PROFESSIONAL DEVELOPMENT OPPORTUNITIES CONTAINED IN TEACHER REFLECTIONS ON SCIENCE LESSONS OBSERVED DURING PEER LEARNING EXERCISES

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ABSTRACT— Amidst raging debates on how to conduct effective professional development for teachers in South Africa and elsewhere, this paper discusses professional development aspects contained in teacher reflections on science lessons observed during peer learning exercises. In a multiple-case study conducted in one of the districts of the Free State province, a collaborative, professional development approach was used wherein teachers were required to plan collaboratively and then observe each other’s teaching. A group of 4-5 teachers per school had opportunities to observe each other when teaching a set of collaboratively planned lessons. Each observation was followed by a discussion session where teachers reflected on how the lesson was delivered and especially the learners’ responses thereto. These sessions were videotaped, transcribed and analysed. Findings were four-fold. First, the findings revealed how teachers tackled professional development issues in relation to the content. Second, the findings showed teacher reflections on teaching and learning strategies used during the lessons. Third, the findings of the study revealed teacher attitudes during and towards the peer learning exercises. Fourth, the study revealed several challenges that arose during the process of peer learning in which teachers observed teachers.

Keywords: Professional development; Teacher reflection; Peer learning; Collaborative inquiry; Science teaching.

1. INTRODUCTION AND BACKGROUND

Lewis, Perry and Hurd (2009) describe Lesson Study as the core of Japanese teachers’ professional development. After the birth of Lesson Study in Japan as a successful collaborative professional development approach and its subsequent spread to North America in 1999 (Lewis, 2000), there has been a research need to expand the descriptive base knowledge of the approach in other contexts (Lewis, Perry & Hurd, 2006; Loucks-Horsley, Stiles, Mundry, Love & Hewson, 2010). Lederman and Abell (2014) further point out two research needs that are relevant to the purpose of this study. These are firstly, the need to explore different approaches to professional development that support teacher learning and secondly, studying how teachers learn as they engage in professional development. This study has been conceptualised along these three research needs. It provides a description of how Lesson Study was conducted in the context of one of the districts in the Free State province. It further serves as an exploration of alternative approaches to professional development exercises in the province and explores how teachers learn during the professional development activities. The implementation of Lesson Study activities in this study played out as a novel approach to professional development. It was against a backdrop in which Lesson Study did not form part of teacher professional development activities that were usually practiced in the area. As an alternative form of professional development, Lesson Study ensured and was hinged on teacher collaboration and inquiry learning. The conceptual frameworks used for this study are grounded in these principles of teacher collaboration and inquiry learning. The purpose of conducting professional development is to facilitate teacher learning. Consequently, the driving research questions for this study are,
1. How do science teachers experience professional development through peer learning during Lesson Study?
2. How do teachers’ attitudes towards collegiality transform during the implementation of Lesson Study?
3. What are the challenges faced by teachers as they implement Lesson Study?

Professional learning is part of what teachers do in their practice. Learning occurs in different ways. The learning avenues include the transformations teachers experience as individuals due to their regular engagements in the classrooms during their practice. If these engagements occur over long periods of time, teachers may enjoy the advantages of being experienced professionals over teachers who have recently joined the profession. The point being made here is that learning is part of the teaching practice. The realisation that learning is part of professional teaching calls for ways to properly harness and maximise the benefits that results from the process. Current trends in professional development call for careful planning and use of models for professional learning that culminate in improved student learning (Kriek & Grayson, 2009; Ono & Ferreira, 2010). One of the goals when facilitating learning in science education is to develop and nurture the skills of inquiry. The success of the incorporation of inquiry in most national science education curricula (Bradbury, 2010) calls for the redefinition of teacher professional learning during practice (Dass & Yager, 2009). Ahearn (2011) points out that despite the recognition of the benefits and subsequent endorsement of inquiry learning for students, providing the same learning opportunities for teachers has been challenging. It can be argued that for teachers to better understand how to facilitate inquiry for learners they should also experience learning through inquiry. This is in the wake of some teachers having passed through previous systems of education that relied on teacher centred modes of imparting knowledge in which learners played the part of passive receivers of knowledge. Teachers may be able to inculcate and cultivate the spirit of inquiry in the process of learning if that same spirit of inquiry is part of their learning culture (Rout & Behera, 2014). Professional development becomes central to teacher in-service learning and in other instances to the ‘unlearning’ of certain teaching and learning practices that do little to achieve goals of science education for inquiry. It is in light of this background that this case study uses Collaborative Inquiry as a conceptual framework for teacher learning. The conceptual framework is used in conjunction with Lesson Study as a theoretical model for teacher professional development in school science.

