



LESSON STUDY FOR IMPROVING MATHEMATICS TEACHING

Dipak Chavan, Ph. D.

Associate Professor, Tilak College of Education, Pune

Abstract

Interest in Japanese Lesson Study as a model for professional learning is growing worldwide. Many countries are using lesson study after the required adaptations. Lesson Study is a form of teacher professional development that originated in Japan and has been cited as a key factor in the improvement of their mathematics and science education (Stigler & Hiebert, 1999). The Lesson Study process included preparing, observing, and critiquing mathematics lessons in the context of solving fractions tasks. By conducting Lesson Study, we anticipated that these teachers would develop greater insight into students' mathematics, which would influence their classroom practices. Therefore, the researcher decided to see the impact of Lesson Study on the mathematics teaching.

The objectives of this research work were to orient the primary teachers regarding the process of Lesson Study, to implement lesson study for Mathematics in one standard (one unit) of Mathematics and to study the improvement in the Mathematics teaching. This is a qualitative research where Interview technique was used to collect the data from six Mathematics teachers directly involved in the process of Lesson Study. It was also supplemented with the lesson observations, group discussions and reflections on the teaching. The collected data was analysed qualitatively.

The lesson study group setting provided an encouraging environment and for the teachers to cooperate, collaborate, discuss and share their teaching knowledge and experiences. The participant teachers articulated that their content knowledge and pedagogical knowledge were enhanced and the classroom teaching of mathematics was improved.

Keywords: *Lesson study, Mathematics teaching*

1. Introduction:

India has strong mathematical traditions. Therefore, the world expects excellence in mathematics from Indians. But this may be an unreasonable expectation, since India is facing with problems of poverty and even universalising education is a challenge. Mathematics is often referred to as the 'killer' subject and in India a large number of children fail or drop out before completing elementary school because they cannot cope with the demands of the curriculum.

The Report 'Learning Without Burden' (Government of India 1993) had pointed out that children were in fact not 'dropping out' but were being 'pushed out', owing to the 'burden of non-comprehension', as a result of an irrelevant curriculum, distanced from the lives of the majority, and often rendered 'boring and uninteresting' by outdated teaching strategies. This

shift away from conventional ‘deficit theories’, which attribute children’s inability to learn to some ‘deficit’ in their mental abilities or their home background, has led to a critical review of the curriculum and the traditional teaching learning process based on rote memorisation of facts. The National Curriculum Framework (National Council for Education Research and Training [NCERT], 2005) guided the development of new curricula and textbooks based on how children actively construct knowledge, rooted in social and cultural practices. Teachers play vital role in this regard. They create interest among the students for learning Mathematics by using different teaching strategies, methods and innovations in their teaching. When the in-service teacher has provided an opportunity through the Professional Development Programmes then his can be possible. Lesson Study is one of the innovative teaching strategies in which can be used for improving Mathematics teaching.

Lesson planning in the Indian teaching practice is an isolated work. Preparing a lesson note is usually teacher’s individual task. It is teacher’s individual responsibility to decide how the lesson will be delivered, what materials to be used and how students be evaluated. This indicates that the efficiency and effectively of the learning experience is dependent on the teacher’s competency and quality. Teachers have substantial impacts on their students’ academic and life-long success. Teacher quality has significant effect on student achievement. The teacher’s academic advancement and professional upgrading activities contribute to an enjoyable and productive teaching (Bayocot 2014). To realize this, there should be an intensive, ongoing professional development model provided to teachers. Lesson study is not widely used in India for the Professional development of teachers.

Lesson Study is a form of teacher professional development that originated in Japan and has been cited as a key factor in the improvement of their mathematics and science education (Stigler & Hiebert, 1999). The Lesson Study process included preparing, observing, and critiquing mathematics lessons in the context of solving fractions tasks. By conducting Lesson Study, we anticipated that these teachers would develop greater insight into students’ mathematics, which would influence their classroom practices. Therefore, the researcher decided to see the impact of Lesson Study on the mathematics teaching.

2. Theoretical Background

The concept of Lesson Study was invented in Japan. It is a professional development practice that holds substantial promise for improving teaching and learning (Weeks & Stepanek, 2001). It is a cycle in which teachers work together to consider their long-term goals for students, bring those goals into life in actual “research lesson,” and collaboratively observe,

discuss, and refine the lessons (Lewis, 2002). Japan executed Lesson Study as a vital initiative for mathematics teacher development. It has been the crucial mechanism of professional development for teachers from the time when the Japanese public education system started (Lewis and Tsuchida 1998; Makinae 2010). It is a school-based collaborative activity for teachers mainly characterized by a continuous cycle of careful planning, judicious and attentive demonstrating and insightful improving of a lesson. It has a wide scope for on-site professional development process which involves a small group of teachers. It is a process in which teachers progressively strive to improve their teaching methods by working with other teachers to examine and critique one another's teaching techniques (Isoda et al.2007). Japanese teachers use Lesson Study as the core process of professional learning to continually improve the quality of educational experiences they provide their students (Iverson and Yoshida 2005).

