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VIDYA KARYA

Problem-Solving in LCM and GCF Material Using The Project-Based Learning Model Combined with Team-Assisted Individualization and Take and Give

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Abstract. This study analyses students' activities, problem-solving skills, and learning outcomes in implementing mathematics learning on LCM (Least Common Multiple) and GCF (Greatest Common Factor) materials using the Project-Based Learning (PjBL) model combined with Team Assisted Individualization (TAI) and Take and Give. This study used classroom action research conducted across four meetings in grade V of SDN Sidomulyo 2 Barito Kuala during the 2023/2024 academic year with 22 students. The research instruments included observation sheets for teacher activity, student activity, problem-solving skills, and student learning outcomes. Data were analyzed using descriptive techniques and presented in tabular form. The results showed that the teacher's activity score increased from 27 in meeting I to 34 in meeting IV. Student activity increased from 40.91% in Meeting I to 95.45% in Meeting IV. Students' problem-solving skills improved from 36.36% in Meeting I to 90.91% in Meeting IV. Student learning outcomes improved, from 40.91% in meeting I to 90.91% in meeting IV. Based on these results, it can be concluded that the PjBL model combined with TAI and Take and Give can significantly improve students' activity, problem-solving skills, and learning outcomes.
Keywords: GCF; LCM; PBL; problem-solving; TAI; take and give

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INTRODUCTION

Education is an effort and a plan to develop human resources (HR) with quality in order to create a talented and skilled generation (Hanushek et al., 2019; Jannah, 2022; Spector & Ma, 2019). In the education system in Indonesia, the curriculum has undergone eleven changes, from 1947 with a very simple curriculum to the most recent, the 2013 curriculum (Sumarsih et al., 2022). The Merdeka Curriculum is a new curriculum that can respond to the challenges of the present era. Implementing the Merdeka Curriculum focuses on student-centred learning, emphasizing the students' personality, background, needs, interests, and talents (Zulaiha et al., 2020).

The teacher is a guide and director who determines all student aspects (Chiu, 2022; Looney et al., 2018; Mulyani et al., 2023). Teachers must also be open to receiving ideas from students and make an effort to listen to their opinions. This aligns with Azizah and Wardani's (2019) view that a good learning procedure is student-centred, with the teacher as a

facilitator. Darmiyati et al. (2023) also argue that a good teacher can build student engagement.

Therefore, teachers are expected to design creative and innovative learning to create an active learning atmosphere. Darmiyati and Mustikasari (2018) state, "Teacher professionalism is very necessary in carrying out the learning process," which means that teacher professionalism is essential in carrying out the learning process. The learning process will be effective and efficient if the teacher can optimize the learning, including mathematics education. Mathematics is a fundamental skill that students must possess from elementary school to university (Asempapa, 2015; Darmiyati et al., 2019; Yayuk & As' ari, (2020).

According to the National Education Standards Agency, the goal of mathematics education is to ensure students have the ability to (1) understand mathematical concepts, explain the connections between concepts, and apply them flexibly, accurately, efficiently, and appropriately in problem-solving; (2) use reasoning in patterns and properties, manipulate mathematics to make generalizations, compile proofs, or explain mathematical ideas and statements; (3) solve problems, including understanding the problem, designing mathematical models, solving models, and interpreting the solutions obtained; (4) communicate ideas using symbols, tables, diagrams, or other media to clarify situations or problems; (5) appreciate the usefulness of mathematics in life, including having curiosity, attention, and interest in learning mathematics, as well as persistence and confidence in problem-solving (Wandini & Banurea, 2019).

Problem-solving skills are essential skills that students must master in mathematics (Prahani et al., 2021; Puspita & Aslamiah, 2023; Saputri et al., 2021; Yuberti et al., 2019). Therefore, mathematics education holds a high position as it involves learning to solve problems related to everyday life. However, many students find mathematics difficult to accept because the learning appears complicated, leading them to feel reluctant to learn it.

Observations and interviews with the class V teacher at SDN Sidomulyo 2 Barito Kuala revealed that 50% of students had not yet mastered learning outcomes. Student activity in mathematics learning in class V is still considered low because the learning is still teacher-centred. In class, the teacher only explains the lesson material, while students mostly listen, take notes, and complete the tasks the teacher gives. Students also do not yet understand or master the material, particularly on Least Common Multiple (LCM) and Greatest Common Divisor (GCD).

The lack of understanding of the material is due to the teacher's learning model being too monotonous. Additionally, there were no activities to develop students' problem-solving skills during the mathematics learning process. Students only listen and take notes without engaging in activities encouraging them to explore information or ask questions. As a result, students are less active during the learning process, which affects their learning outcomes, especially on the topics of LCM and GCD in class V at SDN Sidomulyo 2, Wanaraya Subdistrict, Barito Kuala District.

