups in group work. I have never thought about creation of subgroups. After providing a task as a group work, we were assuming that all students are discussing as a single group. Now, I have learned that it is important to circulate and go around the class in order to avoid the creation of subgrouping. To make sure that no student is left out and being dominated by other students. These are some of what I have learned after participating in lesson study and on which I have tried to make changes.

Rsearcher 00:19:03: Ok thank you. SAT4 earlier indicated she worked alone in isolation, teacher SAT1 works alone; all other teachers also work alone. In lesson study, teachers work and collaboration with one another. Therefore how the collaboration you are experiencing now is different or similar from the earlier collaboration?

SAT4-H1 (00:19:55: If we see the nature of collaboration that was present before participating in lesson study. My teaching was not influenced by others. I teach, give notes, ask question in the way I like. After participating in lesson study, we are preparing joint lessons by sharing ideas on what to

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teach. Moreover, we agree on the type of notes and exercises that should be given, questions that should be asked and type of experiment that should be done. In earlier practice, collaboration was limited to informing one another the unit or sub-topic to be covered. No one knows what type of notes I give to my student. No one knows the type of note teacher SAT2 gives to his students. No one knows what type of oral questions I ask the student and what type of motivation I use. No one knows what SAT1 and SAT2 use. Lesson study helped us to use common lesson. It allowed us to collaborate and share ideas. If I have an idea if I share it with SAT1 he can use that motivation in his teaching. The motivation that SAT1 uses can be shard to SAT2. By doing so, we follow one plan. This means that we are teaching the same way. Collaboration means that we are providing our students with the same information. No collaboration means no uniformity among us. There was not much collaboration before lesson study. We were saying to one another let us do this or do that. Now, we are discussing on what to teach, what type of questions to include, discuss on the demonstration and agree on the experiment. There is difference between the two collaborations. The collaboration that we are practicing in lesson study is more effective.

SAT1-H1: 00:22:12: In science department we have a long history of preparing lesson plan together. Our plan was always one. For example all grade 8 science teachers agree on the content and nature of test and quiz. As SAT4 explained the collaboration is different. Earlier we were not serious. For example SAT2 is absent today. In order to cover the topics planned for this week he may drop the demonstration from the plan. What the supervisors from above tell us is that five days difference is acceptable. This is because one teacher could be fast and the other could be slow. Now in lesson study we take things seriously and we all collaborate with one another. We were preparing what we teaching after conducting discussion. This is far better. But the question is do we have time to do it this way in the future? For example the way they taught grade 7 was very attractive. They used materials such as circuit board and bulbs. In the old teaching we would not take extra pain to collect all these materials and we would abandon the demonstration altogether.

All (00:23:12: laughter.

SAT1-H1: 00:23:14: To speak the truth we do not know whether they have bought them or the students have brought them. The students are interested in works related to technique. If we ask them where they work, they would tell us where they work. The students like practical lessons because it helps them in their work.

The lessons were improving because all of us were providing our input. The two of them were responsible for the lessons in their grade and the three of us were responsible for the lessons in our grade. The collaboration has enriched the lessons with deep knowledge. I can say we have learned from this practice. But who will take the pain to prepare such teaching aids like the ones prepared by these two teachers. For example, I do not know from where they have brought them. Laughter. In the normal teaching one teacher would present the same lesson by simply drawing the circuit board on the blackboard and quickly proceed to the next lesson. Traditionally we were saying that the bulbs on the streets are connected on series and the bulbs in the homes are connected in parallel. We were wrongly saying that the street bulbs are not connected in parallel. Now, things became clear to us. Lesson study is good. But to implement it in schools it requires time, development and facilities. Moreover, satisfaction of teacher is necessary to do lesson study. Based on the orders from the Ministry we plan together, prepare test together. All members of science department work together. We are all acknowledged by the Office from A-Z.

SAT3-H1: 00:24:45: Now the question is how the two collaborations differ. Though limited, as teachers we collaborate with one another. SAT5 was mentioning it earlier. On Friday if I am to going to prepare a lesson plan I would ask daughter of Ghere the contents to be covered for the week. Laughter. I may ask her questions like ‘what are you doing with this’. However, the collaboration after lesson study is more detailed. There are teachers whom I know in this school who are shy to ask questions to their colleague. I do not have such problems. I have asked several times to teacher SAT4 or SAT1 or SAT5. A teacher can wrongly understand concepts. After participating is lesson study I became more and

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more confident. From lesson study we learned to collaborate. Therefore I do not have problems to sit down and learn from SAT4, SAT1 and SAT5. After participating in lesson study we are deepening our collaboration. There was collaboration but we are deepening it now.

Rsearcher 00:25:59: Ok. Our job is to teach students. How do you know whether or not that your students are learning and your lesson is successful? What are the indicators?

SAT3-H1: 00:26:36: In our earlier practice we were telling that our goal has been achieved by only taking the participation of the few active students into consideration. But we forgot the other students. We rectified it later on. Based on this we could say that the goals in the last two lessons have been successfully been achieved, because in this lessons the average students in the class have participated in the lesson. The lesson was a repeated lesson we have not tested new lesson. We can say the goal of a lesson is achieved by looking at the participation of the students especially when the average students present.

SAT5-H1: 00:27:43: Ok. I assess my lesson, even long ago, by giving more focus to the weak students. If I get slight satisfaction from these students for example in their note taking I would proceed to the next sub-topic. If we see the first research lesson which was taught by SAT2, of course there was pressure to finish the presentations and we were allowing only the outstanding students to participate in order to give life to the atmosphere. But later on we knew that the goal has not been achieved because many students were left out. In the second lesson we involved more from the weak students by eliminating the outstanding students. Mostly the outstanding students may have support at home and their own research. Of course they have potential. Assessing the lesson by taking them as a point of reference is unfair. I would say I have achieved the goal if the weak students mention one or two points from ten points I taught them. If he is able to tell me what parallel and series circuits are, I would accept that the goal for the lesson has been achieved. Of course the outstanding student can also tell by memorizing the concept. If an average student tells the difference by understanding it, I would think the goal of the lesson can be achieved.

SAT4-H1: 00:29:20: Time is the main factor that determines the participation of students. Time. If you have sufficient time you could allow all the students to participate in the lesson. The second factor is place. If we had a specific place such as hall and laboratory, where we can display our materials and demonstrate our lessons instead of using classroom, students could have observed the demonstration freely. They could have been able to jot down important points, take notes, ask and discuss. Student do not participated as required because of constraints in time, comfort, safety and class size. These factors influence participation. In the 40 minutes we intend to finish our lesson by allowing the active students to participate. We motivate only these students. They finish any assigned work within a short period of time. If we are to give chances for the weak students there must be sufficient time and comfortable environment. Moreover, the class size has to be reduced. If these factors are satisfied then it is possible for all students to engage in a lesson. This is the challenge.

Rsearcher 00:30:38: Ok let us continue. Up to now we have taught two lessons each and a total of for lessons. In addition to what you teach for lesson study you have the regular teaching. Now, to what extend do you use the new knowledge and skill obtained from lesson study to your teaching practice? For example, SAT5 indicated that she has never thought about creation of subgroups. Are there any new things like this example that are discovered by you to use them in your teaching?

SAT4-H1: 00:31:32: Is it for the future use?

Rsearcher 00:31:36: No. It could be for the future or for the present use, while you teach your lessons.

SAT4-H1: 00:31:40: Now we are the end of the academic year. The academic year has ended.

Rsearcher: 00:31:48: What about for future use?

SAT4-H1: 00:31:40: In my opinion, we have to plan so that lesson study starts with the starting of the academic year in future. The subject teachers should plan, in group, for their respective section and subject. They should include the experiment and other necessary information in the plan. Moreover, there should be one demonstration room at the disposal of science teachers. One teacher should be

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assigned to take care of it. The person is responsible for preparing the timetable for each grade and subject and cooperates with the teachers as needed. Majority of lessons are experiment based and few are theoretical. We do not do some of the experiments. If we plan starting from now I feel that we will be able to do good job. But need a demonstration room.

Rsearcher: 00:32:50: What you are currently using or if have you any plan for the future. One of the two.

SAT3-H1: 00:32:55: I suggest teacher SAT1 to speak first. Laughter.

SAT1-H1: 00:32:59: Ok. What she is saying is correct. If we were to teach the way we are teaching now using lesson study, one specified room and a lab technician is required. If we had a lab technical he could have prepared all necessary materials required for the lesson and our problems could have been solved, similar to the university level instruction. The teacher is responsible for the instruction while the lab technician prepares necessary materials based on the instruction of the teachers. We were using the same method when we were in high school. I give him the instruction. For example, I tell him to prepare balloons and hot water, similar to we have done. I am responsible for the instruction and he is responsible for preparing necessary materials. His duty is only preparing materials. The questioning and answering is done by me as a teacher and the students. If we had lab technician, all my sections, SAT2's and SAT4's students could have worked in the room one after another. The school does not provide us what we require. They tell us to buy from our pocket to be reimbursed later. We also rush with the lessons by leaving the experiments aside. We justify it by saying SAT4 has overtaken me, I was absent yesterday and others. Had there been a lab technician we could have been obliged to send the students to the room and follow them.

This lesson study is new. If the intention is to introduce it, the above mentioned problems should be fulfilled. It does not work without preparing for it. We implement some of it (policy). We do it the way – "let's do but never do it perfectly". If I do it she will skip it. Another teaches theoretically and skips the practical. The other tells in short this is this, if this happens the balloons burst, if we do like this the bulbs light using sketches and then skip the lesson. Still others teach the way we taught the lesson study. We could work effectively if a laboratory is sanctioned to us with a person responsible for it as in high schools. This could have saved our time. The students would go to see the experiment followed by their teachers. This is what helps the implementation of lesson study. Its implementation in our country requires capacity. There are rooms however we have thrown away the charts that we have prepared them ourselves due to lack of place to display them.

SAT5-H1: 00:35:25: That is the challenge. We prepare every year but we do not find it the next year. It is not stored. We have requested for the storage place several times. Much of your time is spent in preparing it. But you do not find it when you require it. No one knows where it is hiding. That is why teachers are less concerned about them. To save time we show pictures from the textbook and proceed to the next. There were charts in two topics especially on reproductive organs. Personally I have not used any charts. Have you used SAT3?

SAT3-H1: 00:35:56: No I have not used.

SAT5-H1: 00:35:57: The charts are available. But I do not know where? Somewhere? Because I used them before two years. We taught reproduction by showing pictures from the textbook. Had these charts been stored properly, it could have been more interesting.

As indicated earlier, if we had a lab room we could easily find the materials. You may ask teacher SAPH for the where about. As time passes on teachers are becoming more and more tired. In order to implement this lesson study, we have to store the visual aids in a laboratory. We have to emphasize on securing a room for next year. I hope that one class be given to us.

Rsearcher: 00:36:36: Ok. Now I will try to ask you these two questions as one question. What benefits have you obtained from the process and what challenges have you encountered? We you worked in lesson study you worked as a group of four or five. Indicated the benefits you have gained and challenges encountered during this process

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SAT3-H1: 00:37:07: Yes. It is good to start with the benefits. I feel that we have answered it in the first question. It is going to be repetition.
Rsearcher: 00:37:22: It is ok. There is no problem if you repeat it.
SAT3-H1: 00:37:23: Ok. Well to speak the truth we have changed our way of teaching. There are many benefits that we have obtained. We learned to give more chance to students, to come to classroom well prepared, use necessary material aids and collaborate with one another.
The challenge is that it takes a lot of time. Laughter. After this workshop (lesson study), love developed among science teachers. I am not exaggerating. We had good relationship from the beginning. As teacher SAT1 indicated we work in collaboration but we developed it more now. This type of teaching requires more time. If it is not of time, it is good in all aspects.
SAT5-H1: 00:38:17: Ok. You told that we could repeat the ideas. For me I feel that lesson study serves as a form evaluation for a teacher. I started asked how much I am prepared? As indicated by teacher SAT4, ok she was my teacher. In fact she has many years of experience. Of course she knows everything in the textbooks. Let alone her, as teacher with few years of experience I pretend that I know what is in the textbook and I sometimes go to the classroom without doing much preparation and planning. Now, as teacher SAT5 I am ready to interact in the class.
SAT3-H1: 00:38:58: self-evaluation?
SAT5-H1: 00:38:59: Yes, I feel that it is self-evaluation. How well am I prepared to teach the students? If I am not confident to answer the questions forwarded by the students, I have started telling that I will read and come with the answer tomorrow. I feel lesson study to be of more advantageous, especially for me. As he indicated time is the challenge. The other teachers used to tell us, oh are you now going to convene a meeting?
SAT3-H1: 00:39:23: laughter.
SAT5-H1: 00:39:24: They were making some jokes on us. I feel that it have problems with time. But I did not dislike it because I know that as an inexperienced teacher it is for my benefit.
SAT1-H1: 00:39:46: Yes, there are many big things that we have benefited. In teaching life skill, we use icebreakers as introduction. Truly speaking I was feeling ashamed of her and she was feeling ashamed of me. Lesson study served us as an icebreaker to break the barrier among us. Now, we can ask any questions to one another and share it with one another. In science (department) there are thing that one knows them but the others do not. There are readers and non-readers. If we have more years of experience they (the less experienced ones) are good in technology. The major thing that we have benefited is that the shyness has been removed. Is served as icebreakers to remove it. The feeling of an outsider has been removed. Even the policy instructs us to start in September (beginning month of academic year) by introducing one another, even to do the same with the students. This year I am the head of science department. Every year a new person takes the charge. I always sign on their lesson plans but I do not have much interaction with them. We do not join with one another. Now, he or she can ask me and I can ask them. Since the barrier has been removed, I can ask her why she did this and that. This is the benefit that we have gained after lesson study, after your arrival. The same is true with rest of science teachers who are part of the lesson study group. Now we can interact and ask one another without any problem.
Rsearcher: 00:41:07: Ok. What challenges have you encountered? Were there any problems?
SAT1-H1: 00:41:3: There were no challenges. When you call us for a meeting they were easily accessible. They were coming for the meeting voluntarily. Since they have welcomed it, I can say that there were no challenges. As their convener, I could easily find them. For example earlier one of them asked me about the timing of the meeting (interview). They do their things in a hurry and get available for meetings. They respect appointments. There were not much problems.
Regarding collaboration, for example, one brings a certain required material, the other does some things, the other provides idea and says why you do not do this like this. If one has good hand writing he writes for us. I could say that there was collaboration. We were looking at the students collectively

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as ours. I could say that there were not many challenges. I do not know if my colleagues have seen any problems they can raise it.
SAT4-H1: 00:42:14: All the points have been raised. Regarding benefit, I could say that we have developed 100% confidence. Regarding challenge, I would say that if we want lesson study to be successful, teachers must work only one shift.
Rsearcher: 00:41:07: Please repeat?
SAT4-H1: 00:42:31: Teachers have to work only one shift. I do not mean that the teachers should stay outside the school the second shift. If we engage classes in one shift, in the opposite shift we can come here for
SAT3-H1: 00:42:41: preparation
SAT4-H1: 00:42:42: discuss with teachers on items such as lesson planning, lesson presentation, on the nature of exercise etc. Now teachers teach in the morning the first shift and then come back for the second shift in the afternoon. Sometimes it is difficult to find free period to conduct meetings. We want to collaborate with one another, but our periods do not allow us to do so. This is one problem that has to be removed if lesson study is to be effectively implemented. In government schools like ours we work the whole day. But in private schools such as School 'C' the teachers teach only one shift. They use the opposite shift to evaluate the work of their students.
SAT3-H1: 00:43:21: they mark student work.
SAT4-H1: 00:43:22: Their exercise books are daily marked. They know in detail their student. They know who is weak. They also know who is working and who is not working.
SAT3-H1: 00:43:29: They have enough time.
SAT4-H1: 00:43:30: Now, if lesson study is going to be implemented, teachers should not be loaded. I can say this is the only problem, other things are ok.
Rsearcher: 00:43:41: Ok. Do you say that students have benefited? What advantages do you think students have benefited?
SAT3-H1: 00:44:20: It is like this. You are asking us what the students have benefited. If we say that a teacher has benefited what does that imply? If I am benefited it does not mean that I will take it to my home. I am receiving these benefits in order to benefit the students. If a teacher is benefited it implies that a student has also benefited. We have shown some changes in our teaching. The type of lesson that we were providing was shallow and we were quickly proceeding to the next lesson. We were providing a shallow lesson leading to superficial learning. Now we are providing deep lessons. The students are given more chance. Earlier we were giving much emphasis to the clever students. Now, we have started saying are there any new hands? There are around five students who usually raise their hands. By ignoring these hands we are saying is there any new participant? The students say "Here are new hands". Since all students are participating, I feel that the students have benefited.
SAT5-H1: 00:45:20: Of course we cannot assess them using one lesson. We were not always using group discussion method. I want to share my experiences about the research lesson I taught with you. There was one shy student in my class, who repeated the same grade twice. He never participates in classroom activities. Moreover, he does not have much interaction with his classmates. During lessons study, I invited him to come in front of the class to assist me on the circuit board, during the demonstration. From that day onwards, the student seemed to be motivated. When I come into the classroom, he starts to welcome me with positive gesture. He also started talking to me. One day he said "Teacher I have finished writing and could you please correct my exercise book". I thought that I have motivated him.
SAT3-H1: 00:46:05: It would have been good had we practiced this from the beginning on September (beginning of academic year).
SAT5-H1: 00:46:06: Laughter. Yah! I know! Yes I understand it is my problem. Of course one must take their age into consideration. Since their class mates are much younger than them, I was cautious not to humiliate them. By inviting him to the demonstration I felt that I have motivated him. Now he is a

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little bit relaxed. Today I gave him feedback and I told him Mussie I was really happy about you and you have shown good progress in the second semester.
Moreover, we are giving them chance to explore their capacity. We never gave them this chance in the earlier teachings. We never gave them chance to explore their knowledge and understanding. Lecture method does not allow students to examine their potential. Now we are using discussion method. We are delivering a detailed lesson that enables the students to explore their ability. As indicated by SAT1 earlier, instead of presenting the expansion of the three types of matter in one lesson, we delivered expansion of gases and then the other states of matter. This way enabled the students to explore their ability. Had we presented the three types of matter in one lesson we could have covered the topics. This means that we are not giving chance for the students to explore their ability. Therefore, by using lesson study we are motivating the students secondly we are providing the students to explore and evaluate their ability. Of course the students will not forget the concept in which they participated themselves and obtained a positive feedback – you are right – from the teacher. This is my feeling.
SAT1-H1: 00:47:45: Yes. You are asking us about the things that the students have benefited. Yes we were doing these things, but we were not doing them appropriately. Now the students have developed self-confidence. As we have observed it in the group discussion of the research lesson, the students were confident. In earlier presentations even the outstanding students were coming forward with their notes. In yesterday's presentation they were presenting it without notes. We told them to write it down. But they do not listen to you.
All (00:48:08: Laughter.
SAT1-H1: 00:48:09: They were trying to attract attention by boosting and mentioning their names. I told them not to mention their names.
All (00:48:12: Laughter.
SAT1-H1: 00:48:13: Since they developed self-confidence, they liked the presentation. You have observed them that they were expressing their ideas fluently. Their English language was good. Even the average girl named Rahwa, which we forced her to do the presentation. In fact she is a beginner presenter but she has done well. The other presenters, the earlier experience helped them. Therefore, they developed self-confidence if not all of them. We did not tell them to do the presentation without paper. It was their initiative. As if they are going to appear on Television, they were saying "My name is …" Laughter. In short they have developed self-confidence.
SAT4-H1: 00:48:58: Everything has been said. I want to stress that the students have developed self-confidence. They were relaxed. They have shown much progress in this short period and in four lessons. If they were given a chance of doing daily presentations, I would say they would eliminate their shyness and would act as teachers. They were taking responsibility for the presentation. In the future, they will need less assistance from us. They will be able to prepare and present themselves. Therefore, they were able to develop confidence.
Rsearcher: 00:49:32: Ok. You said lesson study requires time to meet and time to discuss. What were you doing to find common time? How were you solving the problem of time?
SAT3-H1: 00:50:05: I will answer this question first. Laughter. Our timetable is the same. We engage classes in the same shift. I exchanged one of my periods with a teacher who have some social problem. Since I wanted to use that period today (to be free for the interview) I called her in order to inform her that I am going to use the period. We were fixing common time by doing like this. To teach the Friday lesson, I exchanged it with the teacher. I told her that I am going to use it. We also exchange it with sport. We use free periods of the students or by cancelling some social functions such burial processions. Laughter.
SAT1-H1: 00:50:53: Yes it is like that. First and foremost they were solving some of the problems like that. However, our timetable is very good. All our timing is the same. Mostly we have classes either before break or after break. For example, today our time table is before break. I had first period and I waited up to now for this interview. He had probably second period. The delayed one will have third

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period. We are meeting in our free periods. We have not wasted any of the students' time. We have purposely fixed this appointment with you on Wednesday because we are free after the break and we are ready to sacrifice our time. Regarding time, we were using our free time. Our timetables are not scattered. It is good timetable. At this time you will not find any one of the science teachers in this school except four of us who are here for interview. Therefore, we have managed the time like this. If there is any problem, we exchange it with other teachers.

Rsearcher: 00:51:51: Ok. For you to participate in lesson study how was the support of administration and school community? Describe the type of support which was available.

SAT3-H1: 00:52:16: Let me answer. Laughter. Yes. It was good that you invited our administration to participate in the workshop.

SAT5-H1: 00:52:22: Yes it is true.

SAT3-H1: 00:03:13: The participation of SAD and SAPH in the workshop enabled them to understand the objective of the workshop. I guess teacher SAPH and teacher SAD would still support us. But since they participated in the workshop their support became even more.

Rsearcher: 00:52:46: What was the nature of support?

SAT3-H1: 00:52:50: Ok. Whenever we have clashes in our periods, they were cooperating in fixing them. If there is clash in my period and if I am going to participate in lesson study, they would exchange it with sport or life skill or other periods. In case if we need materials, the store keeper for example was instructed to open the store on Friday. Sometimes we were keeping necessary materials in our staff room. This is how they were supporting us.

SAT4-H1: 00:53:36: If we see the support of administration, we did not ask them much. We were using materials available in the school. However, the administration of this school allocates each year budget for each department for purchase of books and other necessary materials. They are cooperative. They are the ones who are ready to answer our requests.

SAT1-H1: 00:54:21: Yes they are cooperative. They are very cooperative. They provide us responsibility to do things. For example when you come SAPH informs us. This is also support. They provided us charts. We were taking from the office. We brought some of the materials such as balloons ourselves. The administration could have bought for us. There is no thermos-flash is this school, therefore we brought from our home. Students also brought the dishes. The school does not have Bunsen burners instead they supplied us with kerosene burner to boil the water for demonstration. To save time we brought boiled water from our home. I do not know about grade 7. Are the materials yours or you got them from the school?

SAT3-H1: 00:55:15: They are from the school. However, we have made new ones this year. The two circuit boards are from the school.

SAT1-H1: 00:55:19: The school is cooperative with what is has. This school is good school.

Rsearcher: 00:55:28: For any change to work the administration has to accept it. For example, if the administration does not accept this research then it would not allow you to exchange the periods. They may tell you that exchanging periods is not allowed. If the administration acknowledges the intervention, then he follows it. What about other members of the school like the teachers and other administrative staff? Is the school community aware of what you are doing? What support do they offer you? Does the school community support what you are doing? Does it take what you are doing as useless or honour what you are doing?

SAT4-H1: 00:57:16: Earlier, they were thinking that we are getting money because of participating in lesson study. They used to tell us, the reason why we are interested in it and why we are frequently moving in and out is because we are getting money. Now, after some of the staff members such as SAT7, SAT8 and SAT9 observed SAT5's teaching, they acknowledged lesson study and they started to value what we are doing. They said this is more than money. They said that they have also learned and gained new knowledge in planning, in how to introduce and how to motivate students. I heard them also speaking about its importance. Therefore, I can say they support it and value it.