The process of Lesson Study has following steps:

1. Forming a Lesson Study Group
2. Formulating objectives
3. Planning (for the Lesson)
4. Observing the Lesson
5. Conducting a Post-Lesson Reflection and Discussion
6. Revising the Lesson
7. Writing on the Lesson Study

3. Lesson Study Process:

A Lesson Study group consists of four to six teachers who meet after school. The Lesson Study process has three components:

- 1) Planning a lesson in a group
- 2) One team member teaching the lesson while the rest of the team members observe
- 3) Post-lesson discussion (reflection session) and improvement of the lesson

Lesson Planning

The lesson planning starts with the identification of the unit objective to better understand how the specific lesson will fit into a series of lessons. After this, the main objective of the lesson being planned is identified. As mentioned, inquiry-based learning (problem-based learning) is used in Japan schools. It starts by posing a problem to students, instead of feeding them information.

Conducting the Lesson

One of the participating teachers will be selected or may volunteer to conduct the lesson with a class. It may be a good idea to make this decision at the end of the planning session by rolling a dice to ensure the full cooperation of all the teachers to the last. The rest of the team will observe the lesson and make notes about learners' learning, actions and discussions during the implementation of the lesson. After the lesson, the teachers gather to reflect on the lesson. Their observational notes must be very specific and should record the learners' actions during a specific point in the learning process.

Post-lesson discussion and reflection session

In post lesson discussion the participating teachers a facilitator and an expert take part. The reason for selecting this format is that it creates a secure and safe environment for teachers. Because the role of external role players is limited, teachers feel safe to give their opinions and accept those of colleagues to improve the lesson.

3. Statement of Problem

Use of Lesson Study approach for improving Mathematics teaching and study its impact.

4. Objectives

The objectives of this research work were

1. To orient the primary teachers regarding the process of Lesson Study
2. To implement lesson study for Mathematics in one standard (one unit) of Mathematics
3. To study the improvement in the Mathematics teaching through Lesson Study

5. Research Questions

The researcher has following questions in his mind regarding this research work.

1. How can we orient the primary teachers regarding the process of Lesson Study?
2. How to implement lesson study for Mathematics teaching?

3. What is the Impact of lesson Study in the Mathematics teaching?

6. Research design

As the researcher was interested in teachers' learning, a qualitative case study approach was adopted for this work. The programme of Lesson Study team was conducted and a large amount of qualitative data in the form lesson observations, group discussions and reflections on the teaching was collected.

7. Participants

Six experienced Mathematics teachers directly including Headmaster and one expert who were directly involved in the process of Lesson Study are the participants for this study. The Students from standard seven for Mathematics subject from Balaji Madhyamik Vidyalaya Dhnkawadi, Pune were selected for Lesson study. The Unit – Laws of Indices was decided for teaching by Lesson study approach.

8. Tools and techniques for data collection

This is a qualitative research where lesson observations, group discussions and reflections on the teaching was used to collect the data from six Mathematics teachers directly involved in the process of Lesson Study. The collected data was analysed qualitatively.

9. Analysis and Interpretation

According to the teachers, the orientation regarding the process of Lesson Study was fruitful because with the help of that knowledge they were able to plan and conduct the Lesson study effectively. The lesson study group setting provided an encouraging environment and for the teachers to cooperate, collaborate, discuss and share their teaching knowledge and experiences. The participant teachers expressed that their content knowledge and pedagogical knowledge were enhanced and their classroom teaching of mathematics was improved.

According to them, the aims and objectives of this Lesson Study team were making students more active participants in class. The topic was laws of Indices as this was considered difficult for students. Teachers had explained students the content and handed out a worksheets.

Teachers' role: The teachers realized that there way of teaching very much centered on them and that they had a tendency of *explaining* content instead of *engaging* students in learning activities. So teachers should engage the students along with explaining the content. Students can do much on their own.

Group work: Group work was not a common strategy for teachers. When the use of groups was discussed regularly asked how it would work out in practice. Students composed their

own groups, finalized their roles in group, present and try to and explain the results of group work.

Teaching order: Initially teachers wanted to firmly hold on to the textbook. Finally they agreed to change the teaching order from the textbook and experienced that doing this opened new ways to discuss and connect the content.

Topic-specific issues: Teachers had taught their students a specific approach for problem solving by using the laws of Indices. However, the problem solving is not as easy as it looks, students need a number of steps they understand in order to solve an exercise. Teachers realize that the guidance they had given their students was insufficient.

10. Conclusions

According to the teachers,

1. The orientation regarding the process of Lesson Study was fruitful because with the help of that knowledge they were able to plan and conduct the Lesson study effectively.
2. The lesson study group setting provided an encouraging environment and for the teachers to cooperate, collaborate, discuss and share their teaching knowledge and experiences.
3. The participant teachers expressed that their content knowledge and pedagogical knowledge were enhanced and their classroom teaching of mathematics was improved.
4. The aims and objectives of this Lesson Study team were making students more active participants in class.

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