

An Assessment of The Influence of Lesson Study on Learners' Academic Performance in Mathematics: Case Study of Selected Secondary Schools in Kawambwa District.

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Kafula Fredrick
Information and Communication University
Lusaka – Zambia.
kafulafredrick@yahoo.com

ABSTRACT

This study was an assessment of the influence of Lesson Study on learners' academic performance in Mathematics. The study follows arguments stating that, Lesson Study would provide a means of improving the content and pedagogical competencies of teachers in the teaching of Mathematics and Sciences. Hence improving learner academic performance (Lewis: 2005, Takashi and Yoshida: 2004). The study was conducted in three selected secondary schools in Kawambwa district. The objectives of the study were;

- *to assess factors that influence the use of Lesson Study in improving learners' academic performance in Mathematics,*
- *to establish the challenges encountered by teachers of Mathematics in practicing Lesson Study in quest to improve learners' academic performance in Mathematics.*
- *to ascertain if there has been significant improvement in learners' academic performance in Mathematics after the introduction of Lesson Study.*

The study targeted district education officials, head teachers, deputy head teachers, heads of departments (HODs), guidance teachers, School Based Continuous Profession Development (SBCPD) coordinators, teachers of Mathematics, and learners. The total sample comprised of 200 respondents of which the response was 100 percent. The study applied a case study research

design. Data was collected using semi-structured interviews and questionnaires and analysed using thematic analysis.

The study revealed that effective Lesson Study practices in schools can improve learners' academic performance not only in Mathematics but also in other subjects. However, the study further revealed that most teachers' attitudes towards Lesson Study was not encouraging though data collected revealed that there has been an improvement in learners' academic performance in Mathematics after the introduction of Lesson Study. However, the study further revealed that there were also other factors apart from Lesson Study that contributed to the improved learners' academic performance in Mathematics. These were examination leakages and malpractices, internet access (you tube lessons), access to summarized pamphlets and books and an increase in number of well qualified teachers of Mathematics in schools.

The study concludes that Lesson Study though not included in the school written curriculum, has various benefits to teachers and lecturers as they tend to learn more from each other as they work collaboratively. Furthermore, Lesson Study enables teachers to develop skills and the spirit of team work throughout a lifetime.

