

A study on change of mathematics teachers in Zambia: Focus on lesson planning on teachers' group discourse in the lesson study

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Introduction

After the EFA conference in 1990, the transition to student-centered teaching was strongly promoted in developing countries through discussions about the quality of education. However, UNESCO (2011) pointed out problems with student-centered teaching methods in Sub-Saharan Africa, where group work and discovery learning are only a formality. They mentioned that teachers of developing countries have cultural and historical issues.

In the Republic of Zambia, Lesson Study Support Project was started by JICA (Japan International Cooperation Agency) technical cooperation in 2005. The main purpose of this project was to promote implementation of Lesson Study through existing In-service training program. The project contributed to disseminate the methodology of the Lesson Study to stakeholders. However, Ministry of Education mentioned "Most of the lessons that have been done in the current Zambia is a teacher-centered". Lesson practice of Zambia has not changed into student-centered yet.

In Indonesia, Tanaka (2011) pointed out other problems: lessons are always in the same "form" that is focused on using charts, concrete objects, and group activities. The lesson improvements on the Lesson Study might be limited by the accessibility of teaching materials and colleagues' abilities.

In this paper, the author clarify how teachers can change by paying attention to lesson plans and teachers' group discourses during the Lesson Study. The results will contribute to making qualitative improvements in future Zambian teaching practices.

Expected teachers' change

In Zambia, the change in teaching practices from teacher-centered teaching to student-centered teaching is being expected through the Lesson Study. The term *student-centered* is beginning to be used in Zambia and is from a publication of the third education policy document called "Educating Our Future" (MOE, 1996). However, the intention and details of the term have not been clarified. The teacher's manual "Teaching Skills Book" (MOE, 2009) published by the Ministry of Education states the following.

«In the long run followed by series of Lesson Study and implementation in class, it is hoped that the teachers will come up with proper strategies of learner-centered teaching and learning as there is no clear position on this matter in Zambia. Also worth noting is the fact that the learner-centered learning varies from country to country and culture to culture. It is envisaged that, in the long run, Zambia will be in the position to define its own learner-centered teaching and learning through our effort for developing better lessons for the pupils.»

As seen from this statement, although Zambia intends to have learner-centered lesson, they do not have a clear definition or strategy in place for the specifics of teaching and learning. The Zambian government hopes that learner-centered lessons are different from country to country and from culture to culture, meaning that the teachers can produce their own works using the Lesson Study.

In the background, Nonaka (2013) tentatively described “learner-centered” lessons in Zambia using the following three elements: 1) Lesson plan written from a learner’s point of view, 2) Activities motivated by core questions, and 3) Configuring knowledge through interactions with others. By analyzing these three perspectives, it is clear that Zambian education policy have not determined the core principles of learner-centered lessons. Although members in the field of education are trying to respond to requests from education policies, the author has identified the core problem: specific way of improvement remain unclear in Zambia.

By analyzing experimental teaching, Kambara (2014) revealed the reality of teachers who are leading mathematics education in Zambia. One problem is that teachers are focusing on external activities rather than the internal thinking of students. The perspective behind the lesson is in transition: from the “correct answer principle” to a truly “learner-centered principle.”

Conversely, by understanding Zambian teachers’ actual learning situations using lesson diaries, Kinone (2012) has Page: 276 showcased the current reality of the reflection on improvements being made in these lessons.

From these previous studies it is possible to understand the current situation and why teachers have not been able to transition to “learner-centered” teaching practices:

- 1) Concrete images of learner-centered lesson have not been clarified by teachers;
- 2) Teachers are focused on external activities instead of the internal thinking of students;
- 3) Teachers’ reflections maintain an educational outlook that focuses on knowledge transmission.

There is the need for clarification, which can be achieved by analyzing the Lesson Study in practice and by determining whether its continued use can address the existing problems.

