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Improving the Quality of Learning through Lesson Study in STEM-based Mathematics Learning in Elementary School

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Abstract

The implementation of the MEA in Indonesia does not only affect the economic sector. The world of education has an important role in welcoming MEA. There are 4 skills that students must have in welcoming MEA, namely 21st century 4C skills consisting of Creativity (creativity), Critical Thinking (Critical Thinking), Communication (Communication) and Collaboration (Collaboration). The learning problems faced in learning in elementary schools are that students are not ready to take part in learning so that teachers use a lot of time to provide concepts with the lecture method. This condition has an impact on students' lack of creativity in the material being taught, in the end most of the students face difficulties in doing assignments, exercises, especially thematic material. Currently, there is an approach that is believed to be able to improve students' 4C skills, namely the STEM (Science, Technology, Engineering and Mathematics) approach. STEM is a multidisciplinary approach in which students learn science, technology, engineering and mathematics in one thematic lesson. The strategy used is Lesson Study. Implementation of Lesson Study aims to improve the quality of collaborative learning for elementary school teachers. Implementation of Lesson Study involves four teachers, one teacher as a model and the other teacher as an observer. Lesson Study activities include three stages of activities which are a series called a cycle, namely Plan, Do, and See. In the Plan stage, discussions are held to review the STEM learning planning (RPP) facilitated by the lecturer, in the Do stage learning is carried out by the model teacher based on the Plan's RPP results, in the See stage a reflection is carried out to examine the implementation of learning that has been carried out by the model teacher to be followed up on the next lesson. . The conclusion is that the implementation of Lesson Study can improve the understanding of the material through STEM learning by students and the class becomes more interactive than before.

Keywords: Quality of Learning · Lesson Study · STEM · Mathematics

INTRODUCTION

Winkel (2007) says that learning is a mental or psychic activity that takes place in active interaction with the environment that results in changes in knowledge, understanding, skills, values and attitudes. These changes are relatively constant and trace. While learning according to Sudjana (in Rusman, 2013) learning is a process of seeing, observing and understanding something.

Learning is related to individual activities while the learning process is called learning. Hamalik (2003) explains that learning is an effort to organize an environment to create learning conditions for students that help students deal with everyday life. Meanwhile Rusman (2013) argues that learning is a process of interaction between students and teachers and learning resources in a learning environment. Not much different from this opinion, Majid (2014) argues that learning is an effort to teach a person or group of people through various efforts, strategies, methods and approaches towards achieving goals. Based on some of the opinions above, it can be taken an understanding that learning is a process of

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teaching students to do activities and interact to gain understanding of the material through a conducive learning atmosphere and implement it in life.

Quality learning is characterized, among others, by the activeness and creativity of teachers and students, effectively achieving goals and occurring in a pleasant atmosphere (Suminarsih, 2008). The activeness of students in participating in learning, according to Sudjana (2010) can be seen in: 1) Participating in carrying out their learning tasks, 2) Involving in problem solving, 3) Asking other students or the teacher if they do not understand the problems they face, 4) Trying to find various information needed to solve problems, 5) Carry out group discussions according to the teacher's instructions, 6) Assess his abilities and the results obtained, 7) Train yourself in solving problems or similar problems, 8) Opportunity to use or apply what he has obtained in completing the task or problem he faces. Efforts to improve the quality of educators and other education personnel to solve the problems encountered while carrying out their duties will have a positive impact. First, increasing the ability to solve real educational and learning problems. Second, improving the quality of content, input, process, and learning outcomes. Third, increasing the professionalism of educators and other education personnel. Fourth, the application of the principles of 21st century skills-based learning.

Learning is greatly influenced by the quality of teaching staff, both teachers and lecturers. Law No. 14 of 2005 concerning Teachers and Lecturers Article 10 states that teacher competencies include pedagogical competencies, personality competencies, social competencies, and professional competencies. Sanjaya (2013) pedagogical competence is the ability of teachers in managing student learning which at least includes: 1) understanding of the educational foundation, 2) understanding of students, 3) curriculum development, 4) lesson planning, 5) effective learning implementation. educating, 6) utilization of learning technology, 7) evaluation of learning outcomes, 8) developing students to actualize their various potentials

The experience of class teachers at SD Cipondok 2 Cibingbin Kuningan in the 2021/2022 school year in the field shows that at the beginning of each learning implementation there is never an agreement from class teachers regarding shared learning objectives that they want to improve in the long term with a wider scope of goals, for example, regarding the development of students' academic abilities, developing students' individual abilities, meeting student learning needs, developing fun learning, developing student craftsmanship in learning, and so on.