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SAT1-H1: 00:58:08: Yes, seeing is believing. After observing our work they have started to value it. There is a proverb which says by appearing as foolish consume their dinner. In the beginning they were making mockery. For example they were thinking that we are doing this because we are getting some benefits from it. They were saying "It was in Embasoyira", "Beer was also served". Laughter. They were telling that we are giving this more attention. They were making jokes. When they observed our work, as she indicated it, they started to appreciate what we were doing. They witnessed that they too have learned. They said these words of appreciation in our presence. Now they have believed that we are doing valuable work. They acknowledged that we are learning from one another and teaching students in a better way. That is what I can say.
SAT5-H1: 00:58:50: What I want to say is that in the beginning they were asking us the reason why we are frequently meeting. They were not aware of what we were doing. This is because we did not invite any of them into our class. We couldn't invite them because we engage classes at the same time. They have classes when we have classes. Therefore, it was difficult to invite them. As SAT4 indicated at least those who observed our work have passed the message to their departments. Moreover, I can say that SAT1's presentation during the workshop changed their minds more than anything else. This is the product of your new job, they said. The enjoyed it very much. Truly they enjoyed it what was done by science…
SAT3-H1: 00:59:44: by science department.
SAT1-H1: 00:59:44: The presentation on the balloons that we have conducted.
SAT5-H1: 00:59:45: Yes the one that we have conducted. Oh they have enjoyed it. Because we made our presentation after social science department.
SAT1-H1: 00:59:51: It is because of the experience we gained from the lesson study.
SAT5-H1: 00:59:52: Yes. The presentation by the social science was like what, it was like
SAT3-H1: 00:59:55: lecturing
SAT5-H1: 00:59:54: Laughter. I am afraid that this could be considered as back biting but their method was lecturing method. Laughter. Please stop the lecturing, shouted the audience. Many of the people on the audience were sleeping at that time. Following the presentation by social science, teacher SAT1 came out to the stage. The presentation waked up all those who were sleeping from their sleep. We laughed. We reflected on our work in the presentation. After the presentation, we obtained positive responses from the staff. They said that lesson study has helped us.
SAT3-H1: 01:00:29: The question is about how the school community was cooperating with us. I would say that it would have important to conduct a meeting and inform all the staff members about the aim of the study, then select those who would participate in the study. Had they knew it right from the start, they could have cooperated. But many do not know what we are doing. For example, on Friday I requested one teacher to exchange my period with her third period, she asked me about what we are doing. I replied that we have some work in the science department. She inquired about what we are doing in science department. Others also ask individually about what we are doing. Those who know what we are doing they cooperate. They were cooperating in exchanging our periods and providing us materials. Others came to observe our class when we invited them. Some wished to participate with us.
Rsearcher: 01:01:34: This question has been partly answered earlier. Do you have any plan of continuing lesson study? Why? If yes what opportunities are available if no why not?
SAT3-H1: 01:02:36: the question is do you have plan of continuing?
Rsearcher: 01:02:37: For example, if we are going to continue with lesson study in the next semester do you have a desire to continue with the study?
SAT3-H1: 01:02:45: Of course, I am ready to continue if there is such opportunity. As indicated by SAT4 earlier, there are some situations that challenge lesson study such as class size. If this situation is improved and if I am in this work and if opportunities are given to me, I will surely continue with lesson study. Even I can say I will start it now. Laughter.

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SAT5-H1: 01:03:14: What I want to say is, of course, if I am in the department it is better for me to continue. As indicated by SAT1, lesson study served as ice breaking. It removed the barrier and now we can say anything and we can ask anything to one another. We woke up from our dormancy in which we were in. I do not mean that the teachers do not know what they are doing. They know it. But teachers need refreshment. I would say even the ones who are the most experienced and the ones who are inexperienced need some workshops, at least for department heads and one teacher from each department. After that they can do in their departments like what we are doing.
For example, next year I may be assigned to a department where there is shortage of teachers. I may be requested to teach mathematics. I cannot do lesson study there and collaborate with the colleagues because I will not find anyone who has knowledge about lesson study in that department. I cannot collaborate with them. I will discontinue doing it, because I cannot run alone. I need someone to collaborate with. Of course I will do the collaboration that I used to do, but I cannot make the collaboration in the lesson study way. I recommend giving this lesson study workshop to all departments. Then when you shift to any department you would be able to collaborate and lesson study would prosper and develop.
SAT1-H1: 01:04:41: Yes. At this moment only five of us know about lesson study. This type of workshop is important. Yes, we want to continue with the study. However in order to continue all the requirements must be fulfilled. If it is not fulfilled all the science teachers are aware of lesson study (we will do it when conditions are favourable). The structure of all the science textbooks is the same, starting grade six up to grade eight. First they start with introduction and then proceed to let us discuss, then give activity and so on. The question here is whether we apply it as prescribed in the textbook or not. As she indicated it earlier, workshop are necessary for all of us if not for the science teachers. We conduct workshops. We conducted one workshop in the first semester. Every year we conduct two workshops. Every department organizes its own workshop. A separate workshop for science and a similar one for mathematics. It was me who suggested to SAD to organize a common workshop for all, so that we could learn from one another. Yesterday's workshop was the first organized for all teachers in the school. In this workshop the weaknesses and strengths were revealed. Comments were given to correct weaknesses. Others have already started to imitate what we are doing. The workshop should be continuously provided to science teachers. All science teachers should practice lesson study. The other science teachers have got information about lesson study by hearsay like the other teachers. We will focus on it if conditions permit. Students are now decreasing in number and there is no problem regarding it. As the number of students is decreasing we are removing extra benches. Earlier the number of students was ranged from 70 to 80, now we have not more than 40 students in a classroom. That is why we were moving some benches out to make classrooms convenient. Next year we will tell the administration to remove the extra benches so that we could use group discussion. My fear is that we will be the only ones (doing lesson study). We will continue experimenting lesson study during the next semester even though it is not in the whole school.
Rsearcher: 01:07:06: What about in other schools?
SAT4-H1: 01:07:10: Already you are telling us that we are going to conduct one more lesson study. I feel inviting the other science teachers and one teacher from each subject or department teaching either grade six, seven or eight to observe the research lesson.
Rsearcher: 01:07:40: Do you recommend lesson study as a strategy for other middle school teachers?
SAT3-H1: 01:08:37: I have already highlighted this response. Earlier there was a question that asked us about the benefits we obtained from lesson study. Lesson study helped me to be confident and make necessary preparations. Secondly we also mentioned the benefits the students gained from lesson study. We have mentioned earlier point such as, to make them speak freely, to wake up the weak students. Lesson study has all these benefits. Then why shouldn't other schools need to wake up their students? We want teachers to give deep knowledge to their students. Therefore, I recommend for all middle schools and for all schools in Eritrea. Laughter. That is my idea.

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SAT5-H1: 01:09:27: Ok. Yes of course I would recommend, but I recommend it with knowledge. I discussed with my friends in School 'C'. We were chatting that this is an impossible thing. We were saying that this does not go with large number of students. Yes we were saying it is only possible in theory but it cannot be implemented in our country. Taking it as something that could not happen in the third world. Again they were saying why should the teachers suffer and exhaust without getting incentives as a form motivation. If we put aside other factors, for example, assigning teachers in the profession without their will, if we are going to implement lesson study first teachers must have knowledge about it. Then its skills will enable the teachers benefit from it through collaboration. It is benefit for the instructor. Moreover, it sends motivation to the students. It also motivates the teacher. Makes a teacher to teach with good spirit. Because the other teacher has explained to him about his weakness. It important as what we call it ice breaking. Anyway it benefits the teachers and the students. Therefore, I recommend to be implemented.
SAT1-H1: 01:10:44: Yes. I do not have objection to the implementation of lesson study because countries well known for their development are using it. Because it the best. It started in Japan, the most technologically advanced country. The Americans who have no challenger in this world except God are applying it. Only before ten year. Here in Eritrea three schools were selected as a model and we testify that it is good. We need this to continue but, it is bad that but always comes at the end. We lack ability.
SAT3-H1: 01:11:22: in principle
SAT1-H1: 01:11:23: Yes, in principle the teachers should take it as their duty with responsibility. Teachers should also be satisfied and get what they wanted. But teachers are doing things on rush. At this moment we are obliged to be here with you otherwise, in a normal day, she would go to wash her clothes and I would rush to tutor a child as private work. Lesson study requires time and teachers do not have this time. It benefits student. It is good plan. I would recommend the introduction of lesson study if not now in the future because it has a potential of bringing change. It is also good.
Rsearcher: 01:11:57: Ok. If you have any comments that you would like to add.
SAT1-H1: 00:12:06: If SAT4 is going to teach a research lesson, she wanted to invite science teachers. All the teachers in the science department are 13 in number. I agree to invite them but I fear that we will overcrowd the class. In this case others were also asking whether we are going to teach the teachers or students.
Rsearcher: 01:12:28: Yes, students.
SAT3-H1: 01:12:29: Observers will outnumber the students and will overcrowd the room.
SAT1-H1: 01:12:33: I am afraid we will be too many in the class.
SAT3-H1: 01:12:35: What if we invite at least one teacher each from grade six, seven and eight teachers.
SAT1-H1: 01:12:36: If that is the case we will invite all the teachers separately in a staff like what we have done during the earlier workshop.
SAT4-H1: 01:12:39: That will be too much. That is entire teachers in the school. Only science teachers.
SAT1-H1: 01:12:45: We are 13 teachers. Ok out these probably 10 may come or 7 or 8 may come.
SAT4-H1: 01:12:49: Also one teacher from each department.
SAT1-H1: 01:12:53: Won't that be too much?
SAT5-H1: 01:12:55: What we can do is first let us use the big classroom and then create space at the back by move the desks close to one another so that the observer can stand and observe from the back and the lesson study group would observe by moving around the classroom while the guest observers observe from the back.
SAT4-H1: 01:13:19: The number of observers should not be too much. In this case the number of observers is becoming equal to the number of students.
All (01:13:20: Laughter.

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Rsearcher: 01:13:23: Let me tell what they do in Japan. The outside observers observe a research lesson from outside through the windows without getting into the classroom.
SAT3-H1: 01:13:32: Ok. That is also possible.
SAT1-H1: 01:13:32: They are well oriented. They are well developed. Their buildings are palaces but in your case, is it possible through the window, you close it…
SAT3-H1: 01:13:38: Laughter.
SAT3-H1: 01:13:44: The question is about additional comments we have. You asked whether we recommend introduction of lesson study in other schools. Yes I recommend, but with all its limitations. First the teacher should teach only one shift. Secondly, the class size should be inviting. If these limitations are removed, why not we are ready to start it from tomorrow. We only ask for resolution of these challenges.
Rsearcher: 01:14:15: what if these challenges are not removed?
SAT3-H1: 01:14:16: With what you have at hand by using our full ability - like what we are doing now.
All (01:14:19: Laughter.
SAT3-H1: 01:14:22: We will do our best
SAT5-H1: 01:14:26: This comment is forwarded to you. Ok now you have introduced lesson study, are you going to try to apply it? Are you going to present the proposal to the Ministry of Education?
Rsearcher: 01:14:42: Always at the end of a research we have recommendations. You inform the policy makers the research the type of research that you have done and the result of the research. You also inform that this has to be changed and it has this type of benefits.
SAT5-H1: 01:15:09: My fear is that at the end of the day if the study sits in the form of a book in a shelf it is nothing. Your proposal I think it can make a difference. It has to make little difference.
Rsearcher: 01:15:21: Should they refer to it or not is a different question. In other places researches done are consulted. A research done by one researcher may have a follow-up by another. By following my recommendations another person could make another research and take the process one step forward.
SAT3-H1: 01:15:53: This is not final research. It could not be a final research.
Rsearcher: 01:15:55: Yes could not be a final. Others can also do similar research.
SAT3-H1: 01:15:58: Are you going to hand it over after you finish it.
Rsearcher: 01:16:01: The research will be presented in the form of written report. Whether the policy makers in the Ministry of education will follow it or not is another question. If they do not refer to it here others in other places may refer to it. For example, I am using the literature from the studies done in Japan, South Africa and America. Others may use my research.
SAT3-H1: 01:16:35: this means that it is world-wide?
Rsearcher: 01:16:36: Yes it is world-wide. Therefore this research will have some contribution.
SAT3-H1: 01:16:37: Ok
Rsearcher: 01:16:42: It seems that we have finished our interview. Thank you very much. I took a lot of your time. How much time have we spent?
SAT1-H1: 01:17:01: One hour and 20 minutes, 25 minutes.
Rsearcher: 01:17:05: An hour and 25? It took us too much time. Therefore, I thank you very much.

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Appendix H2: Second teachers' focus group interview scheme

1. What did you learn when you planned the lesson with your colleagues? (in terms of content knowledge, pedagogical knowledge/ teaching practice, working and sharing ideas with colleagues, classroom observation skills, and lesson planning skills)
2. Did your students respond to the lesson the way you anticipated? (justify your observations by providing specific examples)
3. What did you learn when you observed the research lessons?
4. What did you learn when you reflect on the research lessons with your colleagues?
5. How is the lesson study cycle helpful to you as a teacher? What did you learn by participating in the study?
6. How has participating in the lesson study cycle impacted your instructional practice? Are there any changes in your practice?
7. Do you feel that you have benefited by participating in the study? What kinds of benefits have you received by participating in lesson study?
8. What kinds of challenges have you encountered, if any, by participating in lesson study? What are some ideas for overcoming them?
9. Did your students benefited from lesson study cycles? What kind of advantages do you think your students have profited?
10. How do you know whether or not that your students are learning and your lesson is successful? What are the indicators?
11. How did you respond when a student experiences difficulty in learning?
12. Do the school community know that you are participating in Lesson Study? What is their reaction?
13. Was the administration and school community helpful in supporting you through the lesson study process? Describe the type of support which was available.
14. Does the school community encourage your experimenting with lesson study?
15. Do you see any impact of lesson study on your school? Describe.
16. Did the contributions of the "knowledgeable-other" influence what you have learned? Describe.
17. What are you doing differently now from what you were doing before participating in this study?
18. Do you have any plan of continuing lesson study? Why? Why not?
19. Do you recommend lesson study as an appropriate professional development strategy for other Eritrean middle school teachers? Why? Why not?
20. Are there any other comments that you would like to add?

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School 'A' Second teachers' focus group interview (English)

Teachers interviewed: SAT1, SAT2, SAT3, SAT4 and SAT5
Date interview taken 31/05/2013
Interviewed by Assistant researcher
Translated by Researcher

Assistant researcher: 00:00:10: Good morning. First of all I thank you. Welcome. First we thank you for sparing your time and for being willing to share your ideas with us. The information that you give us is valuable. Therefore we thank you. This interview will take place in group as a focus group interview

Assistant researcher: 00:01:26: Now, let us start with the first question. First we will discuss general thing. What have you learned from this lesson study? What have you learned by working as a group? Teacher SAT1-H2: we will start with you followed by others.

SAT1-H2: 00:01:26: Yes. I can say that we have learned a lot from this. It enabled us to work in groups to discuss and agree on what we teach. For example the second lesson was better than the first lesson. We were able to judge that improvement was observed. We were accepting comments and made amendments accordingly. We have digested the lessons. We used necessary materials. We were saying if you add this, this will happen. Provided suggestions about what should be included. Earlier we were allowing outstanding students to participate, Now, we are forcing on the remaining students to participate. As a result the students have benefited. We also have benefited. We have shared ideas on how to improve the lessons. All the research lessons that we have taught have shown improvement. The re-taught lessons were better than the first lessons. If we had enough time, I feel it would have been good to teach using the lesson study method. However, there is no time. Time is barrier. Time does not allow us. Otherwise, it is a very good strategy. It is good strategy because it gives opportunity for teachers to study the lesson and subject thoroughly.

Assistant researcher: 00:03:16: Ok. There are important points that you have raised and we will see them later on. What have you learned by planning a research lesson together? Do you have any idea around this? Now we will start with SAT2 and then proceed to others.

SAT2-H2: 00:04:28: Yes. This is our first experience. Truly speaking working in group, planning in group and then when one of the teachers teaches the lesson the others were observing the lesson. Giving feedback to the person who taught the lesson, working by reflecting on your action is very useful for the students. Things improved from the first day to the second day. This type of procedure is very important. I feel that if lesson study is introduced it would have been good. It would benefit the students much.

SAT4-H2: 00:05:33: In genera, I this helped us to assess our weakness and our strengths. The weaknesses revealed during the first teaching were improved in the re-teaching period. I would say we have gained a lot of experience that helped us to improve our current and future practices.

SAT5-H2: 00:06:05: According to me planning a joint lesson, presenting it and then reflecting on it I can see the whole process in two ways. First it serves as motivation for the teacher. It enables the teacher to come outside the box because there are observers who would watch his teaching. Therefore, he thinks about how to teach, what to transmit and what strategies to use which are different from what he was using. Moreover, it is enhancement for the teacher in addition to development of students. The teacher himself is developing. Let us take the development of students for granted. The teacher will transfer necessary knowledge to the students if he himself is awaked, motivated and enhanced. Secondly love and respect by itself. Instead of working alone, working together enhances relationship. I think it upgrades the teacher. Therefore, in general I have positive impression about it.

Assistant researcher: 00:07:12)

SAT5-H2: 00:07:28: Now, truly speaking our school is good school. To some extent we have good relationship among ourselves. We hear the situation in others schools that every department has its own staff room. Some teachers working in the same department do not know one another. Introducing lesson study enhances relationship. For example, it enables to plan a lesson around one table. Last time we were saying, in the old days we were feeling shy of the department head or other experienced teachers. Now, we are sitting with them, asking them and coming to them repeatedly. This indicates that healthy relationship is flourishing.

Assistant researcher: 00:08:19: could we consider this as collaboration?

SAT5-H2: 00:08:20: Yes we can take it as collaboration. Collaboration is big thing.

SAT3-H2: 00:08:24: My colleagues have said it all but I may repeat some of their ideas and also include mine. You are asking us what we have learned by planning in collaboration with one another.

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Assistant researcher: 08:45: It is good that you are indirectly answering the subsequent questions but we will also see them again.
SAT3-H2: 00:09:06: We were preparing planning together before participating in lesson study. Now the planning process is different. It is deep. Earlier planning was limited to only asking questions such how far we should cover. Tell one another the content to be covered in the plan. Then everybody prepares his/her individual plan. Now, after lesson study there is more collaboration. In addition to how much to cover we are discussing how to teach, what to add and what students expect from this lesson. In earlier planning, we were focusing only on how to finish, while now we are moving towards thinking about what concept the students would grasp and how the goal of the lesson get achieved.
Assistant researcher: 00:10:00: Yes. This is good information.
SAT1-H2: 00:10:03: I want to add some information to the lesson planning process. As he explained, our earlier lesson preparation process can be considered as fooling yourself. It includes introduction, development, conclusion and finally evaluation. We used to prepare a brief lesson plan which is prepared based on introduction, development, conclusion and finally evaluation. As head of the department I also check for these items and sign on the lesson plan. Now, we are using a lesson plan with columns given to us by the researcher. At first it was not clear to us. But finally we were successful in preparing the lesson plan. Her contribution during this process should be acknowledged. Through collaboration we were able to prepare a detailed lesson plan that matched the implementation. As a result, student participation increased. We have implemented exactly what has been indicated in the columns.
Assistant researcher: 00:11:07: SAT4 first prepared the plan and then you used it.
SAT1-H2: 00:11:18: Yes. We said this is good work and then we learned from it. Our earlier lesson plan was not based on columns. In this lesson plan we inserted the information in the appropriate columns. Therefore, the lesson was successful.
Assistant researcher: 00:11:32: It is good. The idea is good. The lesson plan requests about what you expect from the students. When you were working in lesson study did the learners responded the way you anticipated? You said that you were preparing a brief plan, now you are preparing a detailed lesson plan. This in itself is learner expectation. Did the student responses match with your expectations? What were your observations?
SAT3-H2: 00:12:26: During the first research lessons few students dominated the classroom. Then we conducted a meeting and evaluated it. We felt that we have not achieved the objective of the lesson. Our objective was to achieve the goal by engaging all the students. Finally, instead of engaging only the outstanding students we agreed to give chances to all students. We have found what we have expected from the students during the last two or three research lessons. In the first and second lessons we did not find what we expected, but in later lessons we found what we expected.
Assistant researcher: 00:13:21: You have observed improvements and the next lesson were better than the former lessons. You did not get your expectation in the first lessons. That is your idea?
SAT3-H2: 00:13:24: Yes.
Assistant researcher: 00:13:24: Let us give chance to others. I think SAT5 seems that she is ready to respond.
SAT5-H2: 00:13:26: Laughter. To speak truth, I thought that this is only for the sake of just making the study. I did not think it was reality. I did not also expect that we will apply it and motivate students. I did not feel that way. What we actually thought was simply forming an artificial class by selecting active students or outstanding students. Later on, we have decided to involve the average students and we were successful. Our negative expectation has changed into positive. Last time, I asked a student, who has never answered a question, I am telling you the truth from that day onwards the student started answering. I do not know how to tell you that I am very happy to participate in lesson study. I did not expect I would be able to make such improvements in student learning. The process was positive and the average students were motivated and started answering. At the end of the day, I have learned that lesson study can work.
SAT2-H2: 00:15:06: Everything has been said. Of course everything that is doable is useful. Let alone this which is a good process, anything that is achievable is good. This process was new for both the students as well as the teachers. The students have worried a little bit at the beginning about the method of teaching we used. They had views similar to what we had at the beginning of lesson study. When things repeated again and again the effect of newness disappeared at last. The participation of student changed from engaging outstanding students to engagement of majority average students.
Assistant researcher: 00:16:10: How was your expectation from the lessons planned?
SAT2-H2: 00:16:12: My expectations have been found to be effective. The lessons became more effective.

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Assistant researcher: 00:16:14: You have explained well the expectation of the students which is also explained by SAT5.
SAT2-H2: 00:16:15: If you want to explain from what we have observed in class, most of the time, the slow learners are not attentive in class. However, when we started to present attractive lessons they turned their attention and started to participate in the lessons. At first, there were creation of subgroups, but later on all, members took part in group discussions. In the groups that we have established, subgroupings were observed, where some students formed their own small group within the large group. At the end, however, all the students were participating as a single group. Truly speaking if we find opportunity to teach this way, students would have benefited and lively teaching would have been delivered.
Assistant researcher: 00:17:45: This is good ideas. You are saying that at first the groups were disintegrated finally they developed into real groups and learning groups emerged.
SAT2-H2: 00:18:05: Yes
SAT4-H2: 00:18:06: The motivation of teaching method that allows student participation was not new to students alone but it was also new to us. Even though the Ministry of Education demands for it, many of the teachers do not practice it. Since it was their first practice, students showed lack of confidence at the beginning. However, continued use of the method, led to increased confidence and participation of the students. Therefore, it is effective method. If we continually use this method, we will be able to achieve our goals effectively.
Assistant researcher: 00:19:03: If you have any comment on this issue of practicality.
SAT1-H2: 00:19:19: Ok. My colleagues have explained it. Now I will explain this in short form. The question is about whether the students have responded the way we anticipated or not. Yes, correctly, the responses of the students were very pleasing. Actually sometimes we use similar type of teaching but most of the time we use shortcuts in order to save time and effort. We only show them the teaching aid from a distance and they shout wow! During the usual teaching, only the outstanding students were participating. Yesterday's lesson was effective because all of them were participating and observing. They were behaving as if they were going to appear on television. We told them not to mention their names and report by reading from a paper. They were presenting without reading from paper. You have observed them presenting better than from what we would present it. Therefore, I would conclude that we have obtained result.
Assistant researcher: 00:2034: You have provided enough ideas and all ideas are more or less the same. Is there anything that you have learned from what you have been observing? From what you have observed in terms of teaching method and content. You have said the students were explaining the content more than you would do. Anything you learned concerning teaching practice, lesson planning skills and observation skill. Let us start with pedagogic knowledge and anything that you have learned in this regards?
SAT1-H2: 00:21:40: You are asking us what we have learning from participating in lesson study. We have learned a lot from one another. This is because two heads are better than one head. For example I have never taught grade seven science. I have been teaching in high school and now I am teaching grade eight. I have understood about parallel and series circuits after participating in lesson study. I have never seen it practically. I saw it just now. My earlier knowledge was only theoretical. I have understood about parallel and series circuits from these two people. We were simply saying theoretically that the bulbs in the streets are connected in parallel while the bulbs in houses are parallel. We were simply explaining what we find in the textbooks. It is only now that I have learned how the wires are arranged in parallel and series circuits. My earlier knowledge about the circuits was limited to theory.
Assistant researcher: 00:2052: I think SAT5 wants to say something.
SAT5-H2: 00:20:55: Laughter. I can say participating in lesson study has changed my way of teaching. When I graduated from Mainefhi, I was using brainstorming during my introduction. But later on I abandoned it to save time. From this lesson study I have learned that brainstorming has a lot of advantages and was advantageous. We were instructing the students to observe the demonstration and then ask them to report what they have observed. We used this observe and report way of teaching in order to measure the potential of the students. Instead of telling them everything, we are giving them chances to observe and learn from one another. This would help them add information or elaborate it in the later stages. From what the students have observed and reported, the teacher could use brainstorming and conclude the lesson in short minutes. This is even an easy way of teaching for the teachers. I think instead of the teacher develops the lesson and conclude it himself, allowing students to participate in the process is good. Teacher SAT1 has also explained that he has learned a lot by observing the lesson which was demonstrated practically. Therefore, I think this lesson study was also helpful for the teacher.
Assistant researcher: 00:24:38: Could you please elaborate what you mean by observation?

