# Lesson Study for Learning Community in Mathematics Learning: An Overview of Implementation in Elementary Schools

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**Abstract.** The results of the Minimum Competency Assessment in the numeracy category in 2022 for elementary school students nationally show that only 46.67% achieved the minimum competency set by the Indonesian government. These results indicate that mathematics learning needs to continue to be improved. One way is using varied models, methods, or media in classroom learning. This research aims to analyze the implementation of Lesson Study for Learning Communities in improving student learning processes and outcomes in mathematics subjects at SD Negeri 47 Parepare. The research method used is a qualitative approach with a case study type. The primary data for this research was obtained from five class teachers at SD Negeri 47 Parepare, which is the partner school in this research, as well as a lecturer from Universitas Negeri Makassar. This research activity was carried out in four cycles over approximately three months. The research results show several findings. First, there was an increase in the quality of the mathematics learning process during the implementation of Lesson Study for Learning Community at SD Negeri 47 Parepare, which can be seen from the learning process during the four lesson study cycles. Second, collegial collaboration between teachers and lecturers has been realized and contributed significantly to improving the quality of mathematics learning at the school. This collegial collaboration pattern is visible during lesson planning activities and during reflection, as well as during the implementation of learning (open lesson). Based on these findings, several essential recommendations need to be considered by various parties related to mathematics learning in elementary schools.

**Keywords:** Lesson Study, Learning Community, Mathematics Learning, Elementary School

## 1 Introduction

Based on the results of the 2023 Minimum Competency Assessment for the numeracy section, 60% of SD 47 Parepare students have achieved minimum competency in the medium category. This is an increase of around 50% from the previous AKM results,


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which only achieved a score of 1.65 in the category still below minimum competency. Students' numeracy skills, especially arithmetic or mathematics skills, are not only a problem for SD 47 Parepare students but are a national problem even at all levels of education. Nationally, the AKM results for primary school level in 2022 show that only 46.67% of students have numeracy competencies above the minimum, an increase of 16.01 from 2021 (30.66%) [1].

The presence of data showing that elementary school students' basic mathematics abilities are still low is a severe problem in education. This problem can have several contributing factors, and a practical solution must consider various aspects. One of the factors that can influence elementary school students' low basic mathematics abilities is the teacher's ability to use appropriate methods so that students are motivated and happy to participate in learning.

Various efforts can be made to improve the quality of Mathematics learning, one of which is through the Lesson Study for Learning Community activity format. Lesson Study, often also called instructional study, is an approach that originated in Japan and has become famous throughout the world as an effective method for improving learning and teaching. Lesson study was first practiced and developed by education teachers based In Japan and called the term kenkyuu jugyo. Makoto Yoshida is a person who is considered an excellent service in developing kenkyuu jugyo in Japan and US in a way persistent developed and popularized by Catherine Lewis, who has conducted research on lesson study in Japan since 1993 (Nursa'ban, 2020).

The main aim of Lesson Study is to improve the quality of teaching and learning. In its implementation, teachers work together to plan, observe, and reflect on lesson implementation systematically so that they can identify weaknesses in their teaching, identify problems and obstacles, and provide each other with ideas and solutions to overcome them in order to improve their learning [3], [4]. Next, lesson study also emphasizes collaboration between teachers. That is, they work together to design lesson plans, observe their implementation, and discuss the results so that they can share experiences and knowledge and learn from each other [5].

Based on the previous description, it is crucial to conduct research that will reveal the implementation of lesson study in mathematics learning in elementary schools to improve the process and outcomes of mathematics learning.

## 2 Method

This research aims to describe and analyze lesson study activities carried out collaboratively between SD 47 Parepare teachers and Universitas Negeri Makassar lecturers. Five class teachers were targeted for mentoring or partner teachers. The researcher attempted to explain and analyze various findings in this activity, which were directed at two research questions. First, how is Lesson Study for Learning Community implemented to improve the quality of Mathematics learning? Second, what is the role of teacher and lecturer collaboration in improving the quality of Mathematics learning in the context of Lesson Study for the Learning Community?

This research adopts a qualitative approach with a case study type of research. In this qualitative research, the focus is given to three main characteristics, namely, emphasis

on natural aspects, in-depth descriptions, emphasis on processes, inductive methods, and efforts to find meaning in the data [6]. This research method follows a case study framework, which aims to understand the phenomenon being studied through two main questions: "how" and "why" [7]. This research focuses on a single case study design that examines implementing a lesson study carried out collaboratively by teachers from SD Negeri 47 Parepare and lecturers from Universitas Negeri Makassar.