Keywords: Lesson Study, Influence, Learners, Mathematics, Performance

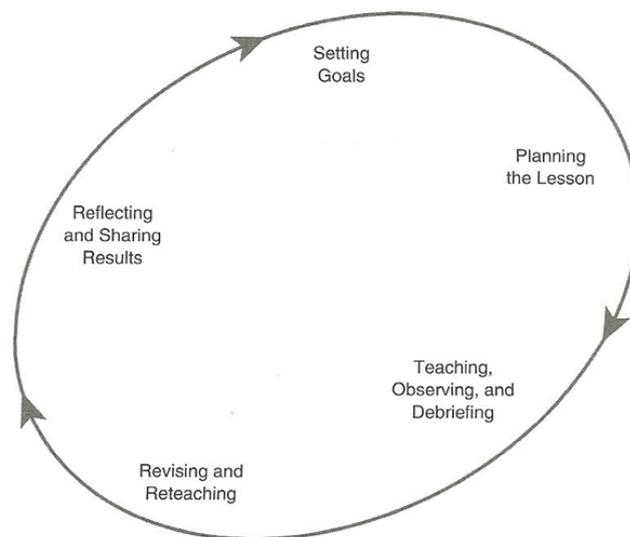
I. INTRODUCTION

1.1 Background

Lesson Study began in Japan and rapidly spread to North America since its publication description in 1987 (Yoshida: 1999). Japanese Lesson Study has been adopted by various countries as a process in which teachers progressively strive to improve their teaching methods by working with other teachers to design, test, and improve lesson sequences and critique one another's teaching techniques (Baba and Nakai, 2011; Tall, 2008). Lesson Study is an ongoing cycle of professional development in which teachers work together in a team to plan a unit of study based on learning goals, teach the lesson while collecting data on student learning (the research lesson), discuss and revise the lesson (debriefing), and re-teach the lesson with the modifications that were made based on the findings from the prior research lesson (Fernandez, 2002; Lewis, 2002; Yoshida, 1999). In determining goals, Lesson Study teams think about where their students are currently and where they would like them to be in the future (Campbell, 2003; Hurd, 2005; Lewis, 2002). During this time, teachers engage in conversations about the content of the lesson as well as expected student responses to the lesson (Lewis 2002; Yoshida, 1999). For each step of the lesson, teachers discuss what they will look for in students' performance during the research lesson (Hurd, 2005; Lewis, 2002). Peer observation and collaboration throughout the process are also crucial components of the Lesson Study model that must be included (Stepanek et al., 2007).

The steps of the Lesson Study process, as proposed by Stepanek et al., 2007, are as shown in the figure below;

The Lesson Study Process



Lesson Study Cycle (Stepanek et al., 2007)

In Zambia, the Zambian Ministry of General Education in partnership with Japanese International Cooperation Agency (JICA) since 2005 has introduced Lesson Study as one of the effective ways of improving primary and secondary Mathematics and Sciences education, Ministry of Education (2009). Lesson Study was first introduced in Central province in 2005 as a pilot project, two years later Lesson Study was extended to two other provinces, Luapula and North Western provinces in 2007. Lesson Study was fully implemented in all the ten provinces of Zambia by the end of 2015 (JICA portal – www.jica.go.jp). The Ministry of General Education demands that each school must conduct one Lesson Study circle each month.

1.2 Statement of the problem

A growing body of research in recent decades has illuminated on the importance of Lesson Study in the teaching and learning process especially in the field of Sciences and Mathematics as being effective in improving learners' academic performance in Mathematics and Sciences. Though

literature suggests positive gains in other countries where Lesson Study has been experimented (Lee, 2007; Marsight, 2007; Lewis, et. al, 2009; Burghes & Robinson, 2010), it is not clear the extent to which the performance in Mathematics has improved since the introduction of Lesson Study in learning and teaching of Mathematics in Luapula province and Zambia as a whole. Thus, this study sought to assess the influence of Lesson Study on learners' academic performance in Mathematics.

1.3 Research Objectives

The main objective of the research was to assess the influence of Lesson Study on learners' academic performance in Mathematics in Zambian secondary schools. However, the specific objectives of the project were;

- i. To assess factors that influence the use of Lesson Study in improving learner academic performance in Mathematics.
- ii. To establish the challenges encountered by teachers of Mathematics in practicing Lesson Study in quest to improve learner academic performance in Mathematics.
- iii. To ascertain if there has been improvement in learner academic performance in Mathematics after the introduction of Lesson Study.

1.4 Theoretical Framework

Since Lesson Study involve interaction, thinking and reflection among members in order to come up with suitable solutions, this study used the theoretical framework provided through by the John Dewey's pioneered Pragmatic theory of 1916. John Dewey (1859 – 1952) has made, arguably, the most significant contribution to the development of educational thinking. His theory explains how the interactions of a person and varying social influences can shape human behaviours in the way of beliefs, motivation, goals, accomplishments, and

personal well-being. His theory describes that people are active participants in their life experience and their cognitive functioning serves as a significant determinant that impacts one's life. Dewey's philosophical pragmatism, concern with interaction, reflection and experience, and interest in community and democracy, were brought together to form a highly suggestive form of education. Dewey believed that education must engage with and to a large experience has continued to be a significant strand in informal education.

Contextualizing this theory to the role of Lesson Study in influencing learner academic performance in schools, it can be argued that to improve learner academic performance it needs collaborative working among teachers as firmly considered avenues where the connection between education and social action in a democracy interact. Lesson Study can be learnt through the school's relationship with its wider community by bringing various stakeholders together. One of the important critical theorists Giroux 1983, cited in Veugelers (2007, p: 112) lists five points that are essential to Lesson Study as, participation, critical citizenship, developing an individual autobiography, values and learning about the structural and ideological forces that lead to opportunities for development. Riddile (2010) contended school improvement must be considered a journey, an ongoing process. All stakeholders must continue the dialogue and forward motion to improve teaching and learning for all learners.