The causes of the low level of student learning independence in classroom learning include: 1) Lack of communication between students in understanding the learning material. 2) In general, the level of student independence in understanding the learning material is still low. They lack the awareness to learn independently. This condition can be seen in the learning process, which include: The learning atmosphere tends to be "not alive" some students are silent, tend to be passive, learning activities only listen occasionally, take notes, sleepy, do not ask questions, and do not respond to questions, so they follow the lesson. without preparation. students have not been able to learn independently.

The educational process at this time has shifted from teacher-centered learning (Teacher-Center) to student-centered learning (Student-Centered) where the teacher as a facilitator must be more creative and innovative in creating a learning process situation in the classroom so that it is more attractive to participants. educate. There are several models, techniques, strategies, media that teachers can apply in the learning process, one of which is the STEM learning model. According to Sukmana (2017) Science, Technology, Engineering and Mathematich or abbreviated as STEM is a popular learning approach at the world level that is effective in implementing integrative thematic learning, because it combines four main areas in education, namely science, technology, engineering and mathematics.

Lesson Study is a model for fostering the teaching profession through collaborative and sustainable learning assessments, based on the principles of collegiality that help each other in learning to build a learning community (Lesson Study Guide, 2009). By implementing Lesson Study, it is hoped that teacher competence will increase so that the quality of learning in elementary schools in Cipondok village also increases and ultimately has an impact on improving learning outcomes, in the form of increasing student achievement.

Lesson study is a learning process that emphasizes collaboration between educators. Teaching staff work together to prepare planning, implementation and reflection. Cooperation between educators in carrying out lesson study can create conducive learning. Slamet Mulyana (2007) provides a formulation of Lesson Study as a model for fostering the teaching profession through collaborative and

sustainable learning assessments based on the principles of collegiality and mutual learning to build a learning community. Meanwhile, Catherine Lewis (2002) states that:

"*lesson study is a simple idea. If you want to improve instruction, what could be more obvious than collaborating with fellow teachers to plan, observe, and reflect on lessons? While it may be a simple idea, lesson study is a complex process, supported by collaborative goal setting, careful data collection on student learning, and protocols that enable productive discussion of difficult issues".*

Lesson study success cannot be separated from teamwork in preparing learning. Teachers need to build a solid team. Every teacher needs to be big hearted to accept criticism and suggestions. The spirit of togetherness, mutual cooperation, mutual respect and hard work are the determining factors for the success of lesson study.

METHODS

Slamet Mulyana (2007) suggests three stages in Lesson Study, namely: (1) Planning (Plan); (2) Implementation (Do) and (3) Reflection (See). At the planning stage (Plan) lecturers who are members of Lesson Study collaborate to prepare lesson plans. The lesson plans made refer to active, creative, innovative, joyful and meaningful learning.

The lesson study model used in this study is the model developed by Cerbin and Koop (2006). William Cerbin and Bryan Koop are two professors from the University of Wisconsin-La Crosse who are currently actively developing lesson studies for various universities in America. The model has the following steps: 1) Forming a team, 2) Determining learning objectives, 3) Planning a research lesson, 4) Implementing learning and observing activities, 5) Analyzing facts, 6) Documenting and reflecting on the results (repeating the process).

The steps for Lesson Study activities carried out refer to the guidebook for distributing Lesson Study grants for LPTKs. The six stages of the lesson study model are carried out in the form of a plan, do, and see cycle as shown in the figure:

Figure 1. Lesson Study Process

This research activity involves 3-5 observers. In this Lesson Study activity, the research subjects were elementary school students at Cipondok State Elementary School with a total of 30 students. Data collection techniques were carried out using research instruments in the form of observation sheets, recordings of the learning process, and researcher notes. The data in this study is qualitative data in the form of a researcher's diary which describes the ongoing learning process and the observer's response to the learning process. Qualitative data also includes obstacles encountered in lectures based on the prepared lesson plans. Data regarding the learning process, observer responses to the learning process and the obstacles encountered in the learning process were analyzed descriptively-qualitatively.