Data collection in this research involved three main techniques, namely observation, interviews, and documentation. Observations focused on lesson study activities at SD Negeri 47 Parepare and Universitas Negeri Makassar. The main targets of the observations included everything related to lesson study, such as lesson planning, open lesson implementation, and reflection sessions. The interviews in this research were unstructured and carried out through informal conversations or discussions in reflection forums. The primary informants in the interviews were five partner teachers from SD Negeri 47 Parepare who were involved in four lesson study cycles and had in-depth knowledge of the ongoing lesson study process. Documentation techniques are used to review various documents, including learning implementation plans made by teachers, open learning observation sheets, notes from reflection discussion sessions, student worksheet results, student assignments such as papers or data collection reports, as well as various other documents relevant to the research focus.

# 3 Results and Discussion

## 3.1. Results

Lesson study activities took place at SD Negeri 47 Parepare for three months, from July to September 2023. During this period, four lesson study cycles were held. Each cycle consists of the lesson plan, open lesson, and post-lesson discussion (reflection) stages. The following is a timetable for four cycles.

**Table 1.** Activity agenda for each cycle.

| Activity | Cycle 1 | Cycle 2 | Cycle 3 | Cycle 4 |
|---|---|---|---|---|
| Lesson Plan | July 20, 2023 | August 4, 2023 | September 4, 2023 | September 25, 2023 |
| Open Lessons | July 27, 2023 | August 12, 2023 | September 6, 2023 | September 29, 2023 |
| Post Lessons | July 29, 2023 | August 22, 2023 | September 7, 2023 | September 30, 2023 |

**First Cycle**

Lesson plan activity in cycle 1 decided that the open lesson activity would be held on July 27, 2023, with the model teacher being Mrs. Madinah, S.Pd. Another decision is that the material taught is "understanding simple fractions and their use in solving problems" in class III. Next, other partner teachers and Universitas Negeri Makassar

lecturers will act as observers. Before carrying out a lesson plan, the model teacher must create a learning tool (lesson design) and then consult with other partner teachers and supervisors from Universitas Negeri Makassar.
The open lesson is held at exactly 7.30 on the previously determined date. The activity lasts for 70 minutes, carrying out all stages of learning, starting from initial activities and core activities to closing activities. All activities are carried out based on the learning implementation plan that has been prepared previously. From the beginning to the end of the lesson, all observers make observations and record the activities of teachers and students during the learning process, both positive things (discoveries of innovations) and negative things (weaknesses).
The post-open lesson activity is a reflection (see), which was held on July 29, 2023. Each observer will present the findings or results of observations during the lesson. The findings presented are positive things or innovations that have just been seen and negative things done by students or groups of students that can disrupt learning activities or the process of students' understanding of the learning material provided.
The findings obtained in cycle 1 are as follows: 1) Provide contextual examples of fractions (pizza cake and apples), 2) Provides singing videos about fractions, 3) Give students only one worksheet for each group (triggers a commotion to work on), 4) The distribution of group members is not homogeneous (some students in the group play), and 5) Small classrooms (limited movement of each group and teacher to provide guidance)
Based on the results of the reflection above, the model teacher will revise the lesson design based on suggestions from observers and will be used as a basis for implementing learning in the next cycle.

**Second Cycle**

The next activity is lesson plan cycle two on August 4, 2023. In this activity, it was decided that the open lesson activity was held on August 12, 2023, with the model teacher being Mr Muh. Idrus, S.Pd. Another decision is that the material taught is "understanding equivalent fractions" in class III. Next, other partner teachers and Universitas Negeri Makassar lecturers will act as observers. Before carrying out a lesson plan, the model teacher must create a learning tool (lesson design) and then consult with other partner teachers and supervisors from Universitas Negeri Makassar.
The open lesson was held at 7.30 on August 12, 2023. The activity lasted for 70 minutes, carrying out all stages of learning, starting from the initial activities core activities to the closing activities. All activities are carried out based on the learning implementation plan that has been prepared previously. From the beginning to the end of the lesson, all observers make observations and record the activities of teachers and students during the learning process, both positive things (discoveries of innovations) and negative things (weaknesses).
The post-open lesson activity is reflection (see), which was held on August 22, 2023. Each observer will present findings or results of observations during the lesson. The findings presented are positive things or newly seen innovations and negative things done by students or groups of students, which can disrupt learning activities or the