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SAT5-H2: 00:24:48: By observation I mean the students observing the demonstration. We taught the lesson practically, isn't it? Instead the teacher explains it to the students and finish the lesson we were asking them what they have observed during the lessons presented by teacher SAT1 and my lesson. We were looking to what extent they have understood the concept. Then the teacher will respond to what the student have presented by adding new concept or rearranging the concept presented by the students.
Assistant researcher: 00:25:23: You were also using it as assessment.
SAT5-H2: 00:25:24: Yes, we were assessing them.
Assistant researcher: 00:25:30: You have explained it well. Now could you please relate your answer with what you have learned from working together and sharing ideas with one another?
Researcher (00:25:42: I want to add some to this question. For example, you were preparing lesson plan together and then teaching it together. When one teachers others were observing the lesson. Now, is there anything that you have learned by observing other teachers teach? For instance teacher SAT1 was mentioning earlier that he knew about parallel and series circuits theoretically but after observing the lesson he obtained practical knowledge. SAT5 also mentioned similar ideas. Is there anything that you have learned by observing other teachers teach? Now from what teacher SAT1 said we can say that he has obtained content knowledge.
SAT2-H2: 00:2654: Ok, any teacher has strengths and weaknesses. One evaluates himself in reference to the weaknesses of the teacher and learns from the strengths he is observing. Therefore, when a teacher observes a teacher teaching he learns from him in a variety of ways. A teacher obtains two types of benefits as explained earlier. One learns or obtains a message not to repeat the weaknesses he has observed from his colleague. From observing the strengths he will develop new traits. Therefore, observing one another is helpful for the teacher. Ultimately it benefits the students.
SAT3-H2: 00:28:30: Last time there was a workshop in our school. Before this we were conducting workshops in separate classrooms meaning one workshop for science teachers in a separate room, for mathematics teachers separately and for English separately. Every department discusses in its own room and would only meet during tea break. SAT1 suggested that there should be a common workshop where representative from each department presents a lesson to the workshop participants. His opinion was accepted by the administration.
First, one from social science department presented their lesson. The staff commented that it was lecture. Next teacher SAT1 presented representing science department. He presented the way we used in lesson study by allowing active participation, by asking questions, by motivating and by telling some jokes. He created a good situation for learning. The audience appreciated it. I heard them saying that they wished they had participated in lesson study. What I want to say is that one gains something by working from one another. Now I can say I have learned by observing a colleague. I and SAT5 are teaching grade seven. I did not have much acquaintance with the grade eight textbook before participating in lesson study. In order to help me observe the research lessons taught in grade eight, I had a chance of reading the textbook. I could say that I have learned something from the grade eight textbook. Therefore, lesson study forces people to search for information and read books.
Assistant researcher: 00:30:36: You are familiar with lesson planning skill. Is there anything that you have learned by planning lessons?
SAT3-H2: 00:28:30: I think we have answered this question earlier. Our earlier planning was limited to only asking questions such how far we should cover. After that everybody plans individually. It used to take me only half an hour to write the plan. Now, we are giving more time to planning. We sit together and discuss the details of the lesson planning about what should be included in the lesson. We are preparing more teaching aid materials. We also consider what our students are expected to achieve at the end of the lesson.
Assistant researcher: 00:31:39: Therefore through collaboration and sharing ideas you have benefited.
SAT4-H2: 00:3150: I am suffering from toothache.
Assistant researcher: 00:31:51: Just try what you can.
SAT1-H2: 00:31:53: Ok. We will repeat what we have said. It is true that we have benefited. We have benefited. As indicated by SAT3 workshop was planned for the four departments. We showed confidence like our students. We were successful with presentation because we already practice it with the students. We presented the lessons with full confidence. This is because we worked in collaboration with one another and by sharing ideas with one another. The presentation was educational and entertaining. The audience did not feel bored. Therefore, what we were doing in lesson study helped us to present the lesson. Preparing for the presentation actually took us some time. We presented the lesson based on common agreement.
Assistant researcher: 00:32:55: This means lesson study has produced impact on other teachers.
SAT1-H2: 00:32:57: Yes it has impact. Yes they were happy about it. The lesson was effective. Therefore, we

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also benefited from it.
Assistant researcher: 00:33:06: We have a question on impact of lesson study on the school. You have already indirectly answered the question and we will go according to conditions. Ok one of the components of lesson study is reflection and you were reflecting on your practice. Therefore, indicate what you have learned by reflecting. Is there anything that you remember?
Researcher 00:33:43: I will explain what reflection is. When one teaches the others observe. The one who taught speaks about the weaknesses and strengths and evaluates his/her teaching. The others also evaluate the lesson and discuss how to improve it. This is called reflection.
Assistant researcher: 00:34:15: Is there anything that you have learned by reflecting on your action.
SAT5-H2: 00:34:26: Let us see what we have learned starting from the first lesson up to the last lesson. Due to reflection and feedback we showed improvement and hence we made changes. We were giving feedback to one another. May be one wants to present it this way and another wants the other way. After SAT2 presented the lesson on expansion of gases, SAT4 suggested, during the debriefing session, about how the revised lesson should be introduced and motivated. We accepted her feedback and we implemented the feedbacks in the re-teaching. Therefore, the re-taught lesson became better than the first lesson. To make the changes that we have made, feedback was very important. No one has taken the feedbacks negatively. Everyone was taking it for the improvement of the lesson. I think this has helped us to improve.
Assistant researcher: 00:35:23: You were sensing that you were developing?
SAT5-H2: 00:35:33: Yes.
SAT2-H2: 00:35:39: The idea has been explained otherwise if you want us to speak. Reflections given after observation, when your colleague tells you to do this and that the reflection was very important. No one took the feedbacks wrongly. The feedbacks were aimed at improving the teaching. During the feedback sessions SAT5 indicated that instead of asking "What is air?" it is better to ask them "What do you breath?" It is different from saying, "What is air?" SAT4 has tried to correct me. I can say the feedback she has provided me was important in improving my teaching. Instead of directly going to the subject matter now I have learned that it is important to use variety methods of introducing the subject such as using brainstorming questions. Reflection is very important. When one teacher evaluates me, he is telling me the weaknesses and strengths which are very important for my development. We benefited a lot. We did not take the feedbacks personally. We took it as something that helps us develop our teaching. That way we benefited. Therefore, reflection brings improvement and helps us to develop.
SAT1-H2: 00:38:47: Reflection is like mirror. I can say that the reflections which we were given during the lesson study helped us in the school workshop. During the workshop we did not go directly to the subject matter to ask, what air is. First we motivated them. We distributed balloons and asked them to blow air into them. Some of them were laughing and others were asking challenging questions. We answered to their challenging questions by telling them that it is beyond their level. At the end the teachers also benefited. Therefore, we understood the benefit of reflection when we presented the lesson to the teachers than to the students, because the teachers were very much participatory and cooperative.
Assistant researcher: 00:40:03: therefore reflection enabled you to work more.
SAT1-H2: 00:40:10: It helped us.
Assistant researcher: 00:40:15: You told me that lesson study was important. Now tell me to what extent it was useful. The questions seem to repeating, but the aim is to get information.
SAT1-H2: 00:40:47: Could you please elaborate that question?
Researcher (00:40:50: The question is about what you have learned in lesson study. Questions are repeating. We can take as measuring several times. Do not be discouraged by the questions being repeated. Yes the questions have similarity. The question is was lesson study supportive?
SAT2-H2: 00:41:35: Now I feel that if lesson study is implemented it would have been very supportive. Truly, if we find sufficient resources and display room and if the challenges are removed we could have liked using lesson study. I do not have words to explain the benefits that we could have gained from it. It is very important and supportive. It has the potential of changing teaching from non-existent to existent. At this time we cannot say that the students are learning properly and we cannot also think that proper teaching is taking place either. This lesson study is attractive. It gives life to teaching by allowing students to participate in the teaching and learning process. If students get something that attracts them they would learn better.
Assistant researcher: 00:43:08: To what extent was useful? To what extent was lesson study useful?

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SAT5-H2: 00:43:15: This is reminder for the experienced teachers. I feel that lesson study serves motivation for the inexperienced teachers. Secondly, lesson study is attractive for the students as explained by SAT2. There would not be a student who would miss classes. I recommend this for other departments such as Social, Science, Mathematics and English. All students would have been benefited and would have developed confidence. All students would have been developed. It is common practice that only the outstanding students participate in the teaching learning process. In high schools also outstanding students dominate the participation. In colleges also the story continues. If we implement lesson study, I feel that the average students would develop confidence.
SAT3-H2: 00:44:26: I think the question is about what we have learned from lesson study. Like SAT3, I have started to reconsider my teaching and lesson planning. I have understood that I should give more time for planning and collaborate with my colleagues. Earlier we were giving chances for five or six students who raise their hands. Now, I have started giving chances for new participants. I have saying is there any new participant. This is the result of lesson study. Lesson study also helped us to change our lesson planning and develop our collaboration.
Assistant researcher: 00:45:25: To what extent does lesson study influenced you instructional practice? SAT3 has indicated earlier. Yes to what extent does lesson study affected your instructional practice?
SAT3-H2: 00:45:53: May I follow? It is similar to what I have been saying earlier. Lesson study has influenced our practice. Lesson study needs preparation, detailed preparation and reading. To do all these things time is required. Now time is challenging. It made us to look for information. I can say it has impact in our practice.
Assistant researcher: 00:46:26: The question is to some extend does lesson study has influenced you instructional practice. Are there any changes that you have made? SAT4 try to respond to some it will be relieve you from pain.
SAT4-H2: 00:46:43: I came only to respect your call otherwise I am feeling sick.
Assistant researcher: 00:46:55: If you are sick you are allowed to go.
SAT2-H2: 00:47:10: I can say it has changed our instructional practice. Good things such as lesson study bring changes. Since this process has many good things it has improved our instructional practice. It also started changing students. The teachers has changed and the students also. It is true that it consumes time. It takes time, because you have to allow participation of all the students and spend time in a specific topic. Instead of teaching a vast syllabus that students do not properly understand it is important to teach specific topics that students understand and that develop from time to time. Therefore, it was very helpful. Lesson study changes the old way of teaching altogether.
SAT1-H2: 00:40:20: I can say there is change to some extent, but much of the change is at attitude level. It is in the mind. There is no doubt that lesson study is important but we are under pressure to cover the syllabus. Several factors such as advancing parallel with colleagues, concerns about covering the curriculum and concerns about national exams hinder lesson study. There is pressure to cover what is planned. But the change has been engraved in our mind. We have made changes in our thinking. We have also introduced it to the students in order to familiarize them so that it will not be new for them later on. As indicated by SAT5 we are sharing experiences. In my teaching I might have used questions to introduce my lesson, or use brainstorming, or textbook, or concerned about finding time or concerned about covering the curriculum. Even though we may have some concerns, we have placed the change in our mind. In ordinary lessons, we skip many of the practical activities due to lack of time. In reality, the practical activities are useful to the students. Students like the practical activities and they are successful in improvising. Our students improvise some teaching materials therefore we save money and we do not ask the school to buy them. They are motivated in such things. They are good in improvising. There is nothing that they do not improvise. Therefore, I would say that the students have benefited. However, we were under pressure to cover the syllabus and also how to produce good result in national examination.
Assistant researcher: 00:51:11: One challenge that you have covering the syllabus. What other challenges are there? How would we solve them?
SAT1-H2: 00:51:43: The challenges are the ones which I have mentioned. To solve these problems well cooperation from the government is required. First number of students in class should be reduced. Number of students is decreasing. Our students have reached 38 in a classroom. We cannot say this class size is big when we compare it with the earlier number of students. Necessity is the mother of invention and we were creative in making the classroom suitable by taking extra desks out. The question is can we make that? Facing the challenge is beyond our scope but we can make what is in our scope. If we are going to solve the challenge, the changes have to be introduced through the government.
Assistant researcher: 00:52:30: What about others?

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SAT5-H2: 00:52:42: As SAT3 said we must reconsider it. I do not like using group work, because it makes managing students difficult. Although numbers of students have decreased this year, giving group work to large class and listening to their presentation make you lag behind. You cannot cover the syllabus coupled with holidays. Now I have started using group work with all the morning and afternoon. I found the students beyond my expectations. But this makes me to lag behind. My colleagues have finished chapters. I was borrowing some periods from my colleagues. I feel that this is a challenge. It is good to use the grouping and more for the students because it motivates them. They like it. They feel happy. They remember what they worked in group when you ask them another time. What you have taught them theoretically they forget it soon. Since the numbers of students were many, it was taking time. We were finishing the presentation in two days. I was finishing one sub-topic in two days because one period is only 40 minute. To discuss the activity, present it and then to conclude one period is not sufficient. It was requiring another day. I lagged behind the other grade seven teachers. Later on I used sport periods to catch them. This was my challenge.
Assistant researcher: 00:54:48: What about now (what now)
SAT5-H2: 00:54:56: Now what I want to explain is the workshop which we conducted last time in the Ministry of Education, the numbers of students in the class were very few. The number of students should be reduced. In grade eight we currently have 38 students in a classroom. Am I correct? I suggest that the class size should be minimized a little bit further from what it is now.
Assistant researcher: 00:55:28: Earlier you have pointed out about the syllabus. That is focusing on specific contents which are important for the students and focusing on active learning. You comment on it also.
SAT2-H2: 00:55:38: Another challenge is language. Around half of the students have problems in English. As you know, the medium of instruction is English. They come from elementary schools to junior schools with poor background. The students face problem of understanding. We are telling them to do what they do not understand and which is beyond their scope. The problem is not with the students, but it is with their background. They reach grade eight, seven and six without mastering what they were expected to master in lower grades such grade one, two or three. Therefore, when they reach junior school it will become a burden for them. It means that we are loading them with what they are not able to carry. Thus, language is one of the biggest challenges. This has to start from the lower grades. Now when we ask them to communicate in English but they cannot communicate. We cannot force them to know what they do not know. One can show them practical activities related to the subject. The students may observe the practical activities but may not be able to get meaning out of it. These are the students who have difficulty in language.
Assistant researcher: 00:57:50: What would you do in such situations for example?
SAT2-H2: 00:57:53: The may do the practical activities with motivation. But the real problem shows when the students are asked to write it. They may understand what they see in a practical activity, but they can translate it into writing. They are weak in writing.
SAT5-H2: 00:5833: I do not think that there are students who do not understand Tigrigna. At the end of the day my intention is to make the student understand the subject matter. I want to tell you how I was solving the language problem. I gave them a project work on electricity that the students were expected to work on it in groups. While presentation, of course the outstanding students were able to present it. The other students were insisting that they could not explain it in English but I was telling them to present it in Tigrigna. That was the way how I was solving language problem.
Assistant researcher: 00:59:15: We are discussing good points. You are telling me that the students have benefited from lesson study. Could you please elaborate on that? You have earlier explained the benefits that students obtained by connecting it to the earlier questions, now give me by elaborating on it more.
SAT3-H2: 00:5956: We are saying that we have benefited from lesson study. We are saying that we have learned a lot from lesson study. Teachers learn new things in order to benefit the students. To make the students know. In our earlier practices we were using shortcuts. We were providing shallow lessons. We were using theoretically dominated teaching. Now, in order to achieve the goals we are preparing necessary material and shifting to practically oriented lessons. Thus the students are grasping the concepts of the lessons. Plus as SAT5 indicated some dormant students have been motivated. Regarding the student she is mentioning, I taught him a year before last year. I still remember that his name is Filmon. He was a dormant student. Now, the lesson study has awakened him. For example in my class I requested students to present a topic and two students volunteered to present it. When I chose one of the students to make the presentation, the other student cried. Because she wanted to present it. Therefore, I can say that they developed such emotions.

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SAT1-H2: 01:01 21: Yes, I could say that students have benefited a lot. Colleagues have explained the reason for this. Majority of the students have language problem and the outstanding students of course they study it. For example, if we take the lesson that we have conducted, i.e. exchange of gases, many of the students would memorize the material without really understanding the meaning behind it. They say breathing is taking in oxygen and giving out carbon dioxide without really understanding it. After doing it practically they understood it more. I also agree with SAT5 regarding using Tigrigna. I was requesting the students to translate the question into Tigrigna before answering it. The students comprehend more when they translate the question and its answer into their own language. In this way, they were mastering the concept. I was explaining to them that this is the question and this is the answer. I was asking them questions such as: What is exchange? Exchange between what and what? What gas did you take in? What gas did you give out? Therefore, since we taught them this way they have benefited. Nevertheless, the main challenge was time. We do not have sufficient time. The students who do not read and study understood the practical activities better. Now they have realized that understanding is better than memorizing. Those who do not read (the weak students) were answering the questions correctly. However, they had language problem. Some of the students are extremely brilliant others are extremely weak. I can say 99% of the students are weak. This is one of the main challenges that we have.
Assistant researcher: 00:03:38: This helped you to allow all students to participate.
SAT1-H2: 01:03:40: Yes. This way of teaching that is using Tigrigna and using practical activities benefited the weak students more than the brilliant students. They were better off. They were able to get sense out of it.
Assistant researcher: 01:04:01: SAT5 was mentioning it earlier that the students were motivated. How did you know? How did you know that the students are learning and the lessons were successful? What were the indicators?
SAT1-H2: 01:04:35: Absence of shyness was the first indication that the students are learning and the lesson was successful. Earlier, they were feeling shy to ask their teacher. Now, that has disappeared. The group discussion helped them to conquer their shyness. The Shyness vanished. They were asking one another and informing one another. In short I could say that I have benefited this.
SAT5-H2: 01:05:09: Even from our earlier practice, our indicators are not the outstanding students, but the average or dormant ones. If these students answer correctly that is one indicator. As he explained the students which are labeling them as average or dormant either when they answer questions or when they follow attentively that is indicator. Earlier these students were sleeping on the desk and now if they follow attentively; it is giving us some kind of indication. It indicates us that they are motivated. Therefore, I think that lesson study is a motivator, especially for the average and below average students. These students are our indicators. One can read from their faces. One can sense happiness in their faces. In the past, some of these students were avoiding from directly looking at a teacher for fear of being asked questions. Now, they started to look directly at the teacher indicating that they are ready to answer, a kind of. I think these are the indicators.
Assistant researcher: 01:06:37: Ok. Are there additional comments?
SAT2-H2: 01:06:48: That is it. I think when one looks at something attractive in front of him/her makes him/her more attentive. Now the attention of the students is the reflection of what the teacher is teaching. If a student turns his face and looks in a different direction or if he looks downwards one can hardly tell the lesson is attractive. Now, the attention of the students is one indicator. A student directly looks at his teacher and that one that looks in another direction is different. Therefore, the students were more attentive. Workings on practical activities were more attractive to them. We know that they have understood the concept by the extent of participation and attention.
Assistant researcher: 01:08:02: SAT3, do you have additional comment?
SAT3-H2: 01:08:08: I am afraid that it is going to be repetition. The outstanding students are always outstanding. This new way of teaching has added some to them. For us the low achieving students are our indicators. It is the weak students that indicated us how much the lesson study was helpful to them. The outstanding students are always outstanding.
Assistant researcher: 010834: How do you respond when the students have difficulty in learning? How do we identify the problem?
Researcher 01:09:10: I want to elaborate this question a little bit. What we mean by difficulty is that if the students do not understand or if they wrongly understand a concept what do you do? How do you respond?
SAT3-H2: 01:09:24: Yes. Earlier I was insulting the students. Now, I would see in detail their problems and why they were unable to answer it. Invite them for consultation during break time or take them with me to the staff room and discuss with them. Most of the time the weak students happen to have problems at home. There is always

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something behind at their homes. The disputes between their parents affect them. I have learned that I must speak to them and identify their problems.
SAT2-H2: 01:10:28: You can easily recognize the student who does not understand because he is in front of you. If students are not understanding as a teacher you cannot continue simply. There is something which we call motivating or energizer. If students are not following one can understand that the lesson is not attractive to them. You cannot continue like that if the students do not understand. Who to teach? If students do not understand, one has to change the teaching methods. We sometimes talk too much. Taking too much is also boring for the students. Therefore, if any one of us has this problem he/she has to change the method or methodology in order to attract the attention of the students. The solution is to create a means that support the student understanding.
Assistant researcher: 01:11:57: Ok. SAT5 do you have any idea? What were you doing at times when students have difficulty in understanding what you are teaching?
SAT5-H2: 01:12:09: We commonly support a student with difficulty by explaining to him individually in his sit or explain the concept again to the whole class. Now I have learned that if we are teaching alone ask another teacher that s SAT1 or SAT3 for help whenever our students have difficulty. For example in agriculture one student was unable to understand materials such hoe, fork etc.. To explain to him I did not know the names of the materials in Tigrigna. Then I asked SAT3 to give their names in Tigrigna. When I told him in Tigrigna in turn the student explained to what they were. Participating in lesson study provided me with opportunity to ask another teacher how he can help to teach the students. This is the benefit I got from lesson study.
Assistant researcher: 01:13:13: Now let us go to the school community and administration. Did the administration and school community helpful in supporting you? First are they aware of what you are doing?
SAT2-H2: 01:13:55: First your approach was good. You invited the pedagogic head and the school director to participate in the workshop. Since they had understanding of what is going they were cooperative and supportive. There was no problem from this side. They were cooperating with us with the best of their ability. For example if we want to change class, exchange periods or if we require resources they were supporting us very much.
Assistant researcher: 01:14:47: This means that they were supportive.
SAT2-H2: 01:14:48: Yes they were supportive. They were supporting us to connect with you. They were providing us telephone service to connect with you. Therefore, they were supportive.
Assistant researcher: 01:15:17: What was their support in the lesson study?
SAT2-H2: 01:15:20: We did not invite them for the lesson study. They did not reject any of our requests. They were providing us their support.
SAT3-H2: 01:15:45: If we say they were supportive that is all. They were supportive in all respects.
Assistant researcher: 01:16:08: What about the support of the school community? Were they helpful?
SAT5-H2: 01:16:18: First, they were jealousy when we participated in the workshop. They asked us how we were selected to participate in the workshop and their attitude was not positive. In the beginning, they did not consider what we were doing as useful. However, when SAT1 made the presentation, during the school workshop, they acknowledged what we are doing as something valuable. Afterwards they were speaking in the staff room about the positives of what we were doing. They showed willingness to participate in it. They supported it. Then they started asking several questions such as: Was there opportunity for us to participate? What were the criteria for selection? Why we were not invited for the workshop? The community became very positive about it. This indicates that it was effective. When we ask them for exchanging period, they were willing to do that. We tell them that we are participating in the research. Teacher SAPH was also very concerned about it. The support of administration, director and school community was positive.
Assistant researcher: 01:17:17: Did the school community encourage you experimenting with lesson study?
SAT3-H2: 01:17:26: Yes when we tell them what we are doing. Some of the staff did not know about what we were doing. On Friday I asked one teacher to exchange period. She asked me about what we are doing. They cooperate after they get knowledge about it. Therefore, they should be informed. In the future, if such type of lesson is provided, first, the staff should be informed about the program, choose appropriate participants for it and then request the staff members for appropriate help. After that, they would be more cooperative.
Assistant researcher: 01:18:03: Does the school community know what you are doing?
SAT3-H2: 01:18:05: Yes they know. They knew it later.
Assistant researcher: 01:18:08: Does they encourage you?
SAT3-H2: 01:18:09: Yes.