II. LITERATURE REVIEW

The center-piece of this chapter is to establish the main theories upon which this research is anchored. The section presents the review of empirical literature. The empirical literature will bring out an understanding of the concept behind the introduction of Lesson Study in most countries. The

goal of Lesson Study professional development is to improve instruction and student learning by enhancing professional knowledge through collaboration. Providing time for teachers to collaborate and continue professional development is essential for improved Mathematics instructions (Reeves, 2010; Loucks-Horsley et al., 1998).

Lesson Study is originally a common practice of Japanese teachers to share and improve their knowledge and skills. After United States researchers wrote a book entitled “The Teaching Gap” in 1999, which asserted that the key to Japanese students’ high performance in Mathematics was the Lesson Study practice of teachers, the practice received interest from researchers and officials in many countries. Now, the practice is found in more than 50 countries around the world. Lesson Study is globally recognized as one way amongst other methods and strategies teachers can use to improve their teaching and learning programs hence improving learners’ academic performance (Lewis: 2006). The term Lesson Study was coined by Makoto Yoshinda, it was derived from two Japanese words Jugyo Kenkyu, where Jugyo simply means lesson and Kenkyu means study or research therefore Lesson Study can be referred to a research lesson (Hiebert & Stigler, 2000). The origins of Lesson Study in Japan can be traced as far back as 1920s. Lesson Study is extremely popular and highly valued by Japanese teachers. It is the linchpin of the improvement process. According to J. W. Stigler and J. Hiebert (1999: 125) teachers in Japan where Lesson Study is practiced see themselves as developing to profession as well as themselves.

Much of Japan’s teaching success has been attributed to the use of Lesson Study as a professional development model (Stigler & Hiebert, 1999; Yoshida, 1999). Due to the success of this professional development model in the Japanese schools, interest in the practice of Lesson Study is

growing in the United States and other countries (Chokshi & Fernandez, 2005).

Lesson Study in Zambia was introduced in 2005 as a pilot project in Central province aiming at the strengthening of Mathematics and Science education in secondary schools. Lesson Study in Zambia was introduced by the ministry of education with the help from JICA in order to improve learner performance in Mathematics and Science (MOE, 2009). In Zambia, a study by Dr. Sibeso Likando on Lesson Study Implementation in Mathematics in Zambia Contemporary Approaches to Research in Mathematics, Science, Health and Environmental Education 2014, Deakin University (slikando@deakin.edu.au). Dr. Likando’s research was aimed at investigating the implementation of Lesson Study in Mathematics. It was conducted in southern province of Zambia. According to Likando, while research on investigation on the adaptability of Lesson Study has increased elsewhere, Zambia seem to have insignificant research. He further lamented that lack of such research in Zambia is a serious omission particularly given the fact that studies on the adaptation of Japanese Lesson Study are not mere issues of empirical interest, but issues of that have significant bearing on the professional development of teachers and indirectly on the economy of a nation. He gave an example of the Government Republic of Zambia which endorses that the skills students get in Mathematics play a critical role in the country’s socio – economic development. (Zambia Ministry of Finance and National Planning 2011: 9)

Another study survey by Benson Banda an independent researcher (www.researchgate.net), conducted in Central province to assess effectiveness of the practice of Lesson Study, the results from the survey indicated that, in the province where Lesson Study was being practised, teaching skills of teachers of Sciences and teachers

of Mathematics were improved and the pass rate in the national examinations in Mathematics and Sciences increased as compared to other provinces which were not implementing the Lesson Study practice. Results from an internal monitoring and evaluation study completed in 2010 found that after three years of introducing Lesson Study in central province, learners' performance pass rate increased in Sciences and Mathematics compared to learner performance pass rate in other provinces (MOE: 2010).

III. METHODOLOGY

3.1 Research design

The research design was a case study carried out to get views from the sampled respondents on the influence of Lesson Study on learners' academic performance in Mathematics. The rationale behind using the case study research design was to help the researcher explain the challenges that are faced by the people on the ground in terms of performance and it offered the respondents opportunities to express themselves freely.