process of students' understanding of the learning material provided. The findings obtained in cycle 2 are as follows:1) Start learning by singing the struggle song from the video, 2) Providing contextual examples of similar fractions (white bread), 3) Provides another version of the singing video about fractions, 4) Providing student worksheets for each person (repair cycle 1), 5) Students practice cutting the bread into similar parts themselves (using a knife as a bread-cutting tool is very dangerous for students), 6) The model teacher does not confirm students' answers to the worksheet assignments given, and 7) Small classrooms (limited movement of each group and teacher to provide guidance).

Based on the results of the reflection above, the model teacher will revise the lesson design based on suggestions from observers and will be used as a basis for implementing learning in the next cycle.

**Third Cycle**

The initial activity in the third cycle is a lesson plan, which was implemented on September 4, 2023. Some of the resulting decisions include the following: The open lesson activity was held on September 6, 2023, with the model teacher being Mrs. Sarah, S.Pd., and the material taught is "knowing flat shapes and their properties" in class V. Next, other partner teachers and Universitas Negeri Makassar lecturers will act as observer. Before carrying out a lesson plan, the model teacher must create a learning tool (lesson design) and then consult with other partner teachers and supervisors from Universitas Negeri Makassar.

Open lesson is held at exactly 7.30 on the specified date. The activity lasts for 70 minutes, carrying out all stages of learning, starting from initial activities and core activities to closing activities. All activities are carried out based on the learning implementation plan that has been prepared previously. From the beginning to the end of the lesson, all observers make observations and record the activities of teachers and students during the learning process, both positive things (discoveries of innovations) and negative things (weaknesses).

The post-open lesson activity is reflection, which was held on September 7, 2023. Each observer will present findings or results of observations during the lesson. The findings presented are positive things or newly seen innovations and negative things done by students or groups of students, which can disrupt learning activities or the process of students' understanding of the learning material provided. The findings obtained in cycle 3 are as follows: 1) Providing contextual examples of flat shapes (blackboard, floor tiles), 2) Provides singing videos about flat shapes, 3) Provide student worksheets for each student (repair cycle 1), 4) Homogeneous division of group members (improvement of cycle one and cycle 2), 5) Practice/find out for yourself the parts of flat shapes and their properties by using pictures from cardboard that have been cut out. (repair cycle 2), 6) Confirming student answers (repair cycle 2), 7) Students sit in groups that do not face the blackboard (causing students to have difficulty turning around when the teacher explains) and 8) Small classrooms (limited movement of each group and teacher to provide guidance).

Based on the results of the reflection above, the model teacher will revise the lesson design based on suggestions from observers and will be used as a basis for implementing learning in the next cycle.

**Fourth Cycle**

Cycle 4 activities was carried out on campus with lecturer-model teachers implementing the 2023 KDS Programs. Lesson 4 is expected to be a learning/experience for partner teachers to come to see lectures on campus with lecturer model teachers teaching their students. Activities on campus will minimize all the gaps found in cycles 1 to 3 so that partner teachers gain new knowledge or experience in learning. On September 25, 2023, lesson plan activities were carried out for cycle 4. The results of the decisions were: The open lesson activity will be held on September 29, 2023, with model teachers from the Universitas Negeri Makassar. The activity will be held on the Universitas Negeri Makassar campus; the material taught is "Finding the formula for the perimeter and area of a rectangular flat shape." Next, another partner teacher will act as an observer. Before carrying out a lesson plan, the model teacher must create a learning tool (lesson design) in the form of a Semester Learning Plan, which has been designed for the needs of one semester. The lecturer only makes a learning action plan and then consults with all partner teachers.

The open lesson is held at 13.30, according to the lecture schedule for class C22B students in the third semester of Universitas Negeri Makassar, on the specified date. The activity lasts for 2x50 minutes (2 hours) by carrying out all stages of learning, starting from initial activities and core activities to closing activities. All activities are carried out based on the action plan that has been prepared previously. From the beginning to the end of the lesson, all observers make observations and record the activities of teachers and students during the learning process, both positive things (discoveries of innovations) and negative things (weaknesses).