2. CONCEPTUAL FRAMEWORK

2.1 Collaborative inquiry
Collaborative inquiry is when teachers explore to learn (Schnellert & Butler, 2012) about their practice in groups in order to improve practice and student learning (David, 2009; Nelson & Landel, 2009; Nelson & Slavit, 2008). Literature reviewed defines the process of Collaborative Inquiry as structured, cyclic and iterative (David, 2009; Nelson & Landel, 2009; Nelson & Slavit, 2008; Schnellert & Butler, 2012). First, teachers collaborate to define the problem. This is achieved as teachers compare their current practices and the envisioned ideals (Nelson & Slavit, 2008). An inquiry question that establishes links between professional practice and students’ achievement is formulated (David, 2009). Teachers then further decide on inquiry strategies to put in place. Secondly, teachers implement the inquiry strategies as a way of collecting data. Thirdly, groups of teachers analyse the evidence collected, which is a process of identifying patterns and themes, in order to derive implications for changing practice (David, 2009). Fourthly, the initial cycle of inquiry culminates into the dissemination of the findings made (Nelson & Slavit, 2008). This may be achieved as teams of teachers document, share and celebrate their findings (David, 2009).

2.2 Lesson study
Lewis et al. (2009) presents Lesson Study as a theoretical model. Lewis (2000) further describes Lesson Study as a family of instructional improvement strategies that involves observation of
lessons, called ‘research lessons’, as a common feature. The theoretical model has a number of underlying tenets. Three of the tenets are mentioned below. First, Lesson Study is a collaborative teacher professional development approach. Teachers work in teams although the teams can include external specialists such as scientists, researchers, teacher educators, and subject specialists among others (Anderson & Moeed, 2014). Second, the cycle of activities in Lesson Study includes a ‘research lesson’ that is taught by one of the teachers while the rest of the team members are observing (Aruni, Keisuke & Lassegard, 2010). Third, teacher learning is learning through inquiry (Ahearn, 2011). The inquiry cycle of Lesson Study comprises four stages, (Lewis et al., 2009) namely investigation, planning, research lesson and reflection. During the investigation stage teachers conduct a number of actions as they define the problem (Nelson & Slavit, 2008). The problem could target difficulties and challenges experienced by learners during learning, topics that teachers struggle with when teaching, or subjects/topics that have recently been introduced in the curricula (Lewis, 2002), among other issues. The actions involved in identifying the problem include studying and comparing current student characteristics and the general and long-term goals of education (Lewis et al., 2009). Teachers also look at curricula and study the content for teaching purposes (Lewis, Perry & Hurd, 2004). In line with inquiry learning a study question is developed. After the process of defining the problem teachers collaborate in planning the ‘research lesson’ taking into account general goals for education (Dotger, 2011) and anticipated learner thinking (Wang-Iverson, 2005). The ‘research lesson’ is taught to learners while the team members observe the proceedings. This stage constitutes a data collection process for the inquiry. The final stage in the cycle is meant for reflection. Teachers sit together to discuss the information they collected about the ‘research lesson’ (Lewis, 2000). The discussions culminate in implications for practice that may include adapting the lesson according to what has been understood about the accomplishment of educational goals, student thinking, teaching strategies used and content delivered. The inquiry findings are documented and may be shared. They usually result in improved quality of lesson plans at teachers’ disposal (Lewis et al., 2004). The diagram in figure 1 makes an attempt at demonstrating how Lesson Study is a form and is imbedded in Collaborative Inquiry.

Figure 1: Lesson study as a Collaborative Inquiry process
3. LITERATURE REVIEW
The practice of Lesson Study is grounded in the belief that collaboration among teachers improves classroom practice (Lewis, 2000). In efforts to enhance accountability with regard to learner performance school structures such as classroom practice have increasingly come under scrutiny. Consequently, teacher learning has also come under the spotlight especially in the wake of widespread curriculum reforms, which have become a permanent feature of some education systems. Teachers are pivotal for ushering change (Pektas, 2014). Change is brought about when they change their practices. However, Lieberman (2009) points out that teachers are prevented from embracing change because of tendencies to uphold individualism, conservatism and presentism. Teachers have generally been observed to work as individuals who occasionally meet up with colleagues to discuss and share practice experiences (Lieberman, 2009). Teachers have also been observed to teach their classes as they have been taught, thereby perpetuating the traditional modes of teaching and learning which are in discord with current curricula visions (ibid). Teachers have also been observed as employing strategies to meet other short-term goals, such as covering of extensive syllabi in limited time frames, at the expense of other long-term goals such as instilling some important learning values such as inquiry learning (Rodrigues, 2005).