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SAT1-H2: 01:18:11: Yes. My colleagues have already explained it. The administration has cooperated with us. For example, they have provided us with wall chart. The two of them participated in the workshop but the storekeeper. The storekeeper should be informed to give us the wall charts. The administration was also informed. The teachers were invited to observe the lesson study as you have seen it. As SAT5 indicated, some asked us how we were selected especially when they heard that we had lunch in Embasoiyra Hotel, as you know, news spread very fast. Some also make jokes and they say you do not care for the normal teaching as you care for this [lesson study]. Some also think that others are attending workshops secretly in a way it is hidden from them. In general, the school community knows about what we are doing. This has become very famous. Every member of the community, from top to bottom knows it. As I indicated regarding resources they provide us. They cooperate with us. Some simple materials we were bringing ourselves. Materials such as wall chart we were asking them. We were also using our source. We were also brining some materials individually. Students also brought some. Any support we ask was welcome.
Assistant researcher: 01:19:46: Some teachers also observed the lesson study. They observed one day.
SAT3-H2: 01:19:56: Two days. The first day they were few but the second they were many.
Assistant researcher: 01:20:03: How did you feel when they observed you? How did you feel when they attended the debriefing sessions? What is your idea regarding these issues? When an external person observes your lesson how do you feel about it?
SAT1-H2: 01:20:21: Nothing. We have developed self-confidence. The lesson was a joint lesson, we felt nothing. The observers appreciated us as you have heard it. They talked in front of you. We have also evaluated ourselves that there is no problem in Science (department). In front of you they have witnessed that this is a good process. When they found us individually they said the same thing. They have indicated that lesson study has produced good collaboration among us. Sometimes they joke, otherwise they have appreciated us.
SAT3-H2: 01:21:12: Yes truly there is also coherence among us.
SAT2-H2: 01:21:15: We do not feel anything if an observer observes our lessons. After all, we have invited them ourselves. Because we believe that the comments that a teacher provides to another teacher after observing a lesson is very important for development. At this time, no one is afraid of being observed and no one is concerned about the feedbacks. From the principle of lesson study, we are not evaluating a teacher but we are evaluating a lesson. We were evaluating the lesson. The evaluation focused on how the students are reacting to the lesson. Therefore, I do not feel anything bad because an external observers to observed my lesson. When we observed one another we felt nothing. For example SAT2 told me that I should have done this instead of doing that. I did not feel anything with his comment. Therefore, we have to belief in this type of culture and develop it.
Assistant researcher: 01:23:07: Earlier you have said that lesson has produced impact on the school community. I want you to elaborate it more for me.
SAT3-H2: 01:23:16: We invited them late. We did not invite them in the first and second research lesson but later on we invited in the 3rd and 4th research lesson. They appreciated it. We told them about the workshop. They developed willingness to participate in this process. The wished the same for them. They wished they have observed the lessons earlier. Others also talked to us as to why we did not invite them.
Assistant researcher: 01:24:00: What was the impact? Please tell us.
SAT5-H2: 01:24:03: Just it is similar to what SAT3 is saying. I felt as if we scored more points. I felt that this department scored more points. I felt as if we are at the top of others. I felt as I have done some special job. Even though the observers knew the concept that I have presented, they took it as if I have presented something special. After observation they told me that lesson study has to be conducted in all departments. I wish other departments such as social and math practice similar process to practice lesson study in all classes of our school.
Assistant researcher: 01:24:40: This means that you are recommending lesson study to be practiced in other departments.
SAT5-H2: 01:24:44: Yes, that type of idea. When we invited them I did not think that they will come willingly taking the time into consideration. That is why we did not invite them right from the start of lesson study. Now when I saw them that they loved it I am saying that it would have been good had we invited them a bit earlier.
Assistant researcher: 01:25:06: Therefore, you are saying that lesson study had impact.
SAT2-H2: 01:25:07: Yes it had impact on the school. As explained earlier, four departments participated in the school workshop conducted on Sunday. The first departments presented its lesson in lecture method. The lesson was not attractive. Therefore, SAD knew the lesson that we have presented and he requested us to present the lesson to the participants. Our lesson was very attractive. Therefore, lesson study had impact in influencing the workshop conducted in the school. Our department has become an example to other departments.

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SAT5-H2: 01:26:13: Other departments tried to imitate the method used by SAT1. This is also impact.
Assistant researcher: 01:26:19: Therefore, lesson study has impact on the school and you used the school workshop as an opportunity to make influence on other departments.
SAT2-H2: 01:26:28: We influenced other departments.
Assistant researcher: 01:26:30: Ok it is good. What was the contribution of knowledgeable other?
Researcher (01:26:41: The workshop was facilitated by researcher and assistant researcher. I am the researcher. In addition, to being researcher I was ready to support you in the process of lesson study for example to supply you with reference books or other reading materials that you require. The question is that is there any support that I forwarded to you? Or assistant researcher because he was present during the workshop.
SAT3-H2: 01:27:33: Both of you i.e. teacher Researcher and teacher Assistant researcher it is your inherent character or is it the researcher that made you to behave like that, I do not know. I do not know if we had come across such a chance. You have been provided all necessary support. At first we were chatting with one another on some ideas such as: this lesson study is going to challenge us. Could we are able to get rid of it. We were saying that it is extended and is going to kill our time. But later when we saw your behavior we were attracted to it and determined to continue it with you. I would say your behavior and support influenced us to work with you.
Assistant researcher: 01:28:31: The support that you have received in relation to lesson study.
SAT2-H2: 01:28:42: Just here. When we were preparing lesson plan, he cooperated in providing us with samples. The presentations and materials provided during the workshop were helpful. During the later stages we borrowed books and we have read the books. We were able to understand what lesson study is from reading materials. We have taken materials. For example I borrowed one book written by one American named Lewis. I have benefited a lot by reading that book. The book was with me until recently. These were some of the supports. The support was not limited to the workshop, it continued after it.
SAT5-H2: 01:30:44: The Researcher provided us with support of course related to the research. We have received materials that describe lesson study. In addition he provided us flash to keep the documents. He brought us a book before we start preparing lesson plan. I feel that book has attracted me. This indicates how much he has been concerned about in our materials. In addition to bringing materials he cooperated in typing. He was typing what we have written in hand. Regarding materials he supplied us with all necessary materials even files. At that time teacher SAD said why he brought files. He said we have files and we could have given him. Therefore, in material wise he supplied us from the smallest to the biggest material.
SAT1-H2: 01:31:43: Yes. The question is about the support provided to us. First of all a two-day workshop was given to us in the Ministry of Education. We were introduced to one another. Our expenses were covered. One good thing, we were introduced to one another. As indicated we have received reading materials, flash, file etc. More importantly he was meeting us based on our convenience. He did not create any constraints on us or on the school. We were also cooperating with him by exchanging our period with other teachers if some clashes happen otherwise most of the time we were free at the same time. Other subject teachers were cooperating with us because they knew what we were doing. They asked us why we want the exchange. Because they have the right to know why we are exchanging. Everyone has to rush for his personal additional work (outside the school during their free periods). The school community knew what we were doing. Therefore, we did not face any problems. We have received support from the knowledgeable other in terms covering expenses, time and materials.
Assistant researcher: 01:33:26: We have taken much of your time and now we are towards ending the interview. We thank you for that. Do you have any plan of continuing lesson study in the future? Why?
SAT3-H2: 01:33:48: Yes, I would prefer to continue. I wished it started from the beginning of the academic year. We started it late and the time was short. We have observed that within this short period we have benefited a lot. Had it been from the beginning of the academic year, we would have made a lot of changes. I wish to continue for more time.
SAT1-H2: 01:34:28: I like continuing with lesson study, but the challenge is getting time and our living situation. Otherwise, it is very effective and supportive.
SAT2-H2: 01:34:38: If we say it is beneficial and if we find ways of continuing it, it good to continue it. However, the condition, it is difficult for us to implement it alone. If we are going to continue it then suitable condition should be created by alleviating the challenges that have been discussed earlier. We do not have doubts about its benefits. Continuing it is good, but we must see it in relation to other problems. As I indicated earlier one problem is related to the syllabus and the education system as a whole. If we were allowed to adopt it we would have been the first to change to this way. But there are challenges.

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SAT5-H2: 01:35:57: If this lesson study is going to continue, I would prefer to continue, using our creativity. Especially the science department has taken the workshop; if we start others will imitate us. They may think about it. However, one problem that we have in this school is lack separate room, where we can use it as laboratory to do our practical activities. One person should also be assigned there as storekeeper. Instead of saying it is not possible, we must minimize some of the challenges and let us say it is possible and start working with it. Therefore, I would prefer to continue.
SAT3-H2: 01:36:40: I want to add few ideas. We know that there are challenges as indicated by teacher SAT2. SAT1 also indicated that our thinking has changed if we are not able to work with it taking the constraints into consideration. Now in order our thinking to changing more, I would prefer to continue with it until favorable conditions are created. When conditions are favorable we will use it. Let the challenges be there, but I would say let us learn to change ourselves.
Assistant researcher: 01:37:19: Ok good. If this is considered as a professional development, do you recommend for other schools in Eritrea to use lesson study?
SAT2-H2: 01:37:56: That is what I said earlier. If other schools are involved in lesson study. If all schools take the necessary training and in addition to the support provided by the schools if the process is approved by Ministry of Education then I am willing to continue. This could have been one of the best processes.
SAT5-H2: 01:38:29: Had lesson study being in the whole school the challenges could have been removed. The Ministry also could have changed it curriculum. We would have worked the way we are working now. Secondly some individuals who graduate from Engineering and other disciplines are assigned to teaching without taking pedagogy courses including teaching practice. When they come to schools, these people are challenged. Their students are also facing challenges. We have the same people in this school. They gain experiences from the staff. To solve such problem, I suggest that these people should take pedagogy course preferably in the form of lesson study and thus we wouldn't have any problem and education would have developed.
SAT1-H2: 01:39:52: I recommend the importance of lesson study to the Eritrean Educational system. Because we have read its importance from the reading that you have provided us. The literature says lesson study started in Japan and now is being introduced in some parts of America. Eritrea would have been benefited from lesson study, because in the last 20 years the Ministry of Education in Eritrea has introduced several initiatives, one after another. Truly speaking students were also confused. Earlier students were specializing in specific science subject such as chemistry and biology. Later on subject specialization was abandoned. After some years the Ministry of Education is advocating for subject specialization. We are using the initiatives of different countries at different times. If we use lesson study this problems could have been solved. Since many countries are following it, I am sure that we too will follow it sometime in the future. America is following it and it is advisable for us to follow it. Do you want to follow to Africa? Laughter.
SAT2-H2: 01:41:00: This lesson study is important. Japan is one of the developed countries. Students who are produced through this approach are invited to high technology. This is the best thing. It is the best from the best. Taking this means you are taking the best from the best. One may hate the political inclination of another. We must be able to see education separate from politics. One must be able to benefit from the education of his enemy. That is my idea.
Assistant researcher: 01:41:55: Now we have finished the interview question. If you have any comments that you would like to add I will give you this last chance in case if you have anything to say.
SAT2-H2: 01:42:18: First of all we are happy to be the first participants of lesson study. We have been supported. That is why we were able to do what we were doing. I take this as golden opportunity. I wish the same opportunity to other colleagues.
SAT5-H2: 01:42:18: I am very grateful for participating in lesson study. I am happy for getting this opportunity. I have not lost anything. Instead, I have benefited by participating in lesson study. I have benefited by collaborating and working with these experienced teachers. I can say my students and me have benefited from this. Therefore, I would like to thank you.
SAT3-H2: 01:43:30: We are saying that we have benefited from lesson study. It is natural that everyone wants to benefit. We have learned from lesson study. Therefore, I want to thank you.
SAT1-H2: 01:43:59: Ok. My colleagues have said it all. I wish you success in your research. I wish others to follow your footsteps. I wish to see many doctors and masters graduates. As a country we wish our country to prosper. By the grace of God I wish your paper to be accepted. I wish to see your graduation. I wish also to see introduction of lesson study in our education system.

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Assistant researcher: 01:44:34: As to my knowledge, this study is the first of its kind in Eritrea. As teacher SAT1 and others you have recommended lesson study to be introduced in Eritrea. Now lesson study in being introduced in many countries. It will be introduced based its outcomes. You are the first participants of this study. As I see it the information that you provide us will enable us to make that recommendation. Therefore, I want to thank you for that. We are the first beneficiaries of this research. Later on the benefit will not be limited to this school only; its benefit will be for the whole country. If lesson study is introduced into Eritrea after two or five years, people will ask about where it started and who participated in it. I want to look at the information that you provide from this perspective. I am sure that you are providing information in that sense. Therefore I thank you very much. If the researcher has anything to say I will give him chance and with that we will end our interview.
Researcher 01:45:40: First of all I want to thank you. This group is a group that has coherence and integrity. The administration was very supportive. Now we have ended our first phase successfully because of your cooperation. Therefore, first I want to thank teacher SAT1 for coordinating the group and then I thank all teachers teacher SAT2, SAT3, SAT4 and SAT5. I thank you for working relentlessly and providing me information. The appreciation is beyond what I express in words. As the Assistant researcher described it, this research is the first of its kind in Eritrea. Let alone in Eritrea, lesson study has only 10 years. As teacher SAT1 indicted it earlier they started experimenting since 1999. Lesson study is being experimented in many are places. We are also experimenting here. You are the first participants and you have envied other teachers. I also envied the assistant researcher. For example Assistant researcher is preparing his proposal on lesson study. Especially SAT5 and SAT3 since you are the youngest you will be able to find some direction for your future studies. I and the Assistant researcher started our teaching career from school teacher. For example I have taught all grades from grade one up to grade twelve except grade two. I was planning to get out of this teaching profession. I used to tell Assistant researcher I have never thought of continuing when I was in high school. The Ministry of Education provided me the offer. Now you have better chance. Therefore, this will help you to give direction. Therefore, I thank you very much. I am very happy for knowing you and working with you. Thank you very much.

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Appendix H3: Third teachers' focus group interview scheme

1. How has collaboration impacted your skill as a teacher?
2. What did you learn when you planned the lesson with your colleagues? (in terms of content knowledge, pedagogical knowledge/ teaching practice, working and sharing ideas with colleagues, classroom observation skills, and lesson planning skills)
3. What did you learn when you observed the research lessons?
4. What did you learn when you reflect on the research lessons with your colleagues?
5. Describe the difference in your work before collaboration and after it. Describe how collaboration has affected your effectiveness as a teacher?
6. How has participating in the lesson study cycle impacted your instructional practice? Are there any changes in your practice?
7. Do you feel that you have benefited by participating in the study? What kinds of benefits have you received by participating in lesson study?
8. What kinds of challenges have you encountered, if any, by participating in lesson study? What are some ideas for overcoming them?
9. Did your students respond to the lesson the way you anticipated? (justify your observations by providing specific examples)
10. How do you know whether or not that your students are learning and your lesson is successful? What are the indicators? How did you respond when a student experiences difficulty in learning?
11. Did your students benefited from lesson study cycles? What kind of advantages do you think your students have profited?
12. Was the administration and school community helpful in supporting you through the lesson study process? Does the school community encourage your experimenting with lesson study? Describe the type of support which was available.
13. How do you feel inviting other teachers to observe a research lesson and attend the debriefing session?
14. Do you see any impact of lesson study on your school? Describe.
15. Did the contributions of the "knowledgeable-other" influence what you have learned? Describe.
16. What are you doing differently now from what you were doing before participating in this study?
17. Do you have any plan of continuing lesson study in your school? Why? Why not?
18. Do you recommend lesson study as an appropriate professional development strategy for other Eritrean middle school teachers? Why? Why not?
19. Are there any other comments that you would like to add?

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School 'A'_ Third teachers' focus group interview (English)

Teachers interviewed: SAT1, SAT2, SAT3, and SAT6
Date interview taken 11/12/2013
Interviewed and translated by Researcher

Researcher: 00:00:00: Ok. First of all I thank you very much for showing willingness for this interview. The questions that I have prepared may seem to you repeating and I want to tell you that, about the nature of the questions. It is a way of getting information by asking several similar questions. Therefore, I ask for your patience.
SAT2-H3: 00:00:33: If the questions repeat again and again it is necessary that the information that we provide should be the same.
Researcher: 00:00:41: Yes correct, the reason for repeating is also to know the consistency of the information.
Researcher: 00:00:46: Here are the questions. The first question is: How has collaboration impacted on your skill as a teacher? What have you learned by planning together, observing together and teaching?
SAT1-H3: 00:01:22: Ok. Working together is always the best strategy. We have benefited a lot from discussing and sharing ideas with one another as the perspective of one is different from the perspectives of others. Therefore, what one sees may be different from what is seen by others. We were giving our comments on the lessons taught during debriefing session. We found it advantageous. We amended the lessons that we feel needed amendment and prepared improved lesson for the coming year. Therefore, we have developed skills. As commonly said, two heads are better than one. From collaborative work, we found many advantages especially in the practical skills in which we had deficiency we got additional skills. One brings materials, one gives ideas and another prepares something. Therefore, by working with colleagues we got advantages.
SAT2-H3: 00:02:40: I agree with his idea. As SAT1 indicated two heads are better than one. We are practicing collaborative work just now. Preparing lesson plan in-group and observing together brings correcting one another. An issue that is visible to one may not be visible to another. As a result, the teaching and learning process becomes effective. We learned this when we practiced lesson study. Truly speaking, we were not using this method. Therefore, we have obtained many advantages from it.
SAT3-H3: 00:03:48: They have mentioned a proverb from our forefathers' proverbs which says that many heads are better than one head. Correctly, working in collaboration has benefited us. Some topics which are difficult for an individual teacher to teach when taught using lesson study he/she gets ideas from his/her colleagues in addition to his/her own ideas. By combining the ideas one could teach it the difficult topic easily. Collaboration is for the benefit of all. It does not only benefit the students, it also benefits the teacher to be confident and become free from pressure in the class. It means the teachers have common understanding. The student too will have common understanding. They will be taught the same way. This collaboration has produced changes in our teaching.
SAT6-H3: 00:05:18: Yes we are repeating what already has been said. It is the culture of this school to ask one another the topics to be covered when one wants to prepare a lesson plan. We prepare yearly lesson plan collectively especially those of us who are teaching the same grade. However, lesson study is different from our earlier practice. In order to teach one lesson all of us were discussing. As teacher SAT1 indicated when one teacher comes with materials the other comes with ideas. We were saying if we do this the students will understand the lesson better and if we do that we will be able to save time and effort. We have benefited from the process and the students also benefited from it. However, we have some concerns. The first concern is large number of students in a class. The second concern is negligence of the students. Generally lesson is a very good strategy. It is helpful. In order to teach one lesson we were discussing about what and how to teach, how to manage students and share ideas. The earlier practice was different from the present practice. There was collaboration but it is not as detailed as this. We were preparing lesson notes and lesson plans individually. However we were informing one another how we are progressing and the topics we have covered. This practice is different from the earlier practice. I benefited from what my colleague teacher knows but which I do not know or my colleagues may correct me from my mistakes. If I am extending it they may tell me to shorten it. Everything was by sharing ideas. Therefore I am satisfied with it.
Researcher: 00:07:26: Thank you. Now you will answer three questions together. What did you learn when you plan the lesson with your colleague? What did you learn when you observe research lesson? What did you learn when you reflect on the research lessons with your colleagues? In terms of these points content knowledge, pedagogic knowledge, working and sharing of ideas with colleagues, classroom observation skill, lesson planning skill, classroom management, observing student learning, reflecting and critiquing and being critiqued. Are any

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changes or improvements in these points?

SAT1-H3: 00:08:40: Ok. As you have indicated earlier the questions are repeating. We have learned many things from participating in lesson study. Number one, the teaching sessions were followed by re-teaching sessions and these teaching and re-teaching sessions were very advantageous. The research lessons were prepared jointly with input from all the members. We benefited from such discussions. If we were to say the reflection was transparent or not we should see the students. Some of the students were disturbing, but since we were going around the classroom majority of them were attending attentively. Moreover, the camera also stimulated them. Even the dormant students were participating. I feel that last year students were better than the current students, because they were doing things that we have not thought about them and they were doing what we haven't told them to do. Therefore it was advantageous. We learned a lot. There are many things that we have learned.

School workshops are conducted regularly. If they ask us to present in a workshop, we will present from the lessons that we have presented during lesson study. Because they are the lessons that have been already checked and enriched with comments. Last year also we presented from the lessons which were prepared for lesson study. As a result our lesson presentation was found to be the best and it was very effective. The audience also enjoyed our lesson. It was simple for us to present again a lesson which has been presented. The lesson was an enriched and improved lesson. For the future school workshop presentations, we will choose from the lessons prepared for lesson study. Therefore, lesson study also helped us this way. It was advantageous. It was absolutely helpful. It was also helpful for the students and the teachers. We have learned a lot from the students, from ourselves, from the lessons planning. I would say we have benefited a lot.

SAT2-H3: 00:11:33: I have also the same idea, but for the sake of speaking I will do so. When we teach them together, that is, when one teacher teaches the research lesson others were observing them. They did not misbehave because we were totally controlling them. When one of the teachers approaches them, they would stop playing around. If one teacher teaches alone, the students would have more chance of playing around, looking through the window and some would not follow to the instruction attentively. This type of teaching and observing in groups is very effective. The students' attention was totally drawn towards the lesson. Reflection on the students and us is helpful. When one teaches with his colleagues he receives support from them.

SAT3-H3: 00:13:12: Yes. I will start with the first question. When planning a lesson in group, we get different ideas from different people. What one does not know the other member may know it and shares it with the group members. Therefore, we put our collective ideas into the plan and it becomes a perfect one. The plan will most likely achieve the objective because it is a collaborative one. I would say planning collaboratively is very effective.

The second point is observing. First I feared that observing a classroom in big group would distract the students, but the situation was not as I feared it to be. Some students whom I know and whom I taught them in the previous year were calling me Teacher! Teacher! Some asked me questions regarding the subject matter. Since the rule of lesson study instructs us not to intervene with the teaching learning process. It also instructs us not to block the students. It also instructs us to leave the teaching to the teacher. Some students were doing wrong observation, other were doing perfect observation. Regarding reflection, the principles of lesson study say do not evaluate teachers. Contrary to the rule I would say we have evaluated one another. We were correcting one another. Therefore, I would say lesson study was useful.

SAT6-H3: 00:14:58: Yes the idea is the same. But I will explain my feeling. In lesson planning we were planning collaboratively. As indicated earlier it is true that two heads are better than one head. During collaboration we were sharing our experience. Some teachers have more experience than others, others are curious and get information that others do not and still others have special skills accumulated through experience. The discussion may be among others on time management, classroom management, use of activity based teaching and use of teaching materials. During observing we were six including the cameraman. As SAT3 indicated the students became familiarized with lesson study. They did not show any shyness in the presence of video and cameras. A teacher teaching alone may have problems managing students who misbehave in class. We were all standing on the sides of the classroom observing the research lesson. Eyes of many teachers are better than eyes of one teacher in observing student learning. We were improving the research lesson further in the re-teaching session through cooperation of all of us including you. The whole process was successful. I feel lesson study would be able to produce more results if we practice it with few selected students. The reflection was good. We learned a lot during reflection. There is a proverb that says a good friend a good mirror. We were commenting on our teaching and student learning.