The post-open lesson activity is a reflection (see ), which was held on September 30, 2023. Each observer will present findings or results of observations during the lesson. The findings presented are positive things or innovations that have just been seen and negative things done by students or groups of students that can disrupt learning activities or the process of students' understanding of the learning material provided. The findings obtained in cycle 4 are as follows: 1) Learning is carried out using the discovery learning model. (students find the formula for the area and perimeter of a rectangular flat shape for themselves), 2) Excellent and spacious room and group seating arrangement (improvement cycle 1-3), 3) Each group presents its findings with a learning video, and the others listen seriously, 4) Giving technology-based quizzes using the Quiziz platform, each group answers by scanning a barcode (students do not need to use the internet to answer the questions given), 5) Distribution of group members fairly and proportionally (an improvement from the previous cycle).

Based on the results of the reflection above, the model teacher will revise the lesson design based on suggestions from observers and will be used as a basis for implementing subsequent lessons.

### 3.2. Discussion

Improving the quality of Mathematics teaching at SD Negeri 47 Parepare can be recognized from various aspects observed during lesson study. Several elements that show this quality improvement include the teaching methods applied, the use of learning aids, the use of worksheets by students, the use of games in the learning process, and the behavior of teachers and students during the learning process. All of these factors indicate a quality improvement that can be directly observed. However, what is most important is a change in the teacher's perspective in dealing with and implementing Mathematics teaching in the classroom.

When implementing lesson study, the first change observed is an increased use of learning models. Previously, teachers used monotonous learning models, where teacher exposition was the general approach. After going through lesson study, teachers received input and suggestions from fellow teachers and accompanying lecturers, who ultimately encouraged them to experiment with learning models that are more innovative, creative, effective, and enjoyable for students. During the four rounds of the cycle, teachers began to apply various contextual learning models. Despite this, teachers still need to eliminate using the expository model. Therefore, in certain situations considered relevant and necessary, teachers still use a lecture approach with various variations such as question and answer and games.

The term "learning model" used by teachers in this research refers to the general pattern of actions of teachers and students in the teaching and learning process. In the view of Joyce, Weil, & Calhoun, when teachers help students gain information, ideas, skills, values, ways of thinking, and goals to express themselves, they teach students how to learn [8]. Therefore, the term "learning model" in this research is considered similar to "learning strategy," so it shows that the term "teaching model" used by Bruce Joyce and Marsan Weil refers to the same concept as learning strategy [9].

As previously stated, one of the positive developments in the quality of Mathematics learning that occurred during lesson study at SD Negeri 47 Parepare was the adoption of a contextual learning model. The contextual learning model is a comprehensive educational approach that encourages students to understand subject matter by relating it to the context of their daily lives, including personal, social, and cultural aspects [10]–[12]. In this way, students will have knowledge that can be applied flexibly from one situation or context to another [13], [14]. It is also described that contextual learning is a comprehensive system where various components are interrelated so that when these components are connected, the results produced far exceed the results that might be obtained if these components were taught separately [15]. Therefore, in the learning process, it is essential always to relate what is taught in the classroom to real-world situations experienced by students in the family and community environment.

In the first cycle, contextual learning is manifested in activities to recognize ordinary fractions and mixed fractions. Learning activities are designed so that students can identify, recognize, and differentiate ordinary fractions and mixed fractions, which are basic mathematical concepts leading to the following material. In the second cycle, contextual learning is realized from the task of knowing similar fractions by showing contextual media or materials so that they are understood and comprehended, not just

memorized. In the third cycle, contextual learning is formed in activities to recognize various types of flat shapes and their properties. In the fourth cycle, contextual learning is realized by finding the formula for the perimeter and area of a rectangular flat shape. One form of improving the quality of Mathematics learning during lesson study activities at SD Negeri 47 Parepare is the use of student worksheets prepared by the teacher for each learning session. Teachers can design challenging tasks in these worksheets, providing students with activities that encourage them to solve problems creating a precious learning experience. When students are given assignments with high learning value or challenges, this will provide motivation and enthusiasm for their learning process. On the other hand, learning that only asks students to copy text from textbooks into worksheets cannot be considered high-quality learning [3], [4].

The improvement in the quality of Mathematics learning achieved during the implementation of lesson study at SD Negeri 47 Parepare is also reflected in their ability to hold interactive and exciting learning. One way is through using games in the teaching and learning process. Perry and Archer distinguish two stages of play: the first aims to entertain children, while the second contributes to their education [16]. The games implemented in Mathematics lessons at SD Negeri 47 Parepare are included in the second category. This is because the teacher introduces the games and increases student motivation. Games introduced by teachers are used as a way to stimulate students' interest in the middle of delivering material or before giving assignments so that students become more enthusiastic in the learning process.