Analysis on the lesson study

The Lesson Study is divided into three steps 1) Planning, 2) Research lesson, and 3) Reflection. The records of Lesson Study are commonly studied using a video camera and voice recorder. However, it is difficult in that it demonstrates the validity of the evidence for analyzing the lesson. In this paper, the author clarifies the actual Lesson Study by analyzing the lesson plan and then analyzing planning through discourse analysis. The creation of a lesson plan is the first step in this process and influences the future success or failure of the Lesson Study cycle. It is also easy to compare and analyze lesson plans because they are put on paper in a particular lesson planning format.

Planning is an important stage for producing change in teachers, specifically in the area of collaborative knowledge building. Methods of analyzing used in teachers' discourse was done in accordance with the researchers' interest, as nothing was particular one.

Investigation and analysis on change of mathematics teachers

In the analysis, the authors discussed the impact of the change of mathematics teachers on the Lesson Study provided in A basic school in Zambia, Central Province.

Outline of field work

This study conducted a field survey twice to capture medium-term changes in mathematics teachers. The first survey was in May, 2010, and the second survey was in February, 2012. The two surveys were spaced to ensure that the changes in mathematics teachers were not temporary. In the Zambian basic school semester system, one Lesson Study is conducted in each semester. These Lesson Study are conducted three or four times over the course of two years. A comparison was made of the two Lesson Study to identify whether the results of them had persisted. Table 1 provides an overview of the Lesson Study investigation of A basic school surveyed.

Table 1 Overview of Lesson Study investigation of A basic school

	May, 2010	February, 2012
Participants	5 mathematics teachers, principal, vice-principal and researcher	6 mathematics teachers and researcher
Target Grade	Grade 8	Grade 7
Unit	Fraction, percentage, ratio -Addition of fraction-	Addition of mixed fraction

This study targeted an area where the Lesson Study was introduced in advance in Zambia. Included in this school is teachers who have most often implemented Lesson Study in the country. These teachers have less than five years of experience all the way to twenty years of experience, making them mid-level teachers.

Given that the Lesson Study was conducted twice, the author was able to analyze the changes in mathematics teachers using participant observation and by recording videos during times of planning. The challenges and the future direction of the Lesson Study will be discussed. Changes will be identified by investigating the discussions and actions of the teachers group.

Results of lesson plan analysis on the Lesson Study

Here, the author compares the two lesson plans on the Lesson Study. The format of the lesson plans are used exactly the same things which are created by the teachers group. Table 2 is the contents.

The lesson processes of the two lesson plans were almost identical. The introduction stage consisted of a review. Lesson development stage one consisted of checking the solution for the example, and lesson development stage two consisted of group activities and exercises. In Zambia, there is a certain type of mathematics lesson and a lesson plan

has been prepared along with it. Although there is a slightly different description, the lesson plans were almost the same during the two years.

Table 2 Lesson plan of Lesson Study on A basic school

Lesson Stage	May, 2010	February, 2012
Introduction	The teacher will revise with the pupils on equivalent fractions. Give two equivalent fractions of $\frac{7}{9}$	Learners to read the question on the board and then identify the number i.e. improper, proper, mixed numbers $2\frac{1}{4}, \frac{15}{14}, \frac{2}{3}$
Lesson Development Stage 1	Teacher will put an already cut orange on the table and ask pupils to put the pieces or slices together to make a full orange. Thereafter, teacher will explain the following. a. $\frac{1}{4} + \frac{3}{4} = 1$ b. $\frac{1}{2} + \frac{2}{3} = \frac{3}{6} + \frac{4}{6} = \frac{7}{6} = 1\frac{1}{6}$	Teacher write example 7 on the board from Pp5 book pg.22 Breakthrough Mathematics. Teacher nominates a learner to do the example 7(b) on the board.
Lesson Development Stage 2	<u>Activity for the pupils</u> 1. Put learners in groups 2. Give them work and instructions 3. Secretaries to give reports 4. Consolidation of points <u>Work</u> Simplify the following a. $\frac{2}{9} + \frac{1}{9}$ b. $\frac{1}{3} + \frac{1}{2} + \frac{1}{6}$	<u>Group work</u> Teacher to give the following for learners to work out in groups. Check how the workers are working. Learners report back to the class. Teacher to consolidate the learners work (Lesson)
Summary & Conclusion	<u>Exercise</u> Simplify the following fractions a. $\frac{7}{12} + \frac{3}{12}$ b. $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5}$ c. $\frac{3}{4} + \frac{3}{5}$	<u>Class exercise</u> Learners to add the following individually in their exercise books. Teacher to go around checking learners' books: Share the answers as a class.