RESULTS AND DISCUSSION

The application of Lesson Study at SD Negeri Cipondok is related to thematic material. Lesson Study which will be discussed in this article is related to the process of learning mathematics. The following will describe the plan, do, see in Lesson 1.

1. Plan

At the learning planning stage, it begins with analyzing the needs and existing problems. The lesson study lecturer team, totaling 3 people, came from the Mathematics Education study program. Lecturers together with teachers compile learning tools. SAP, syllabus, worksheets, use of media, preparing facilities and infrastructure are determined based on deliberation. The learning method uses project based learning based on STEM. Through learning activities based on STEM Education, students are able to design bridges using straws so that students can work together, think critically, and be creative. At the planning stage, intelligent character appears in intellectual, emotional and spiritual attitudes. Teachers have intelligent characters seen in the learning innovations they do. The use of botaoja media during storytelling is the work of the lesson study team. The model lecturer can convey the material well.

2. Do

At the implementation stage there are 5 observers in charge of observing the learning process. The first step is the formulation of the problem, at this stage the teacher explains in advance about problem solving in everyday life, here students are shown a video in the form of news through a projector, namely areas that do not have access to schools, one of the accesses that can be used is a bridge. So from the video how the teacher directs students to be able to design a strong and safe bridge to be passed by vehicles and pedestrians.

In the learning process, students design a bridge called the Stronger Bridge, which one is stronger. The challenge is for each group to design which straw is stronger to support the marbles. The science subjects obtained in this study are pressure then surface area. The math subjects were obtained while they were counting because each group was only limited to 30 straws. The science subjects obtained in this study are pressure and then surface area. While the technology was obtained when they applied it, which was at the beginning of the lesson, then the teacher explained using problem solving in everyday life, so they were shown a CNN news video that was broadcast, namely that some areas or areas of Kuningan Regency do not have access bridges, especially children who go to school. so how do they design a bridge that is stronger so that vehicles or people can pass through it will be safer, By using a projector

The resulting product: In this STEM learning the resulting product is a bridge design that is designed using straws and tape to support marbles. In addition, teachers are taught to convey their mandate and teach students to be creative with the projects they make by prioritizing active, creative, innovative, joyful and meaningful learning

Teachers are committed to carrying out their responsibilities as well as possible. The lesson study team is also competent and has pedagogic, personality, social and professional competencies. Consistent attitude is reflected in diligent, patient, tenacious and focused in observing the learning process.

3. See

At the reflection stage the discussion process went well. The observations obtained by the observers contained several shortcomings in Learning 1. The lecturers and teachers analyzed the problems and how to overcome them. At the time of division of the group spent quite a long time. The random division of groups was not effective. The discussion process did not go well, there were some groups that were still passive. From the results of the discussion obtained ways to overcome these problems. The effectiveness of time during learning can be realized if the discussion groups have been grouped before learning begins. The formation of groups was heterogeneous. This is done to increase group activity. Classroom conditions are not effective for implementing discussions so that they need to be rearranged.

At the reflection stage, the teacher's character values are reflected in optimally providing maximum service. The lesson study team works hard to improve learning. All the shortcomings contained in learning 1 were analyzed and given a solution. The values of gotong royong, mutual respect for opinions, and deliberation for consensus appear at the reflection stage.

The application of lesson study in learning 2, the learning process is almost the same as learning 1 consisting of plan, do, and see. It's just that the lesson study team has made learning innovations to correct the errors found in learning 1. The subject matter taught in lesson 2 is more about storytelling techniques. Students are taught vocal techniques, gestures, expressions, story theme selection, and the use of media.

CONCLUSION

Based on the description above, the following conclusions can be drawn:

1. Lesson Study is one of the models for fostering the teaching profession through collaborative and sustainable learning assessments based on the principles of collegiality and mutual learning to build a learning community.
2. The application of lesson study can increase tolerance, communicative, disciplined, hard work, honest, creative, democratic and responsible attitudes. This attitude is reflected in both educators and students.
3. The application of lesson study can form character educators. Have a trustworthy, exemplary and intelligent attitude. The attitude of trust consists of commitment, competence, hard work, consistency. Exemplary attitude consists of simplicity, closeness, maximum service.
4. The STEM learning model can increase students' enthusiasm in learning and increase students' creativity and problem solving abilities.

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