This issue cannot be left unresolved and requires improvements to ensure the learning process runs smoothly and improves. To address these issues, the researcher proposes using a combination of the Project-Based Learning (PjBL) model, Team-Assisted Individualization (TAI), and take-and-give. By applying these three models, the researcher hopes to increase student activity, problem-solving skills, and learning outcomes in mathematics, especially in LCM and

GCD, in class V at SDN Sidomulyo 2 Barito Kuala.

The PjBL model was chosen because it encourages students to actively participate in various activities to produce a product. This aligns with the opinion of Hefny and Rini (2023), who state that the PjBL model is designed to enable students to solve problems through project creation. This model can also enhance students' skills and foster enthusiasm during learning (Muyassaroh et al., 2022).

The second model is TAI, which involves students in groups with different levels of intelligence. According to Munawarah et al., (2022), the TAI model aims to improve students' abilities and participation in groups, fostering a sense of responsibility. The advantages of this model are that it minimizes the teacher's involvement during the learning process, as the teacher focuses on small groups, and weaker students can be helped by more capable students, promoting a sense of responsibility and teamwork (Nurani, 2022).

The third model is Take and Give, a teaching method using cards. Each student receives a card and is asked to find a partner and exchange information (Yusransal et al., 2022). According to Ningsih et al. (2023), the Take and Give model can train students to remember the material, collaborate, appreciate the abilities of others, and practice interacting with their peers.

The application of these three teaching models, PjBL, TAI, and take and give, is expected to create a creative, enjoyable, and meaningful learning atmosphere for students. As a result, students will become more active during mathematics learning, develop problem-solving skills, and improve their learning outcomes, especially on the topics of LCM and GCD.

METHOD

The type of research used in this study is Classroom Action Research (CAR). CAR is a type of research teachers conduct in the form of specific actions to improve student learning processes and outcomes (Rustiyarso, 2020). CAR focuses on improving or enhancing the activities of teachers and students (Jannah et al., 2023). According to Jannah et al. (2019), CAR allows teachers to develop their teaching performance because CAR positions teachers as researchers with a collaborative performance model.

In this study, CAR follows the stages from Kemmis and McTaggart, as quoted by Rustiyarso (2020), which include four stages: 1) Planning stage, 2) Action stage, 3) Observation stage, and 4) Reflection stage. In the planning stage, the teacher plans actions and determines steps to implement them. In the action stage, the teacher implements the planned activities. In the observation stage, the teacher records important points and obstacles encountered during the action. In the reflection stage, the teacher reviews and analyzes the actions carried out based on the data collected during the observation stage.

This research was conducted at SDN Sidomulyo 2 Barito Kuala. The research subjects were 22 students in class V, consisting of 10 male students and 12 female students for the 2023/2024 academic year. The data collection techniques used were both qualitative and quantitative. Qualitative data were obtained from observations of the teacher's activities, student activities, and students' problem-solving skills. Quantitative data were obtained from written tests conducted in both group and individual formats. Data analysis used descriptive analysis techniques, which were presented in tables.

The success indicator for teacher activity is if the teacher achieves a score of ≥30 with the "Very Good" criteria (Irawati, 2023). The data analysis technique for teacher activity is based on the following criteria Table 1.

Table 1 Teacher activity criteria

Score Range	Criteria
30-36	Very Good
23-29	Good
16-22	Fairly Good
9-15	Poor

The success indicator for student activity is if students achieve ≥82% with the "Very Active" criteria (Prastitasari & Rahmawati, 2023). The data analysis technique for student activity is determined classically for each aspect being observed. The student activity criteria are shown in the Table 2.

Table 2 Student activity criteria

Score Range	Criteria
82% - 100%	Very Active
63% - 81%	Active
44% - 62%	Fairly Active
25% - 43%	Less Active

The success indicator for problem-solving skills is if students achieve ≥82% with the "Very Skilled" criteria (Prastitasari & Rahmawati, 2023). The data analysis technique for problem-solving skills is determined classically for each aspect being observed. The problem-solving skills criteria are shown in the Table 3.

Table 3 Problem-solving skills criteria

Score Range	Criteria
82% - 100%	Very Skilled
63% - 81%	Skilled
44% - 62%	Fairly Skilled
25% - 43%	Less Skilled

The quantitative data for student learning outcomes are considered achieved if individual students score ≥70 in the minimum completeness criteria and classically if the overall percentage is ≥82%.

RESULTS AND DISCUSSION

The researchers make preparations that can support the implementation of this research: 1) the Planning stage, 2) the Action stage, 3) the Observation stage, and 4) the Reflection stage. This research was conducted in four meetings. Learning activities begin when the teacher enters the classroom by saying greetings and asking students how they are. The activity continues by reading the prayer before starting the lesson. After that, the teacher checks the students' attendance and then invites the students to sing the national song. The teacher makes an apperception and then conveys the learning objectives.