Researcher: 00:18:33: I want to include one question. When you observe a research lesson or when you teach a research lesson you talk about the lesson. Then what do you feel when you critique others and be critiqued as

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well?
SAT6-H3: 00:19:05: Please elaborate it.
Researcher: 00:19:07: What do you feel when you critique and others critique your lesson. How was your feeling before and after lesson study? Indicate the development within the two semesters. This a type of developmental study therefore what was you feeling before lesson study and after it? If there is any change.
SAT1-H3: 00:19:31: We were free because during lesson study we agreed that we are not observing the teacher but the student learning. We were not bothered by our English. We were not personalizing it. We were focusing on the subject. The main point of our observation was on how the lesson transferred to the students. After teaching we were discussing on how to improve the lesson. One volunteer to prepare one thing, another prepares teaching aid and still another volunteer to write it. The lesson was a joint lesson that we prepared it together by sharing ideas and based on common understanding. Therefore, we did not feel anything. We were free to critique and be critiqued. Because the objective was to develop our profession. Truly speaking it was advantageous. The lessons were among the science teachers and therefore we were accepting whatever are the feedbacks. We were accepting them in good faith. When any correction was given to us we were accepting it. For example even if I am the oldest and the most experienced teacher in this group, I got good ideas from these young teachers. Therefore, I would say that I have benefited. More importantly, the re-teaching was effective because we include all the ideas from the first lesson for improvement. We were collaborating with one another to improve it. I would say it was beautiful. We were free and we did not feel anything. Frankly speaking we were free.
SAT2-H3: 00:21:18: After participating in lesson study, I was to evaluate the teaching learning process. We were looking on how the students are learning. In student-centred teaching, the role of a teacher is facilitator or coordinator. We were not evaluating the teacher, but how the students responded to the lesson and how they accepted the lesson. Therefore, we did not feel anything. The feedbacks that were forwarded during debriefing sessions were mainly constructive in nature. They were not humiliating and distractive. The feedbacks were aimed at improving the practice of teaching in the future. I feel that a teacher should accept the feedbacks given to him either during lesson study or other times, because they sharpen the teacher. When feedbacks are given to a teacher, it means that some issues that are not visible to that teacher are visible to the other teachers who are observing the lesson. Therefore, accepting feedbacks positively makes a teacher better. If feedbacks are not given to a teacher, the teacher carries the problems with him all the time. During debriefing, there should not be any bad reactions to the feedbacks and there were not any bad feelings in our case.
SAT3-H3: 00:23:47: The comments are becoming similar. No one was evaluating a teacher. We were sometimes giving feedbacks. The feedbacks were aimed at helping the teacher to improve the teaching for the future and not to put down a teacher. I was expecting more comments from these experienced teachers who taught for more than double of our age. I request them the same in the future. We do not feel anything.
SAT6-H3: 00:24:58: The general understanding which was raised during workshop was not to evaluate a teacher. However, one would indirectly evaluate the teacher. In this school there is transparency. We are characterized by unity. We operate like family. Our ideas are not very far from one another. All comments were taken as family issues. In one of the lessons, for example, we raised why we were not able to give short notes. Such types of feedbacks were useful. The feedbacks were not many but we were giving some for improvement. Everyone was accepting these comments positively thinking that it is for improvement of the lesson and self. No one took the comments as personal insult.
Researcher: 00:27:32: As indicated earlier there is repetition and therefore, I beg your patience. Before this you might have experienced collaboration. You were working collaboratively. But the collaboration in lesson study is different because one goes up to classroom to observe his colleague. If this is considered as collaboration, describe the difference in your work before collaboration and after it.
SAT1-H3: 00:28:23: Yes it is correct. As indicated earlier by SAT6 we in the science department prepare lesson plan in group. The teaching procedure that we use is the same, that is, introduction, development and conclusion. I am department head and I sign on the individual teacher's lesson plan but I do not see about the details what each teacher used in introduction, development and conclusion. I look only on the topic. Then everyone implements his/her own plan. There is more collaboration because after preparing a lesson plan in collaboration we observe the implementation of the lesson. During observation we check whether the lesson has been implemented as planned and we give our comments during debriefing sessions. That is the difference.
SAT2-H3: 00:29:37: Now, after lesson study collaboration has been increased. Lesson study provided us opportunity to collaborate more. As my colleagues explained it we prepare lesson plan jointly together, but that is annual plan. Otherwise we prepare individual lesson plan. During lesson study we plan in group and that lesson is

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considered as joint lesson. After planning when one teacher teaches the lesson the other teachers observe the lesson. I could say collaboration has been manifested now after lesson study. By putting the challenges aside, if we are able to implement lesson study in our schools, the education system in our country would develop. Working in collaboration is better than working individually. During lesson study, we taught the research lessons with ideas obtained from the different members and own ideas. We taught an enriched lesson. We are practicing collaboration more after lesson study.

SAT3-H3: 00:31:34: Yes there was collaboration before lesson study, but it is not in the same understanding. During planning we inform one another the extent of coverage and then everybody sits alone and prepares individual lesson plan. Now, it is not like that. We sit together and discuss about what to do and what to include in the lesson plan. Therefore, collaboration has developed more after our participation in lesson study. This has benefits. First it helps us to teach free from any feelings because it is a collaborative lesson and we all are responsible for it. There was one thing that worried me most when I worked individually and that is I always think about how my colleagues are teaching their students. Whether they are teaching more than what I do. Worried about what extra things they are including in their lessons that I do not do for my students. Now, since we are preparing the lesson in group I do not worry about what and how others are teaching. I get convinced that we all are teaching in similar way. I do not worry about achievement of my students as I used to do earlier. Now I am relieved from worries and I am working freely.

SAT6-H3: 00:32:53: My opinion about the earlier practice is the same as what my colleagues have indicated. Earlier we do not go deep into the lesson but we work a work that gives us spiritual satisfaction. In lesson study we are deeply involved. We study the lesson thoroughly and discuss on how to present it, preparing teaching aid materials which are suitable to the topic and discuss on how much to present. In lesson study we prepare lesson cooperatively. As my colleagues told you once the lesson is planned, any one among us could teach that lesson because it is joint lesson. After teaching we discuss on points such as: How did the students react to the lesson? What were they doing? What have they learned? Did we notice any misunderstanding? Was the lesson successful? We stress on these points. During this lesson study we have used our experiences which we have accumulated for several years. There is much difference between our earlier and current practices. The current practices stress on collaboration. In lesson study we stress on the lesson. It is for the students. How was the situation for the students? How was the classroom situation? How did the students follow to the lesson? How to present the lesson? Since it was in our hand to adjust the difficulty of a lesson to ability of students, we discuss on identifying topics that are difficult for them. Which topic is simple that they can understand it easily? Then based on this analysis we choose a topic. I would say the process was very good and it was supportive.

Researcher: 00:35:08: How has participating in lesson study impacted your instructional practice? Are there any changes in your practice? This question is about change.

SAT1-H3: 00:35:44: Yes there is change. Had this changes been in all lessons I would say it would have been good. There was marked difference in the research lessons that we taught because we have supported the theory with practical activity. But the challenge is time. Otherwise there are a lot of changes. In grade seven truly speaking we were not giving much attention to levers. We used to explain them in theory. Now, we showed them practically about the position of fulcrum, load and effort. Similarly the lessons in grade eight showed development. The problem is time does not permit us to teach that way. Everyone rushes not to lag behind to complete the syllabus. This is good way of teaching especially for those who are interested in the profession of teaching. Now, the reality is that some of us go to our private work and give less emphasis to teaching and others rush by treating the lessons theoretically. Lesson study was advantageous. Many changes have been manifested. We have made what has not been made before. The students are like a white paper, when we told them something they immediately understand it. Their achievements were good. We have also obtained their feedback. Sometime we were obtaining unexpected answers. For example I have got one unexpected answer from the students when I was teaching about force. When I asked them which team won the tug war, they were giving the answers based on their interpretations. They have mastered the push and pull of forces. The topic was new and it was their first time to study it. I do not know whether or not the topic was simple but they showed remarkable achievement. If we are teaching them in similar manner and if lesson study is introduced we wouldn't have a weak student. Provided that they come from elementary schools with mastery of reading and writing skill. Using lesson study brings changes due to several reasons. First we were complementing the theory with practical activities. Secondly, we were giving more time for the students to actively participate. Finally the re-taught lessons were enriched by feedback from colleagues given during debriefing sessions. I would say that it was advantageous and we have also benefited a lot. In the future we will teach them the same way. Like what we did earlier. I have finished.

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SAT2-H3: 00:38:16: In the book which you gave us last time I read about the comment given by one teacher. He said that he would not consider that he was teaching the students before he participated in lesson study. Likewise we have improved a lot of things after participating in lesson study. For example we have improved our teaching, our planning, working together, planning collaboratively and teaching collaboratively. All these changes came after our participation in lesson study. I do not mean that we were not working together. I am saying the collaboration was limited. Of course we were preparing annual plan together and most of the ideas that go into that plan come from few individuals. That is how we were preparing our annual plan. Lesson study is a process where many teachers participate in planning, teaching, observing a lesson that is being conducted in one classroom. It is process where we evaluate students than teachers. I would say we have benefited a lot from lesson study. Had lesson study being introduced in Eritrea, as SAT1 indicated, we would not see a weak student because, this type of teaching is entertaining for the students. It allows students to participate. I would say that we have benefited a lot.

SAT3-H3: 00:40:17: The question is about change. I would say that there is change. But there are obstacles. I guess you have question on challenges later on. Sorry for answering it here. One of the big obstacles was the extensiveness of the lessons. Had the lessons been narrower, the change would have been very successful. Truly speaking we were just rushing to cover the syllabus. There were also many holidays in between. Lesson study does not like rushing. Lesson study requires to patiently sit down together to collaborate. It requires planning in collaboration, preparing necessary teaching aids and using real objects instead of picture in order to achieve the objective of the lessons. Lesson study requires patience in order to deepen the lesson and in order for the students to comprehend the concept. I would say we have improved our teaching even me. The only obstacle was that the lessons were wide and we were rushing to complete the lesson. Otherwise I would say we have demonstrated some changes.

SAT6-H3: 00:41:48: Now the question is about change. Whether or not we have made required changes, change can come even if we get new idea through reading books or material which will change our thinking and views. After participating in lesson study we have made changes. The first thing I would say was that we have developed interest in lesson study. This is what I would take it as a big change. During teaching we were observing how the students were progressing and identifying the average, active and weak students. As one teacher teaches we were observing by standing at the back of the classroom and we were sensing some changes. If one is alone he cannot identify the students much. I do not mean that there were no problems. As SAT3 indicated in order to fulfil the demands of lesson study and our private work we were showing some rush. Apart from this rush we were respecting time especially during the end of the lesson study. Going through timetable and plan is also big change. Showing interest in the work is also another change. I would say we have made big changes. I would say in general it was good.

Researcher: 00:43:43: Ok. Of course you have mentioned the possible answers for this number seven question. I think there is no problem if you respond to it. Do you feel that you have benefited by participating in lesson study? If yes what kind of benefits have you received?

Researcher: 00:43:28: Now let us change the sequence the questions. Let others start to respond to the question.

SAT2-H3: 00:44:31: This has been time again explained earlier.

Researcher: 00:44:36: First do you feel that you have benefited?

SAT2-H3: 00:44:37: Yes I have been benefited, very much.

Researcher: 00:44:40: Next, what have you benefited?

SAT2-H3: 00:44:41: The first benefit that we have obtained by participating in lesson study is working with colleagues. I have understood the benefit of working together. Secondly, I have understood the advantage of lesson study in evaluating students. It helped me to understand how to evaluate my students. Finally, I have changed my focus from what to teach to what the students should learn. Therefore, I have benefited a lot. We have already discussed it. I did not get much to add. The answer is yes.

SAT3-H3: 00:45:43: The answer of teacher SAT2 is yes, my answer is also yes. Yes, we have benefited from participating in lesson study. I have benefited regarding content knowledge. If we say that the students have obtained deep knowledge, it means that it is because the teacher has developed more knowledge. In order to satisfy the students we have consulted several books. We collaborated and shared ideas with our colleagues. This means we have gathered more knowledge regarding the subject which is going to be reflected to the students. Therefore, content wise it means we have developed deep knowledge, which is a result of detailed preparation. Another is working and sharing ideas with colleagues. This we were mentioning it before. After participating in

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lesson study, we have high collaboration among ourselves. We constantly share ideas with one another. Another is lesson-planning skill. Before participating in lesson study, we were preparing very short lesson plan without long-term goal. Now, I am able to prepare lesson plan that addresses the need of the three categories of students namely the outstanding, average and weak student. Regarding classroom management, some students sleep while we are teaching. We would say poor he is tired and then neglect him. However, lesson study does not permit that. There are some students at the back seats who do not attend or some students writing something else during the lesson. We must observe them while teaching them. Even though I was doing these earlier, I am doing them more effectively now after participating in lesson study. Regarding observing and being observed, at this time, I have developed confidence. Earlier when a teacher or a supervisor observes my lesson, I was losing confidence. Now I feel nothing. I am open to anybody to observe my lesson, because I have taught several research lessons.

SAT6-H3: 00:48:12: My answer to this question is positive. Yes is the answer. If you ask me why I said yes. Now, after participating in lesson study, even though the content of the lesson which we taught is similar to the earlier content, during lesson study we taught them by giving short content followed by activity. This means all the students were engaged one way or another in the activities. This is one advantage. All students participated in the lesson, even the ones who lacked experience got opportunity to learn from their colleagues. After providing the opportunity of learning for everybody, every one learns based on interest his/her interest. For example, when food is prepared the way people take food is different. Some take more food quickly and others take it slowly. In classroom, the active students get more benefit. The weak students may start to follow the footsteps of the active students and develop interest. Another way which we used to involve students is by providing them an activity based on pictures. The students could best learn by studying the activity. It does not mean that we were not doing such activities. It does not mean that we have not learned such types of teaching methods before participating in lesson study. But, we were not implementing them similar to what we done during practicing of lesson study, because of several reasons. First, we have big number of students. Secondly, there are several pressing conditions such as economy, situations at home and lack of incentives that did not allow us to implement what we have learned. In lesson study many instructions and information are given about what to do. We evaluate the students and ourselves. Therefore, I would say it was practiced successfully. Everything went well. After participating in lesson study there was some changes.

SAT1-H3: 00:50:20: Yes. I will give short answer. You are asking us what we have benefited. Number one, since lesson study is presented to the students in the presence of colleagues who are in par with me, better than me or in the presence of the ones who would benefit from me, it made me to do necessary preparation. In our usual lessons we do not make such detailed preparations, we just walk into the classroom and ask the student the point where we have stopped previous time and continue from that. Therefore, at this time I did not come to the classroom freely without preparation. I made necessary preparations. Lesson study made me to make necessary preparations. Secondly, I obtained feedback from my colleagues. Thirdly, I was able to control my shyness. Since observation in lesson study is not aimed at evaluating a teacher, this enabled me to feel free and conquered my shyness. Therefore, I obtained three benefits. It made me prepare, obtained feedback from colleagues and be able to present the lesson in front of my colleagues without of fear. Three points.

Researcher: 00:52:00: Ok. The next question is about challenges. What kind of challenges have you encountered, if any, by participating in lesson study? What are some ideas of overcoming them?

SAT2-H3: 00:52:36: Earlier SAT3 has indicated the challenges. According to me the main challenge is an issue related to syllabus. If we see now our progress in grade, we are still in first unit. We spent a lot of time in one unit, many weeks. With such pressure of completing the syllabus, one would focus on covering the syllabus than thinking about how students are learning. One cannot get time to think about student learning. One thing that does not go with lesson study is the extensiveness of the syllabus. Lesson study would have been possible with medium sized syllabus. This is one of the challenges. The second challenge is number of students in classroom. Another challenge is the narrowness of classrooms and the nature of the desks. The desks do not encourage lesson study. The classrooms are narrow. The students are many. The desks are not suitable for doing group work. There is no place in the classrooms for displaying materials. To summarize it the extensiveness of the syllabus, large student number, unsuitable desks and narrow classrooms. Some rooms are dark. These are some of the challenges.

SAT3-H3: 00:54:50: Yes, I explained the challenges earlier. Even we described the challenges during last year's interview. The challenges are the same. As teacher SAT2 indicated the first challenge is the extensiveness of the syllabus. This year we are lagging behind when compared to the annual plan. In such situations, instead of using real objects and demonstrate to the students we will be obliged to explain theoretically rush to the next topics,

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because the semester examination is approaching. To use lesson study the syllabus should be medium sized. The second challenge is class size and arrangement of desks in the classroom. The number of students should be manageable and the desks should allow us to do activity-based tasks. We should be able to move them to a rounded shape with the teacher at the centre so that all students could observe the demonstration done by the teacher or students. Lesson study is very problematic with such type of classrooms and number of students. The third challenge is time. Lesson study requires a lot of time. Because of all the social and economic problems they have, teachers want to fulfil their daily necessities. Lesson study takes time; it consumed our private time that we would have used to fulfil our social and economic requirements. To work in lesson study one has to get ample time and should be free from situations that drag the teacher. If time were available, I would say it is a very good way of working.

SAT6-H3: 00:56:40: Yes. Regarding challenges, it is difficult to use lesson study given our tough daily regular working situations. Moreover, nowadays students are not interested in learning. They come to school, mainly, to get ID cards than gain knowledge and skills. This is one challenge. The biggest challenge that we faced is lack of interest of the students to learn. Advising them and encouraging them does not work. This is what we are observing every day. Generally, the students are not in a good situation. The second challenge is the extensiveness of the syllabus. The third challenge is that the desks inside the classroom are not comfortable. The fourth challenge is time. In order for lesson study to be effective, a teacher must have ample time. At this time, for example, we are worried about which period we are going to miss and which period we are going to catch. This is another challenge. Colleagues have indicated the extensiveness of the syllabus. The class size is big. Students' lack of interest is also another problem as indicated earlier. Most importantly this is something done with an empty stomach. If a teacher is satisfied with his basic needs and profession, he could demolish a mountain overnight. He would invent new things overnight. He would invent new things overnight. At this time, the earnings that the teachers make and the market prices do not match. I know there is nothing that you could do about it, but I am informing you just to give you an indication about how much this has affected the teaching learning process. There are also other challenges that we could speak about, to make it short these are some of the challenges.

SAT1-H3: 00:58:48: Ok. I will go to the challenges directly that affects lesson study from what we have experienced. Otherwise the challenges that teachers are confronted with are numerous. The first is unsuitable classrooms both in teaching and staff. The room which we are using now (for this interview) is somebody's office which we asked for to use it for this purpose. Lack of classrooms everywhere, both for teaching and for conducting debriefing. This is one challenge. The classroom was not suitable for the students in short. In general classroom is one challenge. The second is lesson study does not go with the present situation especially with reference to time. At this time we are lagging behind. For example we have mock examination tomorrow, I am informing you informally and we (the lesson study group) have not started unit three yet. Others have almost completed unit three. By understanding its benefits we have concentrated on lesson study and we are teaching by making sure that the students understand the concept, but we are lagging behind our colleagues and even in relation to our Nieus-zoba (sub-region administration). The student number is improving when compared to earlier number of students in class. The number of students dropped from 70 to 50 and now to 40. It is decreasing. The problem now is with finding suitable classroom. There was problem of finding teaching aids but we solved it ourselves accordingly. We did not wait for the administration to solve it. Some of us brought rope and others were bringing other required materials. It was not big issue and we were solving it. We were able to solve the requirement of the teaching aids.

Researcher: 01:00:39: Did your students respond to the lesson the way you anticipated?

SAT1-H3: 01:00:48: I have written the response of the students in the formats. One of SAT2 student's gave me unexpected response. I love such type of responses. When I asked them, which team won the tug war, the expected answer was team A won the game or team B won the game. That was the expected answer of both the teachers and students. One of the students observed that the rope was in the east west direction. I admire this student for saying to the west. This student gave me an answer, which I did not expect. These types of students are students with potential that require attention. I do not know him, but I admired his answer because he gave me a unique answer. This is one example which I can give.

SAT2-H3: 01:01:58: Yes it is possible to find some students which give unexpected responses. In a lesson presented by SAT1, two students who were designated with different units of force were requested to demonstrate a push and a pull. A big student assigned with low unit of force was being pulled by a small student assigned with a larger unit of force. The other student (big) was deliberately releasing the table and has been pulled by the smaller student. This is unexpected response observed from the students. When you instruct them to do

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something some of the students applied the force in a way we did not expect. This is new topic for the students. This is my special observation. There are also many more.

SAT3-H3: 01:02:47: I do not have much to say about special situation that encountered to me. But in grade seven while teaching about levers, it was during the re-teaching session, I was worries about how to demonstrate seesaw. Suddenly we found a piece of wood which was in one side of the classroom and the students shouted "Teacher! Why do not you use the bucket?" I called two students to demonstrate it and it worked perfectly. I was thinking that seesaw could only be a big bar of wood made in a factory for that purpose. Since the students play on such things they knew it better and recommended me to use the piece of wood and a bucket. This is one incidence which I remember. Laughter.

SAT6-H3: 01:03:43: Sometimes one may find unexpected responses from the students. Sometimes they contribute and explain ideas based on their understanding. When you find such character from the students you appreciate them. We appreciate them when they explain things in their own words within the limit of the subject matter. One would expect these students to look at one another and sit dormant; however that was not the case. When asked for example they provided responses such as to the west or to the south by remembering the four directions that they have learned in grade five or four. Remembering this was great.

Researcher: 01:04:42: Did your students benefited from lesson study cycles? What kind of advantages do you think your students have profited?

SAT1-H3: 01:05:11: Yes they have benefited. They were freely discussing in the group discussions and they were free to ask their doubts to their colleague students than their teacher. They were sharing ideas i.e. as one asks questions the other was explaining to him. They were cooperating i.e. as one writes others were providing ideas. Therefore, I would say that they have benefited. During report writing, we told them to discuss in Tigrigna, they were trying to explain. Therefore, first they have controlled their shyness. Secondly they were free to ask and discuss with their colleagues. Another benefit is that some of the students, if not all of them, have understood that learning is not only through reading and memorizing but through sharing ideas and doing something practically using hands-on. I would say that they have benefited. We did not expect them to do things practically the way they have done it. As he explained it earlier one would expect the big student, which was designated less unit of force, to pull the small student designated with more unit of force. When we taught them that the net force is towards the larger force, the big student understood and was releasing the table. Therefore, I could say that they have benefited, if not all of them.

SAT3-H3: 01:07:02: He could have pulled him.

SAT1-H3: 01:07:03: Yes he could have pulled him to a longer distance. Laughter.

SAT2-H3: 01:07:13: I would say that they have benefited, especially in participation. Every student was busy working. During the discussion, every student was participating. They were participating with a belief that they should also participate and contribute. In earlier lessons, only the outstanding students were answering while the weak students diverting their attention to something else. At this time when we used group discussion, they were obliged to participate in the discussion. We were also encouraging them to present their discussions. The weak students were also showing tendency of volunteering for presentation. I would say the students have benefited. It is also beneficial for the teacher. It is beneficial for all. If we were able to introduce lesson study, leaving the challenges aside, it would have been beneficial in all respects. I would say the students have benefited a lot

SAT3-H3: 01:08:50: Ok. Earlier there was a question that asked about whether or not a teacher benefited from lesson study. It that correct?

Researcher: 01:08:57: Yes.

SAT3-H3: 01:08:58: I feel that if a teacher is benefited, the benefits of the teacher are for the students. Last time in grade eight, while teaching about genes, I informed them about lesson study, when we taught the research lesson, the next day they asked me about whether I am happy about the lesson. In return I asked them whether or not they are happy. Now what I wanted to stress to is, the participation that teacher SAT2 described. They have made more participation. We do not see such participation during the usual times. They do not participate even if they know it. I think the group of observers and the cameras stimulated them to participate more. Moreover, we were using more teaching aids in lesson study than the normal lessons. Since they are getting deep knowledge, I would say the students have benefited.