From the literature study conducted the benefits of Lesson Study have on one hand been found to be general as a form of collaborative teacher professional development. On the other hand they have been found to be specific and particular to the approach. The benefits of Lesson Study as a collaborative approach to professional development are portrayed in juxtaposition to the weaknesses of conducting professional development as lectures in which teachers are passive receivers of information. Two of the important benefits are mentioned here. First, Lesson Study is like an answer to conditions prevailing in some contexts where teachers are exposed to unsustainable and once in a while professional development exercises which are driven by external agents (Dass & Yager, 2009). Although Lesson Study teams can include outside specialists they are basically constituted by teachers. Accordingly, Lesson Study as a professional development approach is school-based. This is one factor that enhances sustainability and continuity. Teachers take charge of their own professional development based on learner needs (Nelson & Landel, 2009). Furthermore, by nature Lesson Study is an iterative and cyclic professional development model (Lewis et al., 2006). The completion of one cycle generates the start of a subsequent cycle. Dotger (2011) says instructional concepts can transfer to other lessons resulting in continual study. Second, the use of Lesson Study as professional development tool harmonises theories for teacher learning and the learning theories espoused for learners by science curricula. Lieberman (2009) propounds that teachers employ the same methods they used to learn for their practice. Accordingly, it is hoped that they will facilitate inquiry in the classrooms.

The benefits also become specific to Lesson Study as an approach. First, Lesson Study ensures that teachers work systematically to achieve, in learners, long-term educational goals (Lewis et al., 2004) such as the inculcation of the spirit of inquiry. Some teachers may struggle to integrate these goals as they plan classroom activities for learners. The planning of a ‘research lesson’ starts with identification of gaps between current learner characteristics and the visions of curricula (Dotger, 2011). Second, through Lesson Study teachers are able to study the thinking of learners as they are engaged in the learning activities (Doppelt, Schum, Silk, Mehalik & Reynolds, 2009). Teachers take time during lesson planning to anticipate learner reactions and responses (Wang-Iverson, 2005). Furthermore, Lesson Study is an iterative process that aims at refining the planned lessons (Dotger, 2011). Accordingly, lessons can be adapted after observation has been done to cater for learner needs (ibid). Third, teachers who engage in Lesson Study practice improve instruction by way of refined lesson design and delivery; enhanced management of learning environment; ensuring quality learner engagement with learning materials; administering quality assessments; and generation of information on student learning (Marble, 2007). Fourth, besides presenting teachers with learning
opportunities, Lesson Study can also be used as teaching methodology in the preparation of pre-service teachers (Pektas, 2014).

4. METHODOLOGY

Using a qualitative multiple-case study research design, 3 secondary schools in the Free State were selected through purposive sampling techniques. The criteria for selection were basically determined by the teachers’ willingness to implement Lesson Study activities in their schools after the workshops and the level of success achieved in completing the tasks. The Lesson Study activities also had to be in the science subjects of Natural Sciences, Life Sciences and Physical Sciences. The multiple-case study enabled researchers to draw comparisons by exploring differences and similarities in the implementation of Lesson Study in the 3 schools for the different science subjects (Yin, 2003). It was an interpretive inquiry in which researchers made meaning of what they saw, heard and understood (Cresswell, 2007) from teacher actions as they implemented Lesson Study.

4.1 Data collection

Two Lesson Study activities were conducted at each of the three schools. Accordingly, there were six implementing teachers from three teacher teams. Lewis (2000) says ‘research lessons’ can be recorded by videotape, audiotape, and observational notes, and can be reflected through learners’ work. Lesson Study activities were video recorded and transcripts generated. Teachers documented all the activities that they engaged in during the Lesson Study exercises. Each Lesson Study team included a group leader/facilitator and a specialist. The group facilitator gave guidance and assisted in the collection of data in an alternating capacity of participant observer and non-participant observer. As a participant observer the group facilitator provided the team with specialist knowledge and guidance on Lesson Study. The group facilitator became a non-participant observer as teachers shared reflections that mirrored what they were learning during the professional development exercise. The group facilitator had to show a lot of skill and tact so that only the learning opportunities experienced by the teachers were carefully captured. The learning opportunities and reflections of the group facilitator were part of the interpretive meaning making of teacher actions during the study. The tools that were given to teachers for Lesson Study required and ensured meticulous capture of activity proceedings. Teachers returned to schools equipped with the following Lesson Study activity protocol presented in table 1.

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<th>Activity</th>
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<td>1. Preparations</td>
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Table 1: Lesson Study activity protocol

Qualitative content analysis methods were used to analyse the data collected.

5. FINDINGS OF THE STUDY

This study set out to explore learning opportunities as revealed by teacher reflections as they engaged in all the stages of Lesson Study. The data generated as teachers engaged in Lesson Study activities were analysed for content. For presentation purposes, the study findings have been organised according to the subtopics in the Lesson Study activity protocol.

5.1 Preparations

The preparations were conducted in departmental meetings. Teachers were organised in small groups per subject in order to initiate teamwork, which is pivotal for Lesson Study. This process had
its own share of challenges because of time constraints. Lesson Study schedules had to be fitted in already drawn up school timetables. In cases where there were no gaps in the timetable, teachers approached timetable committees for special consideration so that team members may be able to observe one another without missing some of the teaching periods. In other cases Lesson Study was scheduled according to the IQMS (Integrated Quality Management Systems) programme in the schools. In this programme teachers were already scheduled to observe their peers teaching. Unplanned visits to schools that disturbed school activity schedules by different stakeholders also disturbed Lesson Study activities and they had to be re-scheduled. Following is an extract from the documented evidence reporting on the how Lesson Study proceeded:

The critical challenge became the time issue and a plethora of unplanned and unannounced visits that the school is often inundated with.

The preparations during the departmental meetings also gave teachers an opportunity to recap on the Lesson Study concept for teachers who attended the workshops and apprise teachers who did not attend the workshops. These preparation meetings set in motion a process of inquiry through Lesson Study. The topic for the inquiry was identified in the form of problem topics that often are challenging to learners and/or topics that teachers find challenging to teach. These problems were identified from subject improvement and/or academic performance improvement plans. Lewis (2002) says that Lesson Study teams can target a weakness in student learning, a topic that is difficult to teach or a subject that has recently undergone reform by introducing new content, technology or teaching approaches.

**5.2 Pre-planning the lesson discussion**

This was a session used to discuss all the topics that had been earmarked to be taught for Lesson Study. The sessions provided teachers with further guidance as they engaged in Lesson Study because teachers would discuss how they would observe the ‘research lesson’ and how they would discuss it afterwards. Furthermore, taking into account that the topics had been selected on the basis that they presented challenges either to teachers or learners, the discussions were to anticipate how the challenges would manifest. Accordingly, teachers delved into identifying content for teaching, instructional strategies and organised and mobilised resources. Some choices of instructional strategies were made based on the teaching resources at the teachers’ disposal. For example in a Natural Sciences lesson on electrolytic cells, the practical activity had to be in the form of a demonstration because teachers could only mobilise materials for one apparatus setup. This is in contrast to a situation where there would be enough material to set up several electrolytic cells apparatus so that learners can conduct the practical activity in groups.

**5.3 Pre-observation preparation**

In this session teachers sat together to plan the lessons in detail. Lesson plans were collaboratively put together for implementing teachers to teach to learners. The developed lesson plans contained components such as the date and place, duration of the lesson and name of implementing teacher. The plans also contained the basic components of a lesson such as the topic, how to ascertain learners’ prior knowledge, lesson objectives, content to be covered, resources, lesson activities and assessment activities.

**5.4 Observing the lesson**

Armed with lesson plans the implementing teachers taught the ‘research lessons’ while the other team members observed the proceedings. This was a stage for teachers to collect data for the inquiry that they were engaging in. Using an observation protocol the observing teachers recorded what the implementing teacher and learners were doing and saying accordingly. They also recorded the time taken to complete each lesson activity.
5.5 Post-observation discussions
This section presents what was discussed in the post-lesson meetings. Two of the lessons observed, from two different schools were on the topic of Forces in Physical Sciences. One of the teachers used the calculation method to solve the problems on forces, based on trigonometry. The other teacher used the method of scale drawing to solve the problems on forces also based on trigonometry. On answering the question what worked, teacher reflections from both schools indicated that learners were actively participating. One of the teachers indicated that he had an opportunity to understand learners’ experiences of forces in the classroom. On answering the question what did not work, teacher reflections show that the mathematical instruments were not enough for all learners to do the classwork activities meaningfully. Consequently, learning was not very successful. In the other class, teachers realised that learners did not have a good background of trigonometry principles; hence they were struggling as they were attempting to solve the problems on the worksheets. As a way of adjusting the lesson plan for the teacher who used the scale drawing method, it was suggested that an alternative teaching method should always be prepared in the lesson plan. The alternative method, such as the calculation method in this case, would act as a backup so that the lesson can continue despite the shortages of mathematical instruments. An extract from the implementing teacher’s reflections follows, ‘I should prepare for the unexpected and use the calculation methods.’ Ironically, the teacher who used the calculation methods also encountered challenges because learners had limited knowledge of trigonometry. It was suggested that science teachers should work in collaboration with Mathematics teachers so that learners have the necessary Mathematics knowledge before the science topic can be taught. The lack of sufficient mathematical sets and learners’ limited knowledge of trigonometry resulted in both teachers engaging with only a handful of learners while the others sat with nothing to do and showing signs of boredom. Therefore, the failure to engage all learners meaningfully in the activities was identified as a challenge that needs to be addressed in other lessons.

Two other lessons observed included experiments as part of the activities. In one of the lessons, however, the experiment was in the form of a teacher demonstration. The topic was Electrolysis in the subject of Natural Sciences. Teacher reflections revealed that learners showed a marked interest in the lesson and asked questions. Despite the learners’ interest in the lesson, learning was inhibited. The class was very large and learners at the back could not see some proceedings of the demonstration. Learners may not have observed the ammeter readings and bubbles as the gas escaped during electrolysis. It was also noted that the teachers’ time management was poor. It was suggested that learners were supposed to be organised in small groups and be allowed to handle experiment materials and equipment under the supervision of the teacher. It was also suggested that learners should be sensitised about safety and precaution issues around the experiment. Accordingly, it was concluded that poor time management and failure to involve all learners in the lesson activities were the major challenges encountered during the lesson. In the other lesson learners worked in groups to conduct the experiments. The topic of the lesson was ‘factors affecting reaction rate’ in the subject of Physical Sciences. Teacher reflections show that learners showed interest in the lesson. However, the implementing teacher felt that he was supposed to set up the apparatus for the experiments before learners could come in for the lesson. There was one group which was struggling to conduct the experiment throughout. One of the observing teachers felt that learners were supposed to analyse the results of the experiment as individuals and not in groups. In adjusting the lesson it was felt that learners should be taught the basics of a practical before they conduct it. The implementing teacher said, ‘There must be a pre-practical and a real practical afterwards.’ That would mean that learners are provided with experiment procedures instead of letting them figure out the steps. Furthermore, it was proposed that learners may conduct the steps of the experiment in groups but when it comes to the analysis of results they should work as individuals. The teachers mentioned a few challenges in this lesson. There were two groups of learners who completed their experiments early. They got bored and became noisy. However, the
implementing teacher mentioned that they were trying to investigate other factors that affect the rate of reaction. It was also noted that the preparation of a standard solution of sodium thiosulfate during the experiment was very challenging.

The final two Lesson Study exercises to be discussed next were conducted at one school. The topic covered in one of the lessons was ‘organic compounds and elements’ in the subject of Life Sciences. As with the other observed lessons discussed above, the teacher managed to trigger learner interest at the beginning of the lesson. One observing teacher said the following about the introduction of the lesson, ‘Learners were given opportunities to ask questions...’ and ‘The teacher was moving around trying to reach all learners.’ Despite this, teacher reflections revealed that time was mismanaged. The teacher presentation was too long and learners got passive. The implementing teacher said, ‘The lesson was too long and I could not give learners an assessment.’ This could have been caused by what one observer mentioned as a reflection, ‘The teacher explained and repeated himself over and over. That wasted his time.’ To adjust the lesson it was agreed that the number of lesson objectives should be reduced so that assessment activities can be included. One observer said, ‘The teacher should involve learners every now and then in the lesson so that they become involved. Assess informally by asking verbal questions’. Teachers acknowledged that the class was overcrowded and the room was too hot, and consequently, some learners became very passive. At the same school a Lesson Study exercise was conducted on the topic ‘classification of materials’ in the subject of Natural Sciences. The introduction of the lesson was well executed. Learners were motivated and the level of learners’ prior knowledge was ascertained. However, as the lesson progressed it was disturbed by late comers and class control became challenging. One observer said, ‘Some of the learners were talking, others gave answers without being given a chance to answer.’ Suggestions for adjusting the lesson were in terms of learners’ seating arrangement. It was noted that if learners sit as friends they become troublesome. Therefore, it was suggested that learners should be spread out evenly in the classroom ensuring that a boy and a girl sit at every double desk. It was also noted that the class was too big and the classroom temperature was too high.

The findings of the first two Lesson Study exercises discussed revealed insights on two instructional strategies used to teach the same topic in Physical Sciences. The findings on the second pair of Lesson Study exercises discussed, revealed insights on the use of teacher demonstration and learner conducted experiments during lessons that involved practical activities. Findings on the last pair of Lesson Study activities revealed how learner disciplinary issues and classroom environment influence events during lessons.

6. DISCUSSION
The learning opportunities for teachers who participated in the Lesson Study exercises manifested along four pathways. These were identified through the emerging themes. The pathways for learning were in the development of content for teaching, instructional strategies, teacher attitudes and challenges that interfaced with the process of Lesson Study.

6.1 Content for teaching
Teacher learning in the development of content for teaching is inherent with the process of Lesson Study (Dotger, 2011; Lewis et al., 2006; Lewis, 2002). Teachers gather together to work on the subject matter necessary for teaching and student learning. These meetings are sometimes graced by specialists. This is in accordance with findings from other studies. Saito, Harun, Kuboki and Tachibana (2006) concluded that the collaboration of teachers and specialists from the university strengthened the academic base of lessons.
6.2 Instructional strategies
Opportunities for perfecting instructional strategies were quite evident in this study. Most of the suggestions made during the time of adapting the lessons were on instructional strategies. Lesson Study enabled teachers to find solutions to contextual challenges encountered. Lewis et al. (2004) propound that one of the benefits of engaging in Lesson Study is that teachers increase their knowledge of instruction. Marble (2006) says that through lesson study teachers contribute to the development of knowledge about teaching and learning.

6.3 Teacher attitudes
Collaboration, working in teams and inquiry are inherent to Lesson Study (Aruni et al., 2010. Accordingly, teachers develop senses of collegiality and cooperation. In this study teacher collaboration was evident in the implementation of Lesson Study. They also developed a spirit of inquiry as they become inquisitive and reflective about their practice. Lewis et al. (2004) say teachers get motivated to improve their practice and develop a sense of accountability to the values of community practice.

6.4 Challenges interfacing with the practice of Lesson Study
A number of challenges were observed to interface with the practice of Lesson Study. The first challenge experienced by teachers was how to fit Lesson Study in the school timetables. Perry and Lewis (2009) point out that Lesson Study should align with district policies and programmes to ensure feasibility and sustainability. In this study the scheduling of Lesson Study activities was a challenge to teachers because it did not form part of professional development activities intended for teachers. In a study conducted by Perry and Lewis (2009), two full-day teacher substitutes were provided to cover classes left without teachers because of Lesson Study. The second challenge pertains to teacher collaboration skills when conducting Lesson Study. Teachers should plan every detail of the lesson together to ensure collective ownership of the process. This avoids situations where the implementing teacher figures out some instructional strategies which will be severely critiqued by observers. The third challenge emanated from the school settings. In one school implementation of the ‘research lesson’ was very difficult in the wake of learners’ disciplinary such as late for class and noisemaking. These conditions derailed what might have been a good lesson as the implementing teacher struggled to maintain discipline and overcome the stress of being observed by colleagues. The fourth challenge was that teachers found it difficult to implement a ‘research lesson’ in situations where resources for the lesson were scarce. In one lesson, learners did not have enough mathematical set instruments for the lesson to proceed as planned. The fifth challenge emanating from the school settings was classroom environments that are unsupportive to learning. At one school the classrooms were too hot and it seemed to derail proper progress of the lesson. The practice of Lesson Study revealed how these challenges stand in the way of student learning.

7. CONCLUSION AND RECOMMENDATION
Teachers practicing Lesson Study experienced learning opportunities in the areas of content and instructional strategies development; attitudes and skills that emerge from communal involvement; and challenges encountered by teachers during the professional development exercise. Lesson Study presented learning opportunities for teachers as they worked to develop lesson plans intended to translate into meaningful student learning. Lesson Study is one way in which teachers can engage in inquiry activities about their practices. This study revealed that Lesson Study has the potential to reveal contextual barriers standing in the way of meaningful student learning. Accordingly, it is recommended that teachers engage in continual inquiry to gather and generate data about their practices in order to improve teaching and learning.
REFERENCES