The teacher asks a trigger question about the material to be learned and then explains the learning material about LCM and GCD. After the presentation of the material, the teacher distributes cards to each student containing material to study. After studying the material on the card, students are asked to exchange cards. Each student can give and receive each other's cards (Take and Give).

The teacher divides the students into groups of 4-5 members and distributes the Group Worksheet containing the project assignment. The teacher explains the systematics and procedures for making the project. Then, students are asked to share tasks within their respective groups. The teacher and students discuss the project deadline, which is 30 minutes.

The teacher supervises and guides students in making projects. Then, students are asked to work on the problems in the group worksheets using the completed project, a factor tree, as a learning medium. After all groups have completed their tasks, each group is asked to present the discussion results in front of the class.

Closing activities involve summarizing what has been learned. The teacher provides reflection or feedback on the material that has been learned.

Furthermore, students are asked to work on evaluation questions. After the students finish working on the evaluation questions, the teacher conveys the material that will be learned at the next meeting. The teacher invites students to sing folk songs and pray before going home. The teacher says greetings to close the lesson.

Based on the observation results of teacher activities, student activities, problem-solving skills, and student learning outcomes using the PjBL model combined with TAI, and Take and Give, it can be described as follows:

Teacher Activity

Table 4 shows the observation results of the increase in teacher activity. Judging from the data analysis results related to teacher activities in implementing the PjBL model combined with TAI and Take and Give in the table, the quality of learning carried out by teachers in each meeting always increases.

Based on the increase, it can be said that the teacher carried out the learning activities very well. The occurrence of increased teacher activity is also a form of implementation of reflection at each meeting. The reflection aims to be a benchmark at the next meeting so that the learning activities carried out will always experience improvements. This is in line with the opinion of Arikunto et al. (2015) that the purpose of implementing CAR is for teachers to reflect on themselves to improve the quality of teaching practices in the classroom so that it impacts student learning outcomes.

Table 4 Teacher activity

No.	Aspects observed	Meeting			
		I	II	III	IV
1	Aspect 1	3	4	4	4
2	Aspect 2	3	3	3	3
3	Aspect 3	3	3	3	4
4	Aspect 4	3	3	3	3
5	Aspect 5	3	3	4	4
6	Aspect 6	3	4	4	4
7	Aspect 7	3	3	4	4
8	Aspect 8	3	4	4	4
9	Aspect 9	3	3	3	4
	Total score	27	30	32	34
	Percentage	75.00%	83.33%	88.89%	91.67%
	Criteria	Good	Very good	Very good	Very good

Teachers will always try to provide the best learning to achieve success in learning. Good and quality learning are also inseparable from the teacher's role in planning and implementing learning. Thus, the teacher is the key to success in achieving learning goals. According to Noorhapizah et al. (2020), teachers design a teaching and learning activity plan. If the teacher carries it out optimally, it can positively improve the quality of learning.

One of the strategies that teachers use is by choosing a learning model. Learning models can help teachers plan and implement learning to create meaningful learning conditions. This is in line with the opinion of Fathurrohman (2016) that the learning model is a conceptual framework as an overall procedure for carrying out the learning process, which is systematically arranged and organized to achieve the expected learning objectives. Teachers can choose a model for this study by using the PjBL model combined with TAI and Take and Give.

Student Activity

The increasing trend is also evident in the description of student activities, as shown in Table 2. Judging from the table's results of data analysis related to student activity, student activity at each meeting always increases. This is due to an increase in the quality of learning carried out by the teacher. Improving the teacher's learning quality will impact student activity so that learning can be implemented properly.

Table 2 Student activities

No.	Criteria	Meeting			
		I	II	III	IV
1	Very Active	18.18%	31.82%	50.00%	77.27%
2	Active	22.73%	27.27%	31.82%	18.18%
3	Fairly Enough	50.00%	36.36%	18.18%	4.55%
4	Less Active	9.09%	4.55%	0.00%	0.00%
	Number of very active+active	40.91%	59.09%	81.82%	95.45%
	Criteria	Less Active	Active Enough	Very Active	Very Active

The increase in student learning activity is due to teacher activity in implementing learning LCM and GCD material in class V SDN Sidomulyo 2 Barito Kuala by applying the PjBL model combined with TAI and Take-and-Give.

In this combination of learning models, students are required to build knowledge independently, involve students actively in learning, familiarize students to work together in adjusting problems and build a conducive atmosphere for students to make learning more meaningful (Budiarti & Widiyono, 2022). This is in line with the opinion of Sari & Kamina (2022) that increasing student activeness cannot be separated from the activities carried out by the teacher in the learning process by applying a combination model.