3.2 Target population

The researcher targeted learners, teachers of Mathematics, school based CPD coordinators, guidance teachers, heads of departments, deputy head teachers and head teachers from the three sampled schools in Kawambwa district; Kawambwa Technical Secondary School, Ng'ona day Secondary School and St Marys' girls' Secondary school. The three sampled secondary schools provided useful information on the subject under study. The researcher also targeted district education authorities in the district, these were the District Education Board Secretary (DEBS), The Education Standard Officer – General Inspection (ESO – GI), and the District Resource Centre coordinator (DRCC). These were picked as key informants as they are in charge of monitoring

school programs such Lesson Study programs at district level.

3.3 Sample Size and Sampling procedure

A total sample of 200 respondents was used as categorized below;

- i. 120 learners, 40 learners from each sampled school.
- ii. 44 teachers of Mathematics that was 15 teachers of Mathematics from Kawambwa technical secondary school, 12 from St. Marys secondary school and 17 from Ngo'na day secondary school
- iii. 21 Heads of department
- iv. 3 School based CPD coordinators (1 from each sampled school)
- v. 3 Guidance teachers (1 from each sampled school)
- vi. 3 deputy head teachers (1 from each sampled school)
- vii. 3 head teachers (1 from each sampled schools)
- viii. 3 district education authority officers.

For the purpose of this study, Simple random sampling was used to select the 120 learners from the three sampled schools. The rationale behind was to give each and every learner a non-zero chance of inclusion into the study. The study also employed purposive sampling to select the 44 teachers of Mathematics, 21 heads of departments from all the 3 sampled schools and 3 guidance teachers, 3 deputy head teachers, 3 head teachers each from the three sampled secondary schools. Purposive sampling was also employed to select the three key informants, the DEBS, ESO – GI and the DRCC. The rationale behind the use of purposive sampling was to select respondents with knowledge and ideas

about the subject under study. The assumption behind was that the respondents chosen using purpose sampling were more conversant with the social dynamic and knowledge about Lesson Study.

3.4 Instrument of Data Collection

In this study, interviews and questionnaires were used to collect data from the respondents. The two different methods were used to confirm or to investigate disparities between the actions undertaken by the participants and the meanings they have attributed to that situation in previously undertaken semi-structured interviews and questionnaires (woods, 1992). These instruments were used because they were found to be cheap and quicker. The questionnaires were given to respondents to fill and the researcher waited for the respondents to fill in the questionnaires and collected them all. For the interviews some respondents were not in their offices at the time of administering the interviews hence ended up administering the interviews via phone calls. All the respondents successfully participated in the research.

3.5 DATA ANALYSIS TECHNIQUES

The data collected was processed and analysed using Micro Soft Excel.

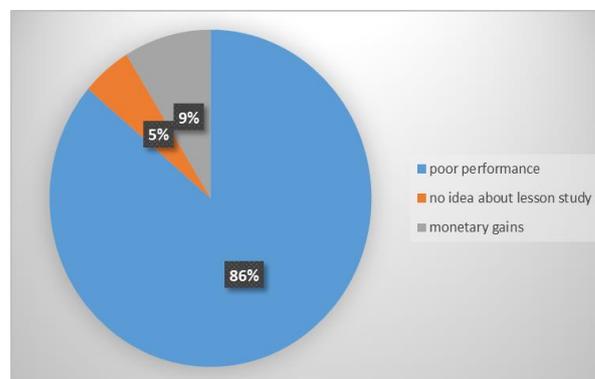
IV. PRESENTATION OF FINDINGS

Not all issues reflected in the interviews and questionnaires have been included in the presentation of findings and discussions. Only issues strongly relevant to the study have been considered. Data was presented according to the set objectives.

Objective 1: Factors influencing the use of Lesson Study in improving learner performance in Mathematics.