SAT6-H3: 01:10:09: Yes it has benefits. Had we taught them three or four more research lessons, they would have benefited more. Influenced by those who presented the reports they were eager to present and answer questions. The activity accompanied with pictures and description was interesting for them. It has benefits but time was short, because in one section there were only teaching and re-teaching. We were also able to assess and

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judge which methods motivate the students and which do not. I would say the students have benefited but it was short.

Researcher: 01:11:06: Was the administration and school community helpful in supporting you through the lesson study process? Does the school community encourage your experimenting with lesson study? Describe the type of support which was available.

SAT3-H3: 01:11:38: Since we are running short of time, I would answer in short. Yes they have supported us very much. If we see the school administration, it is as usual similar to what we said last year. They were allowing us to exchange periods freely. They were ready to give us teaching aids but we did not ask them. Regarding encouragement, they were providing us necessary moral support in the process. Last year, the school community was not much aware about lesson study. Those who were aware, when they see the researcher, they ask us questions such as: When is the research going to end? Have you not finished? They then put an offer about what type of support we would like to have? The other teachers also recognized the researcher and they were cooperating with us.

SAT6-H3: 00:12:38: There was support from the school community and administration. They were permitting us to exchange periods. They were voluntary to engage our classes or leave their classes for us to us it. Their support was great. They provided us materials for which we asked.

SAT1-H3: 01:13:13: Everything has been mentioned. Nothing has been left. The school was supportive. Mr SAPH was even more efficient in providing support to lesson study than to the normal teaching. He was providing us what he has. They were cooperative. They were providing us what they have, of course, when we informed them. Even it has efficiency. As explained by my colleagues, other teachers were supporting as in exchanging periods. When we invited them they were coming to observe the research lesson. However, we did not invite many. Truly speaking, the school community was cooperative.

SAT2-H3: 01:14:18: The school administration was fully cooperating with us. They were supporting us, for example, in choosing appropriate classrooms. They were providing us their offices to conduct the debriefing sessions and interviews. We did not ask them teaching materials otherwise they could have provided us.

Researcher: 01:14:57: Teacher SAT1 mentioned it about inviting teachers. As you said, this year they observed only once and last year they observed twice. I also invited SAT5 and SAT7 to come to observe, but they did not come. Have you tried to invite them?

SAT3-H3: 01:15:28: This year the teacher who was a member of this group did not come let alone others who are not members. The reason why they couldn't come is because of their heavy teaching load. They have to work outside this school in addition to their regular job. I also tried to invite some, but it was not suitable for them. Another reason why they were not able to come is they had classes. We were supposed to tell them the time in advance so that they could make necessary arrangements.

SAT2-H3: 01:16:16: Would you like to have tea?

SAT6-H3: 01:16:18: Yes.

SAT3-H3: 01:16:19: This year we tried to invite some, but they could not come because it was not suitable for them.

SAT1-H3: 01:16:48: Truly speaking it is difficult to find them. Everyone rushes to his/her own work. We are able to meet now because our timetable is the same i.e. we are free at this time and have classes after the break. Had the condition been like last year where everything are mixed we wouldn't be able to get common time for meeting. They respond positively but they do not come. You cannot find them. When we start coming together, the teacher is already gone.

Researcher: 01:15:32: Ok. We will proceed to the next question. Do you see any impact of lesson study on other teachers? The same question has been asked last year.

SAT2-H3: 01:17:51: Yes it has impacted on teachers. Many teachers wanted it to participate in it.

SAT3-H3: 01:18:22: Of course using lesson study needs preparation and it takes time. In a form of joke, some teachers say you are going to bring into our schools some demanding ways of doing things. We are doing our job comfortably using shortcuts. However their message is that they are appreciating lesson study as it benefits the students and teachers. They wish to see all teachers be able to participate in this type of programme. Therefore, I would say it has impact on the teachers.

SAT6-H3: 01:19:19: Yes. Does it mean that the teachers feeling jealous about it?

Researcher: 01:19:22: Yes.

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SAT6-H3: 01:19:23: Yes, because lesson study benefits the teacher. To participate in lesson study we read books, make detailed preparation and make us to use time efficiently. We obtained knowledge, be able to share knowledge with colleagues and developed presentation skills.
SAT1-H3: 01:19:57: The question is whether or not lesson study impacted on other teachers?
Researcher: 01:19:58: Yes.
SAT1-H3: 01:19:59: I would say yes it has impacted. But I do not think that they are interested in lesson study but they are interested in the presumed monetary benefits. They make some jokes on us. They insist for example that we are more interested in lesson study than in the normal teaching. Others also say that they were teaching biology or science and would qualify to participate. I did not find anyone who told me that they liked the teaching. They always joke that we are more interested in lesson study than the normal teaching. Even from the administrative office they say so. I would say it has impact on teachers. They think that we are getting some benefits. They think that we are so interested in it because we are receiving some advantages from it. Therefore, it has influenced them.
Researcher: 01:21:05: Now we will go to the knowledgeable other. One person was supposed to be here with us who supports you in the process. But that was not possible. Therefore, I took the role of knowledgeable other. I participated in organizing the workshop, typing the lesson plans, helping in preparing charts and others. Then how do you see the support of knowledgeable others?
SAT3-H3: 01:21:57: I wanted to say that as well. You said knowledgeable other is required. Am I correct?
Researcher: 01:22:02: Yes, it is required.
SAT3-H3: 01:22:03: I would say it is your support helped us to make this achievement. During the start of this study when the work became too much for me I was intending to withdraw from the research because according to the agreement we are allowed to withdraw at any time. But your support and motivation made me stay in the research. You gave us a lot of support such as hand-outs which is useful for us in the future. I would say that there was a lot of support. Laughter.
SAT6-H3: 01:22:50: We were supposed to thank you even a little bit earlier. I assume that this work is for you, but we have also benefited from it. You did not waste our time. You have done what you were supposed to do. You have supported us in typing, drawing, giving ideas and editing. I would like to appreciate you for that because it helped us in our teaching.
SAT1-H3: 01:23:34: Yes, this knowledgeable other is important. I would say knowledgeable other was present. You were very busy. You were doing the work that we gave you from both grade seven and grade eight. I would say you have produced a lot. Moreover, the Research assistant also contributed in the seminar. I would say we have obtained necessary support from knowledgeable other. You helped us in drawing and lesson planning. You helped us in editing. I would say we have obtained necessary support from you and the research assistant.
SAT2-H3: 01:24:20: Ali, all this has been facilitated by you. You might think that the benefits are for you, but I would say the work is also our work. You were responsible for it but we were also supposed to do our share. You are doing this research to benefit the country and the people therefore we were also supposed to do our share. I would say that it was useful. I wish to see the implementation of this in Eritrea. Truly this is history.
Researcher: 01:25:16: Now it is regarding you plan. Now this study has been completed. Do you have any plan of continuing lesson study? Conducting two or three research lessons in a semester using the lesson study method?
SAT2-H3: 01:25:42: If there is one person who coordinates this lesson study in this school, I am ready to practice it. We would make effort to pass it to other subject teachers and school community members. This is more or less my idea.
SAT3-H3: 01:26:16: I would if conditions are suitable and if a person is assigned to coordinate the process, as indicated by teacher SAT2 I would like to participate. We have indicated that it benefited the students and teachers. We would like this benefit to continue. Therefore, I would like if we promise to continue in the second semester on our own. I would say we will do it for sure.
SAT6-H3: 00:27:14: My ideas is, I do not see anyone who does not like this. As indicated by SAT2 I wish all subject teachers to participate in it. But the duration should be extended and the teachers who are participating in it should be made free. This lesson study is being conducted in three schools mainly School 'A', School 'B' and School 'C'. I would suggest the involvement of additional schools and teachers so that we could help our children. If a person dedicated for this job is to provide support in materials, knowledge and skills I would like to participate in it.

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SAT1-H3: 01:28:33: Yes we have the wish to continue it but since it involves the approval of others I do not think we will be able to do it. Based on our desire we would have started right now, but it requires the cooperation of the administration and the Ministry of Education. Secondly it is difficult to organise and bring these people together once this study stops. Therefore, it will not work in reality.
SAT2-H3: 01:29:13: If it is supported by the school, this could have been implemented in this school by acquainting other teachers in the form of workshop. During workshop this lesson study could be important.
Researcher: 01:29:42: In another school, they have informed me that their school requested them to do peer-observation. They have never done it before. This lesson study helped them to implement peer observation. Does your school ask you to do peer observation?
SAT2-H3: 01:30:22: No.
Researcher: 01:29:23: But they told me that the school instructed them to do it. They told me that it appeared to them difficult until they start practicing lesson study. Lesson study provided them with opportunity to do peer teaching.
Researcher: 01:30:48: Now do you recommend lesson study to other middle schools?
SAT3-H3: 01:30:16: We said that lesson study is beneficial. It benefits the students and teachers. Therefore, I would recommend lesson study to all schools in the country. This is strategy copied from Japan and we have seen its benefits in our school. Therefore, I would recommend it to all schools.
SAT6-H3: 01:31:49: I support it to be used in other schools provided a person is assigned who would coordinate it like what you are doing. Secondly time is a factor. Those who participate in lesson should be trained in lesson study and be relieved from load. I recommend this lesson study to be introduced in other schools. However lesson study looks for time and situation. There must be a responsible person who supports the teachers but not a one who brings the innovation and then disappears.
SAT1-H3: 01:32:50: Yes I would recommend lesson study to other schools because of its importance.
Researcher: 01:33:04: Teacher SAT2, do you recommend lesson study to other schools?
SAT2-H3: 01:33:13: I think there is no problem if we repeat ideas. Yes I recommend lesson study to other schools. This is because I support everyone to benefit from something good. You do not recommend something bad to others. Since this is a good strategy that supports student development I would recommend to all schools in Eritrea.
Researcher: 01:33:52: If you have any other comment?
SAT6-H3: 01:34:02: I want to suggest that this method is good. However the following conditions should be fulfilled. Sufficient time should be given. Those participating in lesson study should be free from load. The participants should be given training workshop for about one month. A person dedicated to support lesson study should be assigned The participants should be motivated. Number of students in a class should be minimized.
SAT1-H3: 00:37:03: Yes, it is understood that everybody would support this. However, lesson study takes time. We are doing this purposely for the research, but in reality it does not work. For example I have class at this time. Therefore, since it kills time if it is not imposed from the government it is not possible to implement. If it is not for this interview, you wouldn't have found at this time here. I would have already gone. Taking into consideration the lack of interest of the teachers, the economic problem we find the teachers in, it is difficult to implement lesson study at this time. Many teachers have not accepted teaching as their profession. Every teacher thinks about how to kill the time and go. Lesson study needs time. One has to work in groups to plan, teach and discuss about the lesson. All this I do not know may be possible after several years. I principle I support it because it is implemented in rich countries. In these countries teachers join teaching based on their will and since they are rich they have resources. In our case the obstacles are more than the opportunities. May be I do not know I would suggest after some years when thing are normalized.
SAT2-H3: 00:44:33: I want to give good comment. At this time the government instead of requesting us to do a bulk of assessments it should introduce lesson study, the students could have benefited a lot. The Ministry should change its extensive syllabus, not appropriately implemented, to medium sized syllabus that the students could master. Moreover, a strategy that allows all students to participate is lesson study. If we are able to implement lesson study in this country it would have been very beneficial. Therefore, leave some message to the authorities.
Researcher: 01:39:55: Therefore, I thank you very much. I have taken much of your time. It took us one hour and forty minutes. Thank you very much.

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Appendix I:
Observation form for the researcher

Date & time: ……..……..

School: ……..……

Grade observed: ……..……

Participants observed: ……

Situation/ context	Actions observed	Reflections

Source: Adapted from Nieuwenhuis (2007b)

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Appendix J:
Interview schedule for school directors and pedagogic heads on school support

Dear director and pedagogic head,

During February to December 2013, lesson study was carried out with science teachers of your school. This program had been supported from you and other members of the school. The intent of this interview is to gain insights into your opinion on and support to the program. Your feedback is very valuable.

1. What is your general impression of lesson study?
2. Are the school community members aware about the middle school teachers experimenting with lesson study, a professional development strategy?
3. Did you take any measures to encourage and support the teachers to implement lesson study? If yes, please specify them.
4. Did the school community provide necessary resources and facilities for the participating teachers? On timely manner? What type of support?
5. How do you think the roles of organizational support provided by you and the school administration play in the lesson study program carried out by the teachers?
6. Did you manage to find time to talk to or observe the classroom teaching of the participating teachers? Did you exchange ideas with them?
7. Were teachers recognized and honoured for their participation in lesson study?
8. Did you share ideas of lesson study and results of the implementation with your school teachers and other schools?
9. Did the school provide the participating teachers enough time for participating in lesson study?
10. What evidence can you provide that the teachers are learning?
11. What evidence can you provide that the teachers are helping more students achieve at higher level?
12. What opportunities are available for the teachers to continue and what challenges are present?
13. Have you noticed any changes in the quality of science teaching due to the introduction of lesson study? Please explain.
14. Have you noticed any improvements in the learning of students? Please explain.
15. Are there any other comments that you would like to add?

Thank you very much for accepting my interview!

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Appendix J1:

School 'A'_ Director and pedagogic head interview

Date interview taken 17 Dec 2013
Interviewed and translated by Ali Suleman

Researcher: 00:00:00): First of all I want to thank you very much for accepting this interview. This interview is going to be recorded. Language there is not problem we will use Tigrigna, later I will translate into English.
Researcher: 00:00:29): The following questions are prepared for the interview. From the questions the first question is about your general impression about lesson study.
SAPH- J1: (00:00:56): My understanding about lesson study in fact deepened after I approached you. My knowledge about lesson study increased after attending the workshop which is aimed for the development of science teachers in 2013 and later also your continuous visit to our school acquainted me with lesson study. I am confident that in the near future we will reach the stages at which the advanced countries such as Japan and America are currently present.
SAD- J1: (00:01:57): At this time, the participation of teachers in lesson study has created unity among them. We have equally benefited from lesson study, because it made the teachers to organize into a group. Secondly, they did not take them time to know one another and work together. Earlier, they were almost working individually. Working in groups helped them to share ideas. Moreover, the lesson study was productive. The students who participated in this study were normal students. We did not provide orientations to the students. The students adjusted to the changes very fast. We can learn from this that lesson study is an effective strategy. Therefore, lesson study was useful in that it strengthened the unity among the teachers. It was productive. If we are able to use it in the future we have seen that it is productive. The justification is that the teachers who participated in the lesson study had gained different skills and experience. When they work together they share experience. Especially the younger teachers, which are the next generation of teachers, benefit from the experienced teachers. It did not take much time for the young teachers to learn it. They were not much different from the experienced teachers. The young teachers were too inquisitive and eager to learn. We are happy that they accepted it properly.
Researcher: 00:03:27): Were members of the school community aware about the teachers experimenting with lesson study?
SAD- J1: (00:03:51): Of course, their awareness or knowledge is not exactly the same as the ones participating in it, but they are informally aware about it. Moreover, some of them observed the lessons. Others watch them while the lesson study group are preparing for the lesson study in the staff room. The majority of the teachers about 75% know about what is going in the school regarding lesson study. It seems to me that other subject teachers have learned from the science teachers that doing similar thing is possible. After participating in lesson study, science teachers have become more coherent. Others departments are ready to follow the footsteps of science. Majority of the teachers are aware that lesson study supports sharing of experience among teachers. Even though they have not practically worked on it, they know it. When lesson study is introduced, it will not be new for them. They know what it is.
SAPH- J1: (00:04:47): What I want to add to what already said is that the school community, that is, the teachers and the administrative staff all know what the science teachers are doing. They knew it as a strategy that is important for the development of students. Plus the representatives of the Parent Teacher Association (PTA) also know about what is going in the school. They are aware that it is beneficial for the students. So far the representatives of the parent community know it. Teachers in this school are aware about what is going on in this school.
Researcher: 00:05:53): When these teachers request for support do you provide them necessary support? What type of support do you provide them? I know that without your support I could not enter from the gate. For example while we were preparing chart teacher SAPH you provided us with wood, nail and glue. Moreover, both of you helped us in selection of suitable classrooms. What other support did you provide these teachers? From your mouth.

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SAPH- J1: (00:06:40): We provide to the science teachers based on their request from the resources available in our store. Moreover, the chairman of the PTA Mr. XXX provided the science teachers with materials which he brought them from the research department of the Ministry of Agriculture. We also provide them with materials helpful for making teaching learning process more activity based. Meaning that we have provided them materials related to teaching and learning for which they have requested. We were fully cooperating with them. The PTA going to the extent of bringing materials for science teachers is an indication of their awareness. I was able to understand that students were also aware of what is going on.
SAD- J1: (00:07:58): Yes. What I want to say is that first we made the teachers to participate in the study voluntarily. Those teachers chosen for the study were acquainted with the process so that they could make informed decision. Entry into the study was based on informed consent through their willingness. Secondly, we made arrangement of periods in a way it is convenient for the study. That in itself is one form of support. Meaning we changed the timetable so that the science teachers find common time for practicing lesson study. Thirdly, we provided them free telephone line so that they could communicate with you without any problem. This issue was accepted among the administrative staff so that they could get the services without problem. Right from the start, we allowed responsible teachers to participate in the study voluntarily. In addition to their requests such as communication with you and changing timetable, the school administration and other staff members were cooperating with them. The teachers were cooperating with them because they themselves were cooperative. There was no problem. We were providing them stationery materials such as A-4 size paper, chart etc free. When they inform us that they have spent some money to buy resources, we paid them back that money. The expenses were from us.
Researcher: 00:09:58): You already touched the support of school community. Did the school community provide necessary resources and facility for the participating teachers?
SAD- J1: (00:10:15): The record office and library were open for them to use. In addition we made the store open so that they can take necessary materials. These three offices were ready for cooperation. Moreover, the departments such as Social study and Mathematics were reminded to cooperate with them. Non-teaching staff such as record office, library and store were cooperating with them on regular basis. All staff members including administrative staff were providing necessary support based on request. I would say that they were providing this support because of their awareness about the program and because they accepted it.
SAPH- J1: (00:11:26): Are we answering number five?
Researcher: 00:11:27): No, we are in number four.
SAPH- J1: (00:11:35): My idea is similar to what teacher SAD said. We were providing them what we were able to provide. We were providing them everything. Teachers were cooperating with them to exchange timetable. The teachers knew that the benefit was for the school therefore, they were cooperating with them in exchanging periods.
SAD- J1: (00:12:04): This is what the other teachers were cooperating with. They were cooperating in exchanging periods with them so that it suits their lesson study program. We also made general changes in the timetable to that effect.
SAPH- J1: (00:12:16): It is like that. If you take library or the administrative part they support everything that benefits our students. We support such initiatives, which benefit students, because we wish them to be implemented when time is ripe for them in the future.
Researcher: 00:12:46): Now we will skip number five because it is already answered above. Therefore you will answer question number six. Did you find time to observe the research lessons?
SAPH- J1: (00:13:16): Truly speaking I did not enter into classroom for observation. However, we were indirectly meeting with one another. When they come to ask me materials we talk to one another. They have accepted it and they are working with sincerity. So far there is no problem. All the members of the group, as SAD indicated, are working voluntarily. The department head organizes them and leads them. Me and SAD support them when the lesson study is in progress. We provide them meeting places such as staff room, my office or SAD's office.

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Researcher: 00:14:22): The support that you teacher SAPH indicated about providing meeting space is good point. We forgot it. Regarding meeting space you were giving us places for which we asked. This is big support. The teachers have mentioned this support. Now when it comes from your side is good thing.
SAD- J1: (00:14:39): Did you conduct interview with them?
Researcher: 00:14:40): Yes.
SAD- J1: (00:14:41): If the teachers have a program they inform us the date and time of their program and we provide them our idea. Moreover, we assist in creating an environment for them to meet. I also observe class. I do not sit much in class. When I find them I exchange ideas with them and ask them about how it is going. They inform me the situation and about what they have done. They approach me openly and therefore we also discuss informally about it in addition to formal. They discuss with me what they have done. They tell me today's lesson was better than the earlier lesson. They tell me the teaching aid they have used. Therefore, our chatting was mostly about lesson study. The topic of discussion in this school was about lesson study. The topic of discussion of the staff members was about lesson study, to the extent that some of the staff members tease on them. The teachers tell them that the reason why they are speaking repeatedly about lesson study is because of that they are getting some benefits from it. Laughter. Therefore, that is the point of discussion.
Researcher: 00:15:42): The seventh question, were the teachers participating in lesson study recognized and honoured for their participation in the lesson study or were they told what they were doing was useless? In this school.
SAPH- J1: (00:16:11): If you do not misunderstand this, in addition to the science teachers the other subject teachers from Social Science and English were welcoming you when you come. This is mainly due to the way you approach them. They wanted the same thing in other subjects. What I mean is that they have information about and they see it with respect. Those participated were also honoured. There was no one who belittled them.
SAD- J1: (00:17:13): Your question is how the teachers recognize the teachers participating in lesson study. This depends on the nature of the teachers who are participating in the lesson study group. These teachers are dignified teachers. They are the ones who understand what they are doing and they are teachers who are able to explain to other teachers what they are doing. Since the teachers discuss about it informally, before you come, they are informed and they have positive attitude towards it. They have desire to observe and see about what is happening but their timetables do not fit. Therefore, there is no one who belittles them because the teachers are dignified teachers that do dignified job. Thus they give dignity to what they are doing.
Researcher: 00:18:00): Ok, now it the eighth question. Did you share ideas of lesson study and results of the implementation with your school teachers and other schools?
SAD- J1: (00:18:22): We have not informed to our staff members formally about the process of lesson study. As we have indicated it earlier, we discussed it in an informal way. We discuss and share ideas about it with the school director of School 'B', because we meet mostly. We discuss about how the process is going and the technical challenges such as electricity cut. With my school staff members it is as I told you. We informed to all science teachers including those not participating. Other subject teachers are informed through informal way.
SAPH- J1: (00:19:10): That is. I do not have much to add. Informally they know that lesson study taking place in School 'B' and School 'C' including our school. We also informed them informally about what is going on. We tell them that it is not only in our school. They ask about the schools where the research is going on and we inform them.
Researcher: 00:19:44): Did the school provide the participating teachers enough time for participating in lesson study?
SAD- J1: (00:19:56): Answering this question is very important. There in enough time for participating teachers because we have made adjustment in the timetable to that effect. There is a specific time reserved for the activities such as for teaching and observing the research lesson. There is no problem regarding time. The time is also not long. Most of the time it takes place in the period itself. If anyone is absent at anytime it is not due to lack of time, it is due to his/her problem. The timetable is well planned. Moreover, the dates are planned in advance. For example if they want to schedule a program on Thursday, the members are informed on Tuesday and vice versa. The organization of the program was not sudden. There is no problem regarding time.