Results of teachers discourses on the lesson planning

Here, the author organizes the teachers' discourses of the first time and the second time shown in Table 3.

Discussion of teachers have been proceeded in a way that trace the description items of lesson plan. Teachers have much interest about general teaching method. On the other hand, it was few discourses about subject matter.

A common feature was that they have selected the examples and exercises by using the textbook as a reference. General teaching methods, such as group work and using concrete objects, spread out as a product of the Zambian Lesson Study. By using such general teaching methods, teachers believed that the lesson would be learner-centered. Any teachers didn't think about the outside of contents in the textbook. It means that Zambian teachers wouldn't improve subject matter knowledge any more.

Table 3 Flow of the teachers discourses on lesson planning

		Point of discussion	
		May, 2010	February, 2012
1	Select of teaching topic		Select of teaching topic
2	Select of teaching class		Select of teaching class
3	Description of rationale		Description of rationale
4	Description of objectives		Necessity of learning mixed numbers
5	Description of prerequisite knowledge and skills		Select of teaching contents
6	Discussion of teaching & learning materials		Description of objectives
7	Contents of introduction on lesson process		Description of prerequisite knowledge and skills
8	Discussion about the lesson process		Discussion of teaching & learning materials
9	Discussion about the example		Contents of introduction on lesson process
10	Discussion about the solution of example		Discussion about the example
11	Discussion about group work		Discussion about group work
12	Select of exercise		Select of exercise

Consideration

Zambian teachers aim simply to use the general teaching methods through the Lesson Study cycle. Lesson improvement is entirely focused on using charts, group activities, and concrete teaching aids. Therefore, the Lesson Study does not increase teachers' knowledgeability of the subject matter. Stated more concisely, teachers' lack of knowledge about the subject matter was not improved through the Lesson Study. If they continued the Lesson Study by focusing only on the teaching method, their lessons might not change.

In Japan, the Lesson Study can be considered teacher training and is used to improve teachers' knowledge of the subject matter. However, Zambian teachers are limited by teaching materials' accessibility and their colleagues' abilities. Therefore, there is a low possibility of Zambian teachers changing because of the Lesson Study.

In developing countries, research on subject pedagogy is underdeveloped. Therefore, there is no opportunity to use existing knowledge from past research. This situation makes it more difficult to effectively utilize the Lesson Study. In this paper, the author tried to capture the current status of the Zambian Lesson Study and attempted to clarify changes in mathematics teachers. However, after comparing the teachers in charge over the two-year duration, few differences were observed.

If summarizing components of the Lesson Study to activate the teachers' change, it would be as follows.

Components of the Lesson Study to activate the teachers' change

- 1) Enhancement of research on subject pedagogy (kyozai-kenkyu).
- 2) Perspective of curriculum development.
- 3) Reframing of learner-centered lesson.

This paper concludes with a summary of the components of the Lesson Study that is intended to stimulate change in teachers. Further research is necessary to refine these components. Many Zambian teachers believe that the Lesson Study is one of the best ways to improve teaching competency. In some cases, teacher change is possible in a short time period, such as changing general teaching methods to incorporate group work. In other cases, teacher change is impossible in a short time period, such as improved subject matter knowledge. In the Lesson Study in Zambia, upcoming issues include improving research on subject pedagogy (kyozai-kenkyu), developing perspectives on curriculum development, and reframing learner-centered lessons. These will also have a significant effect on the future development and continuation of the Lesson Study in Zambia.

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