The increase in student activity at each meeting was also due to researchers trying to improve the quality of learning by reflecting so that at the next meeting, there was an increase in student activity, which was getting better and maximized. Then, the achievement of success in increasing student activity also did not escape the researcher's strategy of choosing a combination of learning models tailored to the characteristics and needs of elementary school students.

Choosing the right model will impact student activity during the learning process where students will become more active and motivated during learning activities. This is in line with the opinion of Octavia (2020), who states that the learning model is an effort to improve the quality of teaching and learning activities because, in learning activities, students are required to play an active role and can use higher-level thinking skills and hone cooperation in a team/group.

Problem-Solving Skills

The increasing trend can also be seen in Table 3, which describes students' problem-solving skills.

Table 3 Problem-solving skills

No.	Criteria	Meeting			
		I	II	III	IV
1	Highly Skilled	13.64%	22.73%	36.36%	72.73%
2	Skilled	22.73%	27.27%	40.91%	18.18%
3	Fairly Skilled	27.27%	40.91%	22.73%	9.09%

No.	Criteria	Meeting			
		I	II	III	IV
4	Less Skilled	36.36%	9.09%	0.00%	0.00%
	Number of highly skilled+skilled	36.36%	50.00%	77.27%	90.91%
	Criteria	Less Skilled	Skilled Enough	Skilled	Highly Skilled

Judging from the data analysis results in the table related to students' problem-solving skills, it can be seen that students' problem-solving skills at each meeting continue to increase. The increase was because, at each meeting, the teacher tried to improve the quality of learning by reflecting so that the students' problem-solving skills improved and increased at the next meeting.

The occurrence of increased problem-solving skills in students in this study is also inseparable from the role of the teacher in creating learning to improve problem-solving skills. This is in line with the opinion of Romanti and Rohita (2021), who state that lesson planning is the most important thing for teachers to stimulate students' problem-solving skills. To create learning that can develop problem solving skills, it is necessary to process the material presented using the right learning model.

Problem-solving skills are an important part of mathematics learning because they can improve decision-making in everyday life (Suriansyah & Agusta, 2021). This is in line with the opinion of Laia and Harefa (2021), who states that problem-solving skills can help students think analytically when making decisions in everyday life and help improve critical thinking skills when dealing with new situations.

Learning Outcomes

The trend of improvement also occurred in student learning outcomes, which can be seen in Table 4.

Table 4 Learning outcomes

No.	Criteria	Meeting			
		I	II	III	IV
1	Achieved ≥70	40.91%	59.09%	68.18%	90.91%
2	Not Achieved >70	59.09%	40.91%	31.82%	9.09%

Judging from the results of data analysis in the table related to classical student learning outcomes, it is known that at each meeting, it always increases. The increase in student learning outcomes is because teachers continue to try to reflect, improve, and improve the quality of learning.

The improvement in student learning outcomes also occurred due to teacher activities, student activities, and student problem-solving skills that improved at each meeting. Susanto (2016) stated that learning outcomes will impact changes in students concerning cognitive, psychomotor, and affective aspects. Then Pratiwi and Octavia (2021) argue that learning outcomes are important in the learning process.

Good learning outcomes are one factor determining whether a learning process can be said to be successful or not. Therefore, if students achieve completeness in learning outcomes, it means that the implementation of learning has achieved the desired goals. Rahman's opinion (2021) states that learning outcomes are a control tool for implementing learning in achieving the expected educational goals.

The improvement in student learning outcomes is also due to students'

understanding of the learning material (Noorhapizah & Jannah, 2022). A good presentation of material will allow students to explore information. Mathematics learning material is not enough if students are only memorizing the theory; students must also understand how to solve it. According to Agusta et al. (2021), the learning process is not only dominated by the transfer of knowledge in the form of theory but students are invited to participate in learning with various independent and collaborative information mining activities. This is in line with the opinion of Suriansyah et al., (2021) that learning by memorizing theory only makes learning less meaningful.

CONCLUSION

The results of research conducted on grade V students of SDN Sidomulyo 2 Barito Kuala on the mathematics content of KPK and FPB material can be concluded that the PjBL model combined with TAI, and Take and Give can significantly improve students' activities, problem-solving skills, and learning outcomes. The results showed that the teacher's activity increased at meeting I, which obtained a score of 27, and at meeting IV, obtained a score of 34. Student activity increased at meetings I to IV from 40.91% to 95.45%. Students' problem-solving skills increased from meeting I to IV from 36.36% to 90.91%. Then, student learning outcomes increased at meetings I to IV, increasing from 40.91% to 90.91%.

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