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SAPH- J1: (00:20:58): We are answering number nine, isn't it?
Researcher: 00:20:59): Yes
SAPH- J1: (00:21:01): The program is planned in advance and they were aware about it therefore, there were no problem regarding organization.
Researcher: 00:21:16): This is a professional development strategy. Do you say that the teachers are developing? It you say yes what evidence can you provide? What are the indicators?
SAD- J1: (00:21:38): What I want to explain is that these teachers participated in the program voluntarily. How far they have accepted it can be seen from their preparation. While preparing for the research lesson they make thorough study, they discuss with one another to present the best lessons. The later research lessons became better than the earlier lessons. This is because they were making necessary preparation before presenting the lesson. Presentation of the lessons were not sudden but after thorough discussion. An indication that they are developing is that they all participate in the discussion. The discussions were not dominated by one. All four of them share their experience and they accept an idea that has majority support. Another indication is that after lesson study they are trying to guide us. Their input was also important for the school workshop. The reason why these people showed development after participating in lesson study is because they have love for their job, they are participating in this study voluntarily (without pressure) and their preparation. They also make necessary preparation at home in addition to the staff. If it is not suitable for them they exchange periods with their colleagues and they inform the same to office openly. Therefore, lesson study is helping the teachers to develop. They are more developed this year than last year. It is clearly evident that the second lesson was more developed than the first and the third was more developed than the second. Another indication of their development is that they spend time in planning. In ordinary lessons, they would use shortcuts. However, in lesson study they give more time to lesson planning. They also work at home. They also meet for their personal matters (networking has increased).
SAPH- J1: (00:23:39): Ok, You gave them written materials. As indicated by SAD they read, follow and see these materials. One can clearly see that there is development not only in students but also in the teachers. They are upgrading themselves. That is the way how science changes always. As a result the teachers are developing with the changes in technology. I understand that they are on the right track. That is how I understand it.
Researcher: 00:24:29): What about students? We have almost conducted six research lessons, three in each semester. Do you say that the students have benefited from lesson study? What evidence do you have?
SAD- J1: (00:24:57): The question is how we know that the students have benefited. During the first time there was newness for the students. The method used in lesson study is student-centred approach that gives more chances for the students to talk. This method supports the policy of the Ministry of Education. The method used has links to the student-centred way of teaching. First it gives students the opportunity to talk. Secondly, it was new to the students. When the students find new things, they accepted it with new spirit. Always students like new things. Since the new thing is starting with them, they became more curious and interested. They were eager to know what it is. They were coming to class on time. Moreover, they have shown some changes when compared to the beginning of lesson study. At the beginning, when they come to the classroom, they were confused and the teachers were instructing them about what to do. Now, there are no more instructions. They are confident and they know what is expected of them in advance. They also prepare themselves for the lesson. The lesson study lessons were taken in normal classrooms with normal students. There were no orientations given to the students prior to the lesson. But they were informed that they are going to participate in lesson study. Now, what I want to say is that the students are becoming more aware. Their development could be clearly seen throughout the duration. The students, if not all, from the sections in which lesson study was practiced were becoming better students.
SAPH- J1: (00:26:52): The idea is the same. Lesson study brought changes in the students. They became more responsible. If not all of them, majority of them developed curiosity to participate actively in the lesson. They developed eagerness. At first, it was new for them but later they get adapted to it. There were changes in the students. They started to follow the lessons seriously. They were free and there were no pressure, therefore, they were happy with the lessons.

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Researcher: 00:27:35): If lesson study is to continue in this school, what opportunities are available for the teachers and what challenges are present?
SAD- J1: (00:27:46): Now one of the opportunities is that the school has understood the initiative and therefore lesson study will not be new for the school. This has been practiced in the science department, transferring it to other departments will not take time. It will not be new for us as what happened during the start of this program. That is natural. When new things come, it creates anxiety and fear but now we can say that we have adapted it. Teachers from the science department who participated in this lesson study are not few. If it is successfully implemented in science, it is easy to transfer the skill into other three subjects. Since teachers are aware about it, they do not need much training. The challenge is related to the curriculum. Since the Ministry of Education has not included lesson study into its curriculum, we cannot practice it in our school. This is only a sample for your study. To implement it in our school we have to be guided by the curriculum of the Ministry of Education. We cannot introduce what has not been approved by the curriculum of the Ministry of Education. This is one challenge. The other challenge that hinder introduction of lesson study is time. Another challenge is the situation of the teachers. Teachers work outside the school during their free time. To speak logic there is no single teacher who sits here during his/her free time. This is because of the economic and social pressure. To earn their living, they usually teach children outside the school or do other jobs. A teacher does not think the free periods he has as free, because they are is already booked for doing other jobs. Practically speaking, teachers do not have free periods. Lesson study is an initiative that requires free periods and ample time. In order to observe a lesson in a form of group, the observers have to sit in another teacher's lesson during their free periods. At this time it is rare to find a teacher sitting in the school during his/her free periods. To implement this, one has to find voluntary teacher who sacrifice their time and secondly the curriculum (Ministry of Education) has to support it.
SAPH- J1: (00:29:58): I do not have ideas which are different from his ideas. If we are able to introduce lesson study on the subjects on which students have problem such as Maths and English would have mastered it. Even though science is a basic subject, there is major problem is language and Maths. Therefore, I support the introduction of lesson study in all the subjects. To introduce it, however, instruction should come from the curriculum department of Ministry of Education. To implement it in our school as teacher SAD indicated it earlier, teachers have to accept it positively. They have to be ready to sacrifice their time. Therefore, they have to make satisfactory earning. If so they will take teaching as their profession and will not roam from the right and to the left to solve their economic problems. Truly speaking if such situation is created, we would be able to see changes in this country. Therefore one big challenge is that the teachers are not satisfied. You are an intellectual and I guess you will be able to understand how we are working with these teachers. We are managing them by giving them promises like what we do with a child. Accordingly we are struggling given the existing situation in order not to disadvantage these children. Except the aged teachers who cannot run and move from right to left, the majority of the teachers do not take teaching as their profession. I could see this in my home. My children for example do not like teaching profession. There is no one who wants to go to teaching profession. Therefore, if the government takes initiative to motivate these teachers it would have been better. The teachers would have been devoted and taken teaching as their profession. I feel that if we were able to implement this lesson study we would have excelled our neighbour countries and we would have lined up with the developed countries. This is because lesson study is effective process that benefit students and that can change youth. I would say that lesson study could have produced results if the Department of General Education of the Ministry of Education works towards its implementation.
Researcher: 00:32:32): Have you noticed any changes in the quality of science teaching due to the introduction of lesson study? Please explain
SAPH- J1: (00:32:43): In fact, I was not able to go into classroom and observe lessons because I had to entertain customers who require service. However, when I observe the activities that are taking place from outside, I could sense that some changes are taking place. I feel that lesson study is a strategy that is able to bring changes. At this moment, it is difficult for me to make qualitative judgment based on this short experimentation. Nevertheless, I can see that the teachers are attracted towards it. The way you are treating them and organizing it might have affected it. First, the teachers are participating in it voluntarily without any

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pressure. Secondly, except SAT3 all others are experienced teachers who worked for many years. SAT3, as young teacher was assimilated with them. He was participating effectively with the experienced teachers. I do not think he has problems. I see this lesson study positively. I have only one doubt and that is teacher satisfaction. This initiative will be effective only if the teachers are satisfied.
Telephone call
SAD- J1: (00:34:29): After participating in this lesson study, the teachers started working together, meaning it increased their coherence. In short, it provided them with opportunity to discuss with one another. Lesson study helped them to know one another. This way of working in groups is also manifested in their normal teaching. They have started working collectively. In the staff room, these teachers talk to one another regarding teaching. It increased their coherence.
Researcher: 00:35:03): Have you noticed any improvements in the learning of students?
SAD- J1: (00:35:13): One change in students that I have observed is that the students started to talk and ask about it. While going is groups of three or four they discuss about it. If not in all students I would say there are changes in the behaviour of the students especially the sections where this lesson study took place. When students come out of their class they talk about it.
SAPH- J1: (00:35:41): I have similar idea. When the students are treated differently from their colleagues it is natural they should speak. They take this positively. I guess that they have confidence in their teachers because their teachers come to the classroom better equipped and organized.
Researcher: 00:36:11): Are there any other comments that you would like to add?
SAD- J1: (00:36:15): Yes. I want to comment on the factors that affected this study. First, you approached them by showing respect and understanding. Secondly, the teachers chosen are responsible especially SAT1, SAT3 and SAT5. These teachers made enormous contribution to the study because you approached them in a nice way. Moreover, your ability to organize the research lessons was based on mutual agreement. In addition, the stipends provided to cover for their transport costs, regardless of the amount and the tea and cookies, which were served during the workshops, motivated the teachers. Usually such types of incentives motivate teachers and should be encouraged. Moreover, I appreciate the approach that you have used from the beginning to the end of the research. I would say it was an effective research. Many people come to our school to do research but most of the time they are unorganized and the research subjects participate without their consent. In this research, voluntary participation was the first criteria. You were not accepting fake things meaning we were trying to give you fake things but you were rejecting it. We wanted to give a good teacher who was no more in science department to teach some of the lessons, but you rejected it. This made your research clean and free from reconstructions. That is my idea.
SAPH- J1: (00:37:49): I want to give comment on your personal character. I did not expect a person with such politeness. I worked for many years in Ethiopia. The Ethiopian culture is full of politeness. There is no such culture here. We are strong. Now to start from you, you used good approach and you were managing them in a good way. Amharic proverb says: from the food that you give to people, the way you treat them is more important. First you approached them with respect and that stimulated them to work. Secondly, as SAD indicated the incentives that you have provided. The Amharic people have good skills of speaking. One day we were in a taxi when one of the travellers get down on the way and went away without paying by thanking the driver. The taxi driver told him, “I cannot by salt with thank you’. Salt is expensive in their country. He was telling him that he should pay. Laughter. Now what I want to say is that the incentives have motivated them. The tea served during the workshops and the incentives that you provided them also encouraged them. As a joke we take the water bottles with us and showed them to Mr Zz and tell him this is what we got from the Researcher. Laughter. Therefore, the incentive together with your approach motivated them to work. We wish also a person similar to you to come when we deal with the other subjects. I feel that if we could introduce lesson study in such manner many developments would have come. I thank you very much.
Researcher: 00:40:00): Thank you very much.

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Appendix K:
Journal: Planning meeting

School: _____ Name: _____ Date: _____

1. What were the objectives of the meeting?

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2. Describe any discussion around: goal setting, content, instruction, and student learning.

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3. Were there any problems during the meeting? If so, how did you solve them?

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4. How did the team members participate?

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5. Have you noticed evidence of an increase in teacher collaboration or change in the way that the teachers work together? Please describe.

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6. Other notes:

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Adopted from Stepanek et al., 2007, page 80

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Appendix L:
Post-debriefing

School: _____ Name:_____ Date: _____

1. ትዕዝብትኻ (ገምጋምካ) ኣብ ተማሃሮ ዝተማህሮዎም ነገራት ዘርዝር። ብዝተኻእለ መጠን ተማሃሮ ዝተዛረቡዎ፣ ዝሰርሑዎን፣ ዝጻሓፉዎን ጌርካ ዘርዝር። Describe your observation of student learning. Include details of what students said, did, and wrote.

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2. ዘይተጸበኻዮ መልሲ ናይ ተማሃራይ ነይሩ'ዶ? ብኽብረትካ ግለጽ። Were there any unanticipated student responses? Please explain.

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3. ክሳብ ክንደይ ዕላማታት ናይ ምህሮ ተተግቢሮም ትብል? ብኽብረትካ ጭብጥታት ወይ ኣብነታት ኣስኒኻ ኣቕርብ። To what extent were the goals of the lesson achieved? Please provide supporting evidence.

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4. ነቲ ዕላማ ንምውጻዕ ዝሓገዙኻ ኣገባባት ኣየኖት ኢዮም? ብኽብረትካ ግለጽ። Which instructional decisions might have contributed to helping students meet these goals? Please explain.

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5. ዘይተተግበሩ ዕላማታት ኣየኖት ነይሮም? ብኽብረትካ ጭብጥታት (ኣብነታት) ኣስኒኻ ኣቕርብ። What aspects of the goals were not reached? Please provide supporting evidence.

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6. ስለዚ ኣየናይ መዳይ ናይቲ ውጥን ምህሮ እንደገና ክስራሓሉ ኣለዎ ትብል? Which aspects of the lesson plan should be reconsidered based on this evidence?

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Adopted from Stepanek et al 2007 page 100

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Appendix L

Summary of Post debriefing Sessions

School 'A'

1. Describe your observation of student learning. Include details of what students said, did and wrote.

SAT1-L1 - Learners behaved properly and followed the instructions given by their teacher. In the learning and teaching process, they tried their best to answer questions. They demonstrated themselves and wrote the expected results i.e. they corrected their mistakes.
SAT1-L4 - The things that students learned are a) they were able to explain fulcrum, load and effort and b) in addition to explaining fulcrum, load and effort they were able to locate position of each on the simple machine.

SAT1-L5 - The students were able to define fulcrum, effort and load and they were also able to locate each of them.
SAT1-L6 - These are my observations about grade eight: 1) Grade eight students were better than grade seven in terms of their discipline and their confidence, 2) Academically grade eight students were explaining in a better way than grade seven students and 3) Above all grade eight students were working collaboratively with discipline.
SAT1-L7 - This lesson taught on 13/11/2013 was a re-teaching session. The lesson was more improved than the previous lesson. I would say the participation of the students was high.
SAT1-L8 - During the first five minutes the lesson was introduced using oral questions. The students answered the questions appropriately. This was followed by an activity containing two parts A and B. The A section was work out questions were students were requested to find out the net force of forces 3N and 4N acting in the same direction, opposite direction and at right angle to one another. The B section was a practical activity were two groups of students contested in tug of war and others observed the contest. The students answered the question effectively in both section A and B.
SAT1-L9 - The students learned what force is and they also learned that net force could be calculated in three ways. 1) If two forces are acting in the same direction then we add the forces, 2) if they are acting in opposite direction we find the difference and 3) if they are acting at right angle to one another then we find the net force using Pythagoras theorem. 4) By working together they were sharing ideas and asking one another freely. Moreover, they have worked practically using a push and a pull on a door and a push and a pull on tug of war. Finally they worked their calculations on paper.
SAT2-L2 - Students discussed in groups. Good student present their findings. They carry activity 5.11 on page grade 8 sciences textbook and answered the questions under the activity.
SAT2-L4- This lesson was about lever and classes of lever. The students were asked and answered about load, effort and fulcrum. Three examples from three orders were given in the worksheet. After that they were grouped to work an activity based on a worksheet containing pictures. First the students discussed in group and worked the worksheet. Later on one person representing his/her group presented the finding of the discussion to the whole class.
SAT2-L5 - This lesson was a re-taught lesson. The lesson was about parts and classes of lever. When compared to the earlier lesson, in this lesson the number of pictures has been reduced to four i.e. one each from first class and second class and two from third class of levers. This has been corrected appropriately. Therefore the lesson was completed within specified time. The lesson was about classes of lever, the explanations of effort, load and fulcrum and classification of the levers into first, second and third order lever. The students worked both in writing and practically.
SAT3-L1 - The students who trying to participate in the class was very confident. They speak very fluent English. They have good understanding of the lesson. But they were few in number (four or five)

SAT3-L2 - The students were having good knowledge of the subject matter because they were actively participating in their groups. They have said that more ideas which are related to the content of the lesson.
SAT3-L3 - Students were trying to solve problems by cooperating with each other. But they were not confident to speak in English

SAT3-L6 - This lesson was about skeletal system and specifically about joints. They were talking about different types of joints such as ball and socket, hinge, gliding, fixed and pivot joints related to the content of the

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lesson

SAT3-L8 - Students were learning about 1) what force means and 2) They were also learning about how to combine different forces as a single force

SAT3-L9 - The students were learning about combining forces acting at different positions. They showed in front of the class. For example push - closing a door and a pull - opening a door. The teacher also grouped the class and two tug teams were in a tug war.

SAT4-L1 - Learners 1) understood the student-centred learning, 2) developed full confidence in sharing their ideas, student-centred interact, engaging in the discussion questions, 3) practiced themselves in the activity

SAT4-L3 - The students did not understand the lesson well. They didn't show student-centred learning, student-student interaction. The majority were listeners instead of engaging in the discussion questions and participating in the activity.

SAT5-L1 - Students collaborated with discussion with their peers. In one group only one student was giving all the information and making sure the other understood.

SAT5-L2 - The class atmosphere was good. Student interaction with the teacher was also well incorporated with the lesson. Natnael group was interacting with his peers by asking question so as other/most groups.

SAT5-L3 - The participation of the students was weak. The students were not talking or answering loudly. And participation of the students was not motivated. Language problem was also seen. As students were not understanding what they were supposed to do.

SAT6-L5 - The lesson was about the three classes of levers i.e. first order, second order and third order levers. Moreover, the three parts of lever i.e. fulcrum, load and effort was discussed. The students discussed the name of simple machines given using pictures and their uses in group and later they presented them to their colleagues and their teacher.

SAT6-L7 - This lesson was about joints in human skeletal system. The students were able to mention the names of different types of joints in our body, their location in our body and the type of movement they allow i.e. full movement, partial movement and no movement. Some of the students were not pronouncing the names of these joints appropriately while others were pronouncing them appropriately.

SAT6-L8 - The lesson was about combining forces. If the forces are acting in one direction the forces are added (F1 + F2 = Fn) and if they are in different direction then they are subtracted (F2 - F1 = Fn). If the forces are at right angle to one another the net force is found using Pythagoras theorem. That is Fn2 = F1 + F2 or C2 = a2 + b2. After this formula was given students were split into groups to solve the problems given to them. They were doing their best to solve the problems through discussion.

SAT6-L9 - The lesson was about force and motion and especially on combination of forces. It was grade eight lesson conducted on 26/11/2013. If the forces are acting in one direction the forces are added (F1 + F2 = Fn) and if they are in different direction then they are subtracted (F2 - F1 = Fn). If the forces are at right angle to one another the net force is found using Pythagoras theorem. That is Fn2 = F1 + F2 or C2 = a2 + b2. After this formula was given students were split into groups to solve the problems given to them. They were doing their best to solve the problems through discussion. Following these two teams A and B contested on tug of war outside the classroom. After observing the tug of war they were given an activity about who won the contest and they answered the activity.

2. Were there any unanticipated student responses? Please explain.

SAT1-L1 - No, because it was not new to them. The activities they did in groups. The answers of the demonstration were also given to them. All these helped student responses to be anticipated.

SAT1-L4- There were no unanticipated student responses.

SAT1-L5 - I would say that there were no unanticipated student response.

SAT1-L6 - Yes there was unanticipated students response. While reporting, when asked to show hinge joint in their body one student showed the hinge on a door that fastens a door to a wall. Therefore, it was a good relationship and linking.

SAT1-L7 - I would say that there were no unanticipated student response, but I would say the re-teaching lesson was better than the previous lesson.

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SAT1-L8 - Yes there were some unanticipated students responses. For example when they were asking the question that says: "To which direction does the rope move?" instead of mentioning the name of the groups the students were mentioning names of the students.

SAT1-L9 - Yes there was unanticipated response from one student who I appreciated him very much. During the tug of war contest team A and B were pulling one another. The students were asked to find the direction of the force during the tug of war. When all the students answered the direction of force was towards team "A" that student answered towards West. Team A was located on the East direction and the direction of force was towards West. Therefore, I found unexpected answer from the student and I very much appreciated him.

SAT2-L2 - Yes. One student explaining expansion as an increase in size of an object when it is heated. He further explained that the increase in size is because of the molecules of that object move far apart when it is heated.

SAT2-L4- Yes there were some responses. For example in the third class they were using broom and they were explaining left hand as fulcrum and right hand as effort, garbage or load.

SAT2-L5 - The lesson was up to my expectation. It was not beyond my expectation. This was because the lesson was a re-taught lesson and it was supported with real objects.

SAT3-L1 - The responses of the students were not that much unanticipated. They were normal responses, which were regarding the lesson. But I was surprised by the students in their English speaking skills

SAT3-L2 - There were no any unanticipated student responses. Their responses were normal and they were not related to the lesson

SAT3-L3 - Yes, there were unanticipated student responses. One student was saying that the railway in countries (like Russia) have gap between it in order to be expanded when it was heated

SAT3-L6 - There were no any unanticipated student responses. But I was surprised by one student whose name is Million, the way he was using to explain the different types of joint in fluent English

SAT3-L8 - Yes. For example when two forces are in opposite direction, the net force is Fn = F1 - F2. Let us say F1 = 4N, F2 = 3N but some students were doing like that Fn = F1 - F2 = Fn = 3N - 4N = -1N Which is totally wrong. A force cannot be measured in negative

SAT3-L9 - Yes. For example when two forces are in opposite direction, the net force is calculated using the formula Fn = F1 - F2. The students were describing the net force as negative. Example if F1 = 15 and F2 = 12N then Fn = 12N - 15N = -3N

SAT4-L1 - Yes, it is because of class size, shortage of materials prepared and time given to the activity

SAT4-L3 - Yes. It is because of the shortage of materials prepared, shortage of time and the classroom of dim (not comfortable).

SAT6-L5 - Yes. Especially some students were explaining boldly what they have learned without any hesitation.

SAT6-L7 - Yes. I didn't expect them to achieve in such a manner given the lesson was new lesson. Their answers were good. I didn't expect it.

SAT6-L8 - Yes. I didn't expect them to achieve in such a manner because as the teacher indicated us the topic was new for the students and they have not done before. The students were volunteering to answer the questions.

SAT6-L9 - From my observation the two grade 8 section i.e. 8-1 and 8-2 seemed slow. They couldn't finish the activity fastly. They were answering very slowly.

3. **To what extent were the goals of the lesson achieved? Please provide supporting evidence.**

SAT1-L1 - The demonstration and the group discussions were the goals of the lesson achieved. The experiment and the hot discussion made the lesson very effective.

SAT1-L4- What has been explained theoretically were practiced practically.

SAT1-L5 - The students used for example the wheelbarrow and some of the students sat on it as a load while others used their effort to lift them. Since they worked on it practically it helped them and they were able to explain it correctly

SAT1-L6 - The lesson was impressive lesson because it was student-centred approach and all the students actively participated in it. Therefore, all the objectives were achieved.

SAT1-L7 - Since the lesson was implemented as planned I would say the goals have been achieved.

SAT1-L8 - The objectives of the lesson were to enable the students define force and net force and calculate net force. The students understood these objectives because they answered appropriately the questions provided to them. This is evidence that the objectives have been achieved satisfactorily.

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SAT1-L9 - All the objectives have been achieved because the students were actively participating practically and theoretically and they were observed asking questions.
SAT2-L2 - The goal of the lesson was successfully achieved. Materials for the demonstration were available. The demonstration was successfully achieved.
SAT2-L4- I would say the lesson has been achieved successfully except time was a little bit extended. All the students have understood the lesson because all of them were participating and giving correct answer.
SAT2-L5 - The objective of the lesson has been successfully achieved. The weaknesses of the earlier lesson were corrected in this lesson. This is because examples of real objects from the three classes such as wheelbarrow, broom, sugar tong, sea-saw were demonstrated to the students.
SAT3-L1 - The lesson (goals of the lesson) was successfully achieved because the teachers were well prepared in all aspects. Which means materially and morally. But the lesson was somewhat becoming more than 40 minutes period.
SAT3-L2 - The goals of the lesson were successfully achieved because most of the students were participating well in the class, the teacher has prepared enough teaching materials and the students were having good understanding of the lesson.
SAT3-L3 - The goals of the lesson were almost successfully achieved, but only few students (the prize winners) were participating actively. So in this case the goal of the lesson was somewhat not successfully achieved.
SAT3-L6 - I would say that the objectives of the lesson have been successfully achieved because the students were actively participating, the teacher was using enough teaching materials and the lesson was related to the age and ability of the students.
SAT3-L8 - The objectives of the lesson were achieved because of the following reasons 1) the lesson was mainly student-centred approach, 2) sufficient materials were used and 3) the teachers prepared lesson plan collaboratively during the lesson study.
SAT3-L9 - I would say the lesson has been successfully achieved because the lesson was interesting and the students were following the lesson with curiosity. The goals of the lesson were successfully achieved.
SAT4-L1 - Most of the goals of the lesson were achieved i.e. most students described the effect of heat; most students define expansion and contraction, most students practically observed the activity.
SAT4-L3 - 70% of the goals of the lesson were not successfully achieved. It is due to the participants' misunderstanding. The lesson and the shortage of materials
SAT5-L1 - The goals of the lesson were achieved. As students were incorporated into the lesson. Also students' question (student Suzana) and the teacher summary of the lesson referred well to the understanding of the students' theories. Thus the lesson was consistent with the lesson goal which made the lesson to be achieved.
SAT5-L2 - Mostly it was dominated by outstanding student which made it difficult whether the lesson was truly achieved or not.
SAT5-L3 - Even though average students were participating, the lesson was not clear. Clarification about the lesson should have been given and all the work should not be left for students to handle as it is not convenient for both the student and the teacher.
SAT6-L5 - I would say three fourth of the lesson objectives have been achieved. This is because they described and practically shown the names, parts and uses of simple machines given in picture (worksheet).