The culmination of all improvements in the quality of the Mathematics learning process depicted in the description above is reflected in the quality of interaction between teachers and students when learning occurs. Teachers are committed to teaching, involving lesson design practice in other classes before implementing open lessons. With quality learning designs, teachers can motivate students to study seriously and complete their assignments seriously. Improving quality in the design process, although not directly, can make a positive contribution in the form of improving student learning outcomes. For this reason, the design and learning process are essential things to pay attention to in lesson study. This is in line with the conclusions of the research, which shows that the main features of the planning process in lesson study must be paid attention to, including the focus on task design and research learning flow, and this is good advice for educators who want to improve lesson study [17].

The main aim of implementing lesson study for learning communities is to build cooperation and collaboration between teachers while still respecting the individual practical abilities of each teacher [4]. In implementing lesson study for learning communities at SD Negeri 47 Parepare, solid cooperation between fellow teachers has been formed. Teachers who embrace a collaborative learning culture tend to become better professionals so that a sense of professional togetherness among certain groups of teachers in certain schools or subjects will be formed, and there will be a mutual exchange of ideas, thoughts, and dialogue regarding teaching and start the process of improvement [4]. Collegial collaboration is formed through sharing experiences and dialogue between fellow teachers. Of course, the quality of this collegial collaboration will increase if the sharing and dialogue process also involves contributions from

educational experts in their respective fields, such as the role of accompanying lecturers in lesson study.

As explained in the data presentation, collegial collaboration between teachers and lecturers during the implementation of lesson study in Mathematics learning at SD Negeri 47 Parepare occurs mainly during the lesson planning stage and during the reflection stage, as well as during open lessons. During the lesson planning stage, teachers engage in intensive dialogue to design adequate learning plans and ensure that each student's learning rights are guaranteed. In the reflection stage, teachers also dialogue to share feelings and findings that emerge from the open lesson experience. From this process, the teachers involved carry out a collegial collaboration process in lesson study through intensive discussions, learning from each other contextual problems in classroom learning practices. In its concept, lesson study can be a contextual learning tool for teachers [18].

Regarding contextual learning through collegial collaboration in lesson study it is also in line with several previous research. The research concluded that through lesson study, a collegial collaboration between educators and the academic support development department, which was realized starting from planning, implementation, and observation (open class), reflection, and follow-up has contributed to improving the quality of learning [19]. Another study shows that qualitative and interpretive analysis shows the growing dynamics of lesson study learning, which can improve several fundamental aspects of collaboration, namely mutual encouragement and support, cooperation, and joint reflection [20].

## 4 Conclusion

At the end of this article, several things can be concluded as follows. First, the implementation of lesson study for learning communities at SD Negeri 47 Parepare has brought an improvement in the quality of Mathematics learning. This can be seen in the development of the learning process during the four cycles of lesson study implementation. During this period, learning was carried out using a contextual learning model, stimulating students to learn more effectively. Learning media was used with more variety, student worksheets were used to create a challenging learning atmosphere, games were applied to make learning more fun, and teachers and students showed totality in implementing learning. Second, collegial collaboration between teachers and lecturers has significantly improved the quality of Mathematics learning at SD Negeri 47 Parepare. This collaboration pattern occurs during the lesson planning, reflection, and open lesson stages. There is a joint learning process and active dialogue between fellow teachers and teachers and lecturers.

Based on the results obtained from the activities, it is recommended that the lesson study for learning community activities be extended to other teachers or other subjects and even to other schools. The spread of the lesson study for community virus will be one way to improve the quality of learning in the classroom and subsequently lead to a sustainable improvement in the quality of education in Indonesia. The next suggestion is that collegial collaboration in lesson study should not only involve fellow educators within a school but, at certain times, involve experts or researchers from outside. This

is in line with research which suggests the need to include researchers in the field of education in an organized manner in a collegial collaboration [21]. In this way, lesson study can be a means of continuous professional learning for teachers and provide insight into the importance of collaboration, collegial relationships, and changes in mindset about careers and teaching work as teachers. This insight is essential for understanding how professional development opportunities can be structured and facilitated to support professional learning through lesson study [22].

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