Majority of the respondents at 86% indicated that poor academic performance in Mathematics and Sciences was the reason for the introduction of

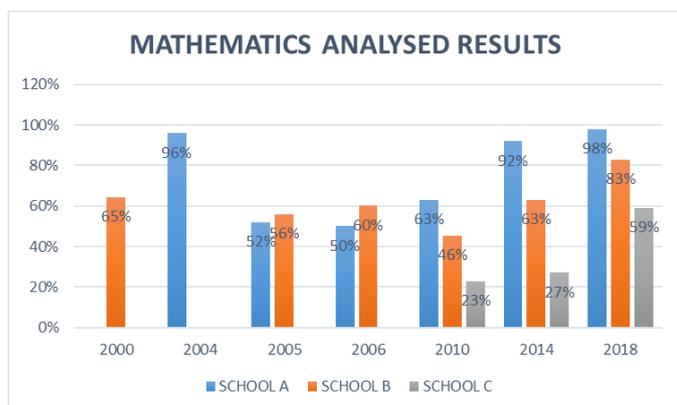
Lesson Study while 5% of the respondents had no idea about Lesson Study program and 9% of the respondents in this category indicated that Lesson Study program was introduced so that some people can gain some coins (money).



Objective 2: Challenges teachers of Mathematics encounter in practicing Lesson Study in quest to improve learner performance in Mathematics.

The data collected from questionnaires and interviews conducted in this study revealed that teachers of Mathematics were facing serious challenges and needed effective strategies to address them so as to improve learners' academic performance in Mathematics in schools through Lesson Study program. From the findings, the greater challenges affecting the teachers when conducting Lesson Study programs were, teachers' negative attitude towards Lesson Study programs, lack of support from the central administration for Lesson Study programs, poor leadership and management skills in schools, learners' negative attitude towards Mathematics and big numbers of learners in classes (poor teacher – pupil ratio), long syllabus and the reduction in periods allocated to the subject from 7 to 6 per week.

Objective 3. Has there been an improvement in learner performance in Mathematics after the introduction of Lesson Study

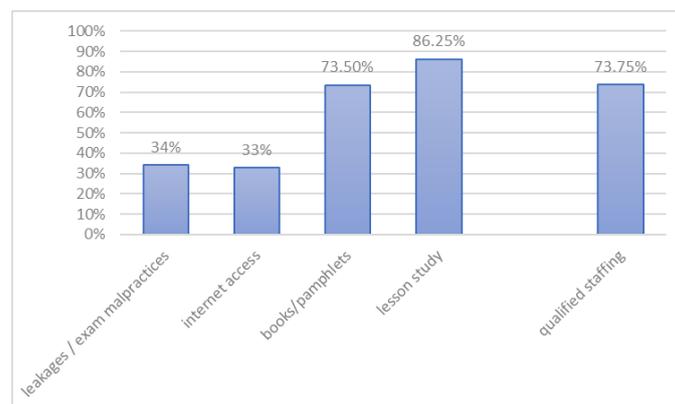


The collected data and analysed results collected revealed that there has been an improvement in learners' academic performance in Mathematics after the introduction of Lesson Study in schools. To ensure confidentiality note that names of the sampled schools were coded using pseudonyms prior to beginning the analysis of the data. However, respondents attributed the improvement in learners' academic performance in Mathematics to several factors not only Lesson Study as presented later.

Other Factors contributing to improved learner performance in Mathematics

The responses from the questionnaires and interviews revealed that apart from Lesson Study being one of the factors attributed to the improved learner academic performance in Mathematics the following were also revealed as other factors attributed to the improved learner academic performance in Mathematics; examination leakages and malpractices, internet access by learners, availability of well summarized books and pamphlets and improved well qualified teaching staff in schools.

Factors behind the improved learner performance in Mathematics.



V. DISCUSSION AND CONCLUSION

The discussion of the findings from the study were presented by addressing each research objective. It started by looking at the factors that influence the use of Lesson Study in improving learners' academic performance in Mathematics. Then discussed the challenges encountered by teachers of Mathematics in practicing Lesson Study in quest to improve learners' academic performance in Mathematics and discussed the factors contributing to the improved learner performance in Mathematics after the introduction of Lesson Study program. The findings from the study have revealed that though there are a number of factors that lead to the introduction of Lesson Study program in schools, the study established that poor learner performance in Mathematics was the main factor behind the introduction of Lesson Study program in schools. The study further established that teachers of Mathematics face some challenges which if not addressed could hinder conducting of Lesson Study programs in schools effectively such as negative attitude by teachers towards Lesson Study; lack of support from administration to effectively conduct Lesson Study programs; overcrowded classroom due to over enrolment; authoritarian type of leadership in some schools and learners' negative attitude towards Mathematics as a subject. Finally, it was revealed that the current improvement in

learners' academic performance in Mathematics could not only be attributed to the introduction of Lesson Study programs in Mathematics but there were other contributing factors behind the improvement of learners' academic performance in Mathematics as suggested by the respondents such as;

1. Availability of summarized books and pamphlets in an open market

The findings from the study show that the quality of education requires the availability and use of teaching and learning materials especially books. The study revealed that the current situation in schools is that educational facilities such as teaching and learning materials are not readily available for effective teaching and learning in schools. Most of the teaching and learning going on in schools is based on theory (M.O.E, 2013). Teachers in all the three schools involved in the study supported the above finding and remarked that, "lack of teaching and learning materials affect teaching and learning." The study established that teachers rely on handouts and pamphlets from learners. The study revealed that most learners were in possession of well summarized pamphlets which were helping them in their studies. The findings from the study established that these pamphlets are readily available on open market and there is no restriction for duplication by photocopying which is very cheap. From this observation, it can be argued that though there is lack of teaching and learning materials in most schools, learners were able to access well summarized pamphlets and answered past papers on an open market. From the findings above it could be concluded that availability of well summarized pamphlets on an open market could lead to improvement of learners' academic performance in Mathematics.

2. Access to internet (you tube lessons)

The study also found out that the coming of easy access to internet via smart phone has also

contributed to learner academic performance improvement. Learners revealed that lessons on you tube internet supplement classroom lessons. They revealed that they understand better Mathematics lesson after watching you tube lessons where alternative methods are explained to arrive at solutions to most Mathematical problems. Teachers of Mathematics too revealed that they do consult posted lessons on you tubes for easy understanding than consulting books. However, the findings revealed that despite learners finding smart phones as supplementary reference study tool, phones were not allowed in schools. The study further revealed that phones were not allowed in schools because learners were misusing the phones by chatting on WhatsApp and face book. The study further revealed that there were reported cases of learners accessing illicit and obscene materials on phones. From the above findings, it could be clear that access to internet might be also one of the factors leading to improved learner performance in Mathematics as compared to early 2000 where majority of the learners had no access to internet.

3. Examination Leakages and Malpractices

The findings from the study indicated that in the recent past there has been examinations leakages and malpractices being practiced by most learners. Teachers in all the three schools involved in the study supported the above finding and remarked that;

"most learners rely on examinations malpractices and leakages to pass the examinations and at times examination leakages could match with real or actual examinations hence, some learners performing well in final examinations."

The study also established that findings from learners too revealed that learners themselves agreed relying on examination malpractices and examination leakages. One of the district education officials sampled revealed that in 2018, grade 12 examinations were postponed and grade 9 examination suspended due to rampant examination

leakages which were reported being posted on social media (Zambian Watchdog). On 23th October, 2018, Honourable Minister of General Education David Mabumba announced to parliament the suspension of grade 9 examination and postponement of grade 12 examination due to examination leaked 2018 examination papers (Zambian Parliament: 2018). The findings from the study show that it might be true that the improvement in learner academic performance in Mathematics could also be attributed to rampant examination leakages.

4. An increase in number of specialized qualified teachers of Mathematics.

From the findings, some respondents observed that in the early 2000 there were very few qualified teachers of Mathematics as most of the qualified teachers of Mathematics by then were reported to be working as expatriates in other countries like Botswana and South Africa. The study revealed that schools only relied on primary school teachers who were seconded to teach at secondary school and some Diploma-holder teachers also seconded to teach senior grades where they were not qualified to teach hence low learners' academic performance in Mathematics. The findings established that currently schools are well staffed with well qualified and specialized teachers and most of them are trained Examination Council of Zambia examiners. With these well qualified and specialized teachers it could be argued that learners' academic performance in Mathematics has improved because of the availability of well qualified and specialized teachers in secondary schools.

Following the above highlighted factors, the findings dismiss the allegation that current improvement in learners' academic performance in Mathematics being attributed to the introduction Lesson Study program alone but there are other factors involved as highlighted above.

CONCLUSION

The study has established and enlightened interested people and other stake holder on the influence of Lesson Study on learners' academic performance in Mathematics in Zambian secondary schools. More specifically, the Lesson Study professional development being examined focused on how the Lesson Study professional development has influenced learners' performance in Mathematics since its implementation and furthermore, the outcome expectancy viewed through an in-depth examination of the entire process, grounded in actual end of secondary school courses. This Lesson Study professional development program was provided through support from the Japanese International Cooperation Agency (JICA) in conjunction with the Ministry of Education (MOE: 2010). This Lesson Study professional development was centered around Mathematics and Sciences instructions that embedded on the learners' poor academic performances in the two subjects. The Ministry of Education incorporated the Lesson Study profession development model to provide a team-centered approach to support teachers as they align their teaching instructions. This case study integrated both qualitative and quantitative data collection methods to assess the influence of Lesson Study on improving learners' academic performance in Mathematics.

The researcher anticipates the findings of this study would lead to a deeper understanding of the influence of professional development, involving Lesson Study program on improving learner' academic performance in Mathematics. In addition, the study would fill the gap in research on the influence of Lesson Study with regard to improving learner academic performance by utilizing Lesson Study professional development strategies. Finally, the researcher hopes to contribute to the existing literature by addressing significant issues within the field of research on the influence of Lesson Study

on learners' academic performance addressing several issues related to Lesson Study programs and outcome expectancy measure.

In this study data was collected through interviews and questionnaire. The interviews conducted and responses from questionnaires revealed that indeed Lesson Study has a role to play in improving learner academic performance in schools. The strategy employed has been to use democratic tenets found in Lesson Study where by teachers in the department work collaboratively to promote better delivery of lessons in schools. Furthermore, the findings revealed that Lesson Study involves participation of whole, if not Lesson Study program is likely not to achieve the intended goal of the program. This in other words means that both teachers and the school administration must work together whereby school administrations provides all the necessary requirements for teachers to hold successive Lesson Study programs.

Responses from the interviews and questionnaires also revealed that Lesson Study program in schools encounters many challenges. From the findings on the challenges affecting Lesson Study programs in schools included: negative attitude by teachers towards Lesson Study; lack of support from administration to effectively conduct Lesson Study programs; overcrowded classroom due to over enrolment; authoritarian type of leadership in some schools and learners' negative attitude towards Mathematics as a subject. These challenges threaten effective conducting of Lesson Study programs in schools.

The responses from interviews and from questionnaires in this study further revealed that Lesson Study programs might have positive influence on improving learners' academic performance in Mathematics in schools and at national level at large in the following ways: promotion of in-service learning, cooperation among teachers in the department, teachers sharing idea and skills, promotion of consultative working

culture in schools which promotes oneness and openness among teachers. There is also effective engagement/participation from all stakeholders in service delivery in schools, district, province and nation at large. Lesson Study fosters the skills and virtues necessary for all teachers encompassing critical thinking and open -mindedness. Education is central to achieving the objectives of the Sustainable Development Goals of 2030 and Lesson Study is going to play a key role in this development in our schools.

The study further revealed that continuous training of teachers and induction of novice teachers (newly deployed teachers) and engaging them in Lesson Study programs could produce well informed teachers in much better administered schools. In democratic societies like schools, teachers and school administrators are key players in the formulation and implementation of Lesson Study program. Successful school administrators (head teachers) are those who develop a common and shared school vision and promotion of a culture of collaboration, support and trust with the people he/she is working with. This research has therefore met all the specific objectives which were set.

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