SAT6-L7 - Almost 95% of the lesson has been achieved successfully because all what has been planned be implemented without any problem.
SAT6-L8 - I would say the goals of the lesson were achieved because the lesson has been completed within the specified time, the students have completed the activity within the time and they were doing the activity without much pressure on their face.
SAT6-L9 - I would say the goals of the lesson were achieved successfully. The teacher presented the lesson well. The lesson ended on time. But the students seemed to me weak. Otherwise everything was fine.

4. **Which instructional decisions might have contributed to helping students meet these goals? Please explain.**

SAT1-L1 - The circulation of the teachers when they were working together helped the students to meet their goals.
SAT1-L4- The instructional decisions that helped to meet the goal are the teaching materials used during the lesson.

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SAT1-L5 - The instructional decisions that helped to meet the goal are the teaching materials used during the lesson.
SAT1-L6 - The instructional decisions that helped to meet the goal were that the students were practically showing the joints in their body.
SAT1-L7 - I would say the lesson was positive because 1) the students were introduced with what joint is theoretically and 2) then they were allowed to explain and show each type of joint on their body one by one.

SAT1-L8 - The instructional decisions that helped to meet the goal were the activities that I have mentioned under number 3.
SAT2-L2 - The students working in groups and doing the demonstration themselves help students to meet the goals.
SAT2-L4- The instructional decisions that helped to meet the goal are the activities that were given in the form of diagram/pictures. The worksheet was asking the following question: What is the name of the diagram? Locate load, effort and fulcrum, what is the order of the simple machine. They explained these questions both in writing and practically.
SAT2-L5 - The instructional decisions that helped to meet the goal are the real objects indicated in number three above.
SAT3-L1 - The student-centred method may help the students very much. Teacher and students collaboration must be encouraged in all teaching centres because these kinds of teaching make the students to have good understanding of the lesson.
SAT3-L2 - In order to meet the goals this way of teaching must be given more than 40 minutes.

SAT3-L3 - We have to try (we teachers) to make students participate at least all of them. We have to encourage students to speak in English. So we have to contribute more in this instructional decision.
SAT3-L6 - The instructional decisions that helped to meet the goal are i) joint lesson planning, ii) using student-centred strategy and iii) using sufficient teaching aid materials and iv) the lesson itself was interesting.

SAT3-L8 - The objectives of the lesson was achieved because of the following reasons 1) preparing lesson plan in collaboration with colleagues, 2) making the teaching-learning process student-centred and 3) preparing enough teaching materials related to the lesson.
SAT3-L9 - The instructional decisions that helped to meet the goal are i) the lesson was almost student centred, ii) the teacher prepared enough teaching aids and iii) the lesson study group prepared the lesson together.
SAT3-L3 - Student participation was weak. Students have problems in speaking fluent English so in the above two cases the goals were not reached.
SAT3-L6 - Yes there were unachieved objectives. These are students were wrongly pronouncing some types of joints such as hinge, pivot and gliding. Instead the teacher gives notes the students were told to prepare notes.
SAT3-L8 - The students have difficulty of recombining force acting at right angle because they did not have background knowledge about the Pythagoras theorem. This posed a little bit obstacles for not achieving the objective.
SAT3-L9 - Almost all aspects of the goals were reached. But for more clarification the above points could be modified.
SAT4-L1 - Learning activities of the lesson plan prepared the students for the lesson study and made them collaborate with each other with full confidence.
SAT4-L3 - 1) Learning activity of the lesson plan, 2) prepared the students for the lesson study with full confidence and 3) made students motivate, collaborate each other
SAT5-L1 - Demonstration that is using visual aids was students can see with their own eyes and prove their theories.
SAT5-L2 - Providing student visualization of teaching aids appropriately. Group discussion, structure of the setting arrangement, ideas (brainstorm) of student writing on the board, helped the students to put them at ease/ easy to follow.
SAT5-L3 - Visualization of teaching aids, even though students were finding it difficult to see. Group discussions, structure of setting arrangement, flip chart were helping students to meet their understanding of the lesson.

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SAT6-L5 - The instructional decisions that helped to meet the goal the worksheet that indicates the simple machines using pictures. This worksheet helped the student to indicate the names and parts of the first, second and third order levers or simple machines.
SAT6-L7 - The instructional decisions that helped to meet the goal was the amount of teaching aid materials used, also the activity given to the students, the time was used appropriately and the number of students were less in number.
SAT6-L8 - The instructional decisions that helped to meet the goal were the lesson started on time and ended on the specified time i.e. it was conducted within 40 minutes. Secondly the lesson was prepared in such a way that it is up to the ability of the students. Finally necessary teaching aids were prepared and used.
SAT6-L9 - The instructional decisions that helped to meet the goal were because of using suitable teaching aids materials, suitable topic that matches the ability of the students and by being able to prepare a lesson that could be completed within 40 minutes.

5. **What aspects of the goals were not reached? Please provide supporting evidence.**

SAT1-L1 - Some students didn't participate. The reporting and the demonstration were done by the clever students.
SAT1-L4- There were no goals which were not achieved because always what has not been achieved in the first teaching was achieved during the re-teaching lesson.
SAT1-L5 - There were no goals which were not achieved because always the teaching and the re-teaching were complementing one another.
SAT1-L6 - Since the lesson plan was implemented as planned I couldn't say that there were unachieved goals.

SAT1-L7 - There were no goals which were not achieved because always what has not been achieved in the first teaching was achieved during the re-teaching lesson. This is because after each teaching we were giving our feedbacks on the lesson.
SAT1-L8 - I would say most of the objectives have been achieved. However, the students did not present the answers for the workout questions, which they worked in groups, on the blackboard one by one.
SAT2-L2 - All the goals were reached.

SAT2-L4- Everything has been successfully implemented except the lesson was a bit extended.

SAT2-L5 - The students were expected to explain or present to the whole class about their discussion. But this has not been done.
SAT3-L1 - Almost all goals of the lesson were reached. Because the students were having good understanding of the lesson. The students were presenting the lesson in front of the class confidentially. And the lesson was related to the age and ability of the students.
SAT3-L2 - Almost all aspects of the lesson were reached. But at the time of group discussion there were formation of subgroups. This could be an obstacle for the goal of the lesson to be reached successfully.
SAT4-L1 - Some students theoretically understood the lesson but they could not describe the lesson. It is because of their potential (language). Class size, shortage of time, interest of the students.

SAT4-L3 - Some students theoretically understood the lesson but they could not describe or present practically (potentiality). Shortage of time.
SAT5-L1 - Time allocated 45 min - last almost 60 min. all students to see the experiment been made by their class members could not be observed clearly due to the class structure and the position of the visual aids.
SAT5-L2 - Some students were not following, like a student was doing his Math exercise during discussion. Subgroups still existed (example Samrawit group). Domination by prize winner students.
SAT5-L3 - Some students were not following, they were dormant. Subgroups still existed. Teaching materials were not well prepared. Teacher should make it attractive to the lesson for student to participate with motivation.
SAT6-L5 - The students were not provided with notes this is because of shortage of time. The lesson was conducted during break time and therefore there was not sufficient time to give them notes.
SAT6-L7 - Some of the groups which were allowed to present were provided less time to present the outcome of their discussion. Other groups were not allowed to present their report. The group works were supposed to be written on the blackboard. The worksheet should have been marked and given them back.
SAT6-L8 - There were no goals which were not achieved. The plan has been implemented successfully. The students were grouped into five groups and performed the activities given to them.
SAT6-L9 - I am of the opinion that the sub-topics presented under the lesson have been achieved.

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6. Which aspects of the lesson plan should be reconsidered based on this evidence?

SAT1-L1 - 1) The group discussion and reporting on what they observed, 2) Short note on the blackboard by taking the ability and interest of students on notes into consideration and 3) practicing the pronunciations of some of the names of joints.

SAT1-L4- The lesson plan was implemented as planned I would therefore say there were no unachieved goals.

SAT1-L5 - The lesson plan of grade seven was implemented as planned. Therefore, there nothing that needs reconsideration.

SAT1-L6 - Any deficiencies in the previous lesson was corrected and re-taught by the second teacher. Always there were complementing one another.

SAT1-L7 - Any deficiencies were corrected during the re-teaching sessions. I would suggest that we should work based on the lesson plan.

SAT1-L8 - One cannot expect a lesson to be perfect without any deficiencies. The weaknesses not identified during the first teaching would be identified and corrected during the re-teaching session. For example if students did not present the answers for the workout questions, which they worked in groups, on the blackboard one by one during the teaching session then this could be implemented during the re-teaching session.

SAT2-L2 - There is no lesson plan that should be reconsidered. I can say that all the goals were reached.

SAT2-L4- The number of pictures on the worksheet should be reduced. It should be supported with wall chart and real objects because these will support the students during presentation. It would help in saving time.

SAT2-L5 - What I have explained in number five above.

SAT3-L1 - The time allotted for one period should be more than 40 minutes (50 minutes or one hour) in order to cover all the goals of the lesson. All the students must have participated in the class.

SAT3-L2 - The allocation of time of the (introduction, development and conclusion) must be increased which means the period should be one hour instead of 40 minutes.

SAT3-L3 - Based on this evidence, most of the students (average of the class) should participate in the class. Since the medium of instruction in junior is English we have to reconsider it.

SAT3-L6 - First students having difficulty in pronouncing some words should do more exercise. Secondly note should be given by the teacher.

SAT3-L8 - In order for this lesson to be successful, the students should be acquainted with Pythagoras theorem before this lesson.

SAT4-L1 - The time allocation given to the lesson, teaching materials, class size and classroom should be considered.

SAT4-L3 - The teaching materials, time allocation, classroom and class size should be considered.

SAT5-L1 - Position of the experimental objects, should have been placed where all students could easily have observed which would have been at the centre. And the time given.

SAT5-L2 - Expected answers/summary written should be written in a form for student to copy without any difficulties. Presentation (group discussion) should be made by average students.

SAT5-L3 - Position of visual aids. Class atmosphere or situation must be motivated even by using Tigrigna. Introduction must be given.

SAT6-L5 - I would say that in order to give them notes that has prepared an appropriate timing should be selected to conduct the lessons. Another is focussing on only one of the simple machines would have been better.

SAT6-L7 - The worksheet done as class work should have been corrected.

SAT6-L8 - In order for the students to master the topic that deals with combination of forces, I would suggest the teachers to repeat the lesson again.

SAT6-L9 - In general if we see the practicality of the sub-topic, the calculation of using Pythagoras theorem does not go with the students' ability. Therefore I am of the opinion this lesson has to be repeated twice or should be removed from the syllabus and replaced by another topic.

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Appendix M:
Lesson study training manual

Lesson study as a professional development strategy

A guide for middle school science teachers of Eritrea

23 – 24 February 2013

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1. Introduction

We are happy that you showed interest to participate in this research which aimed at introducing lesson study in selected middle schools as a strategy of supporting science teachers in implementing curriculum in Eritrea. This study will take place for a period of two semesters. During this period you will be asked to do the following duties:

- Actively engage in the process of lesson study i.e. planning, teaching, and observing research lessons in collaboration with group members.
- Participate in feedback meetings.
- Keep record based on available formats.
- Be available for interviews.

The following sections of the manual will acquaint you with a theory on lesson study i.e. the history, concept, processes, organization, benefits and challenges of lesson study. This manual is supported with power point presentation and demonstration of lesson study processes through video shows.

2. Historical overview of lesson study

Lesson study is a well-established collaboration-based form of continuing professional development strategy that has been extensively used in Japan for decades. Outside Japan it is in its early stages of development. It has been known to outside world in the late 1990s. Lesson study was first brought to the attention of US educators in 1999 and it has also been experimented in several counties, such as Canada, Australia, Israel, South Africa, Singapore, Taiwan etc.

After the publication of "*The Teaching Gap: Best Ideas from the World's Teachers for Improving Education in the Classroom*" by Stigler &Hiebert in 1999, lesson study was brought to the attention of many educators worldwide. This book summarizes the study of the Third International Mathematics and Science Study (TIMSS) which compares grade eight mathematics instructions in Germany, Japan, and United States. In the study they discovered similarity of teaching cultures within each country with sharp contrasts between the teaching culture in the United States and Japan. They indicated that teaching in United States classrooms are not interactive and students learn mathematics by following the teacher-cantered approach, where teachers devote most of the time teaching definitions and demonstrating procedures and less time is dedicated to developing the technical details and rational of procedures. Contrary to this situation, teaching in Japan is

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shared by the teachers and the students. Students are encouraged to invent procedurally and conceptually demanding own procedures for solving problems.

In their book, Stigler &Hiebert describe **lesson study** – a model for intensive, school-based professional development used in Japan – as a strategy for change and improvement of teaching.

3. The conception of lesson study

The core activity in lesson study is for teachers to collaboratively work in groups and develop a lesson plan, teach and observe the lesson to collect data on student learning, and use their observation to refine their lesson. It is a process by which teachers engage in to learn more about effective practices that result in improved learning outcomes for students. The main goal of lesson study is to improve the instruction that the teachers provide to their students. Lesson study is a simple idea. If one wants to improve instruction, there is no obvious way than collaborating with fellow teachers to plan, observe, and reflect on lessons. The lesson study process is illustrated in Figure 1.

4. Lesson study versus traditional professional development programs

Certain characteristics set lesson study apart from typical professional development programs. These characteristics are described below

Traditional	Lesson study
• Begins with answer • Driven by outside expert • Communication flows from trainer to teachers • Hierarchical relations between trainer and teachers • Research informs practice	• Begins with question • Driven by participants • Communication among teachers • Relationship reciprocal among the teachers • Practice is research

Source: Lewis (2002b)

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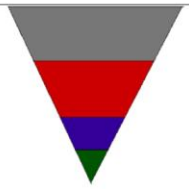
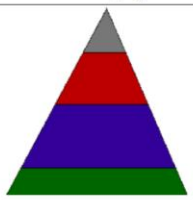
5. Lesson study uses data

Teachers' activities to improve instruction

Teachers' Activities	United States	Japan
Choose and write curriculum Plan lessons individually Plan lessons collaboratively Watch and discuss each other's classroom lessons		

Source: Lewis (2002b)

What about in Eritrea? Teachers' activities belong to which of the categories described above?

6. Features of lesson study

a) Lesson study is based on a long-term, continuous improvement model.
b) Lesson study maintains a constant focus on student learning.
c) Lesson study is collaborative. Lesson study provides a platform for teachers to come and work together.
d) Lesson study focuses on the direct improvement of teaching in context.

7. Lesson study process

Lesson study is a cycle of instructional improvement in which teachers come together and collaborate with one another in order to improve instruction. During lesson study, teachers work through the steps listed below:

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- Forming a team
- Setting goals
- Planning a research lesson
- Teaching, observing and debriefing
- Reflecting, revising& re-teaching

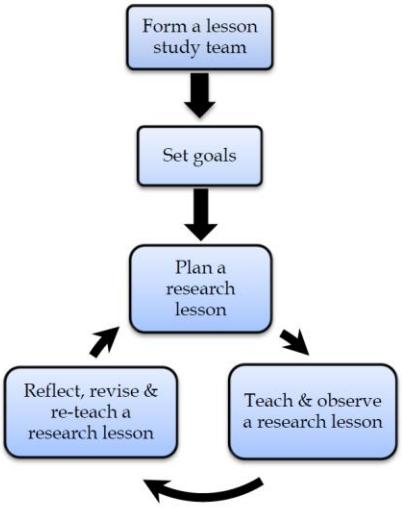

Figure 1. Lesson study cycle

a) **Forming a team**: at this stage three or more teachers who teach the same grade/subject come together and form a team/group in order to achieve particular objectives – usually improve lesson or student achievement. Teams in lesson study are usually composed of 3 – 6 teachers.

Activities:

- Recruit members for a lesson study group
- Make a specific time commitment
- Set a schedule of meeting
- Record meeting
- Agree on ground rules for your group

Ground rules:

- Communicate clearly and listen carefully.
- Respect the views of others.
- Share your views willingly.
- Ask and welcome questions for clarification.
- Be open to the ideas and views presented.
- Honour time limits.
- Stay on task.
- Take collective responsibility

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b) **Setting goals**: There are different types of goals involved in lesson study namely, the **long-term goal**, **unit goal**, and **lesson goal**. The research theme is a broad, **long-term goal** that focuses on students, not on teachers or instruction – for example, "Students will become confident and creative thinkers and innovators." Lesson study teams often focus on the same research theme through multiple cycles of lesson study. Ideally, the goal will serve as a focus for the whole professional development program, not just lesson study. The research theme helps to ensure that lesson study addresses important issues that will have an impact on student learning.

The **unit goals** are over all goals for the unit within which the research lesson is located. For example, "Students will investigate, describe, and analyse ways in which matter changes." **Unit goals** help connect the research theme to the lesson-specific goals. Lesson goals are specific student learning outcomes for the lesson – for example, "Students will make careful observations of both positive and negative results".

Teachers choose goals for a topic which is new to the curriculum, one that is difficult for students to understand, one that is difficult for the teachers to teach, or one that the teachers want to master.

Activities:

- Agree on a research theme (or main aim) that captures your long-term goals for students.
- Choose a subject area (e.g., science, mathematics, social science)
- Choose a unit and lesson, and agree on goals.

c) **Planning a research lesson:** Collaboratively teachers plan a lesson that is designed to produce these goals and produce a lesson that could be observed known as a "research lesson". The plan for the research lesson is very detailed, with description of anticipated response from students. It is a guide for teaching the lesson, but it also serves a communication tool for the lesson study team by clarifying the goals and ideas being tested. The team decides how to observe and collect evidence of student learning.

Activities:

- Study existing lessons.
- Develop a plan to guide learning. The plan addresses long-term goals for students as well as specific goals for the unit and lesson. It also includes a data collection plan.

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Planning a research lesson differs from the lesson planning familiar to most of us. The following questions may help to guide planning of a research lesson:

- What do students currently understand about this topic?
- What do we want them to understand at the end of the lesson?
- What is the sequence of questions and experiences that will propel students from their initial understanding to the desired understanding?
- How will students respond to the questions and activities in the lesson? What problems and misconceptions do we anticipate in response to each element of the lesson? How will the teacher use these ideas and misconceptions to advance the lesson?
- What will make this lesson motivating and meaningful to students?
- What evidence about student learning, motivation, and behaviour should be gathered in order to discuss the lesson and our larger research theme? What data should we collect regarding student learning, motivation, and behaviour? What forms are needed to collect it, and who will be responsible for each piece?

d) **Teaching, observing and debriefing**: This is the process of implement the lesson in which one of the members teach the research lesson while others observe the research lesson in order to gather evidence on student learning and development. The observers take notes on what the teacher and the students are doing and saying and collect evidence of student thinking. The purpose of observation is to gather data about the effectiveness of the lesson, not to evaluate the teacher. After the teaching, the team conduct a debriefing session to discuss the lesson and their observations. The members of the lesson study share the evidence of student learning that they have collected.

Debriefing begins with the teacher who taught the lesson speaking first by detailing what parts of the lesson worked as planned and what require improvement. Based on the data they have collected the other teachers forward their feedback and provide constructive suggestions for improving the lesson.

Activities:

- Prepare the classroom
- Prepare students for the lesson study
- Reduce interruption
- Collect data as planned.
- Reduce side conversations during the lesson observation.
- Circulate freely when students are working, but move to the back of the room during whole-class discussion.
- Make sure that you do not block students from viewing the blackboard.

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- Minimize interaction with the students. Refrain from teaching or assisting the students. Interact only to clarify your understanding of students' thinking.
- Each observer should have a copy of the lesson plan and record observations throughout the lesson.
- Assign members to observe and record specific type of data.

What to observe?

- Look if the goal of the lesson is successfully achieved
- Take notes on how students collaborate with one another.
- Take notes on how students engage in the learning process.
- Take notes on how individual student respond to the instruction.
- Record on the appropriateness of the content to the students' level of understanding.
- Record on the usefulness of the resources used.
- Record on how students work on particular tasks.
- Record on the type and frequency of questions asked by different students and the teacher.
- Document student-student and student-teacher interactions.
- Record on common misunderstandings, errors, and the ways student use to solve problems.

e) **Reflecting, revising& re-teaching**: based on the evidence collected and discussed during the observation and debriefing, the lesson study team makes changes to the lesson. The teachers will use the data to revise the lesson. The team may meet several times to revise the lesson, which is taught by a different member to a new group of students. The same processes of observation and debriefing are used for the second teaching.

Activities:

- Follow a carefully-structured agenda.
- Focus discussion on the data collected at the research lesson.
- Consider how to revise the lesson/unit/instructional approach.
- Re-teach the revised lesson, if desired.
- Discuss the benefits and challenges of your lesson study effort, and what you would like to change in the next cycle.

The following questions may help to reflect:

- What is useful or valuable about our lesson study work together?

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- Is lesson study leading us to think in new ways about our everyday practices?
- Is lesson study helping us develop our knowledge of subject matter and of student learning and development?
- Is our lesson study goals compelling to all of us?
- Are we working together in a productive and supportive way?
- Have we make progress toward our overall lesson study goal?
- Do all members of our group feel included and valued?
- Do non-participants in our work feel informed and invited?

8. The Organization of Lesson Study

- Study lessons are planned by a group of 3-6 teachers who generally teach the same/ similar grades.
- Each group will generally carry out three or more lesson study cycles, which they schedule them in advance.
- Groups working on a study lesson have regular meeting to plan, teach, observe and reflect on the research lesson.
- It is also necessary for teachers to share their work across lesson study group. Therefore, this meeting has to be scheduled in advance.
- In addition to the teachers who worked on the study lesson, other teachers should be encouraged to make efforts to come and discuss the study lessons.

9. Benefits of lesson study

- Teachers think carefully about the goals of a particular lesson, unit, and subject area.
- Lesson study provides opportunities to collaborate.
- Deepen teachers' knowledge of subject matter.
- Teachers gain an increased knowledge of instruction,
- Teachers learn how to observe students, critique, and be critiqued
- Teachers be able to connect their daily practice to long-term goals,
- Increases teachers' motivation and sense of efficacy.
- Improved quality of available lesson plans.
- Teachers see tangible results in students' learning.
- Lesson study presents teachers with an opportunity to study student misconceptions and use that information to make adjustments to a lesson.

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- Lesson study allows teachers to be intimately involved in their own professional development. The classroom becomes the laboratory where teachers' experiences, observations, and expertise are tapped into to improve instruction.

10.Challenges of lesson study

- Lack of clear understanding about what lesson study is.
- Teachers think that they lack knowledge to carry lesson study.
- Finding time for collaboration.
- Lack of support from the administration.

11.What lesson study is not?

- Lesson study is not about creating a unique, original, or never-seen-before lesson. Teachers may not be requested to prepare an original lesson from scratch. Parts of a lesson may be borrowed from a textbook, modified from other lessons, or derived from the existing curriculum.
- Lesson study is not about perfecting a single lesson. It is important to remember that the reason for conducting lesson study in the first place is to improve one's practice.
- Lesson study is not about producing a library of tried-and tested lessons for others to use. It is more of intellectual work.

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Appendix N:
Lesson plan format

Description of the research lesson plan

Date: _____
Grade: _____
School: _____
Subject: _____

Teachers' Name:

1) _____
2) _____
3) _____
4) _____
5) _____
6) _____

Topic: _____

Objectives of the lesson:

_____
_____
_____
_____
_____
_____

Process of the research lesson:

Steps of the lesson: learning activities, key questions and time allocation	Learner activities, expected learner reactions or responses	Teacher's responses to learner reactions or things to remember	Goals and methods of evaluation

Evaluation of the lesson: