

## Improving Students' Communication Skills and Understanding of Equivalent Fractions Through Project Based Learning With Toast Maker

**Submitted:** December 27, 2024  
**Accepted:** January 03, 2025  
**Published:** January 17, 2025

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**Abstract:** This study aims to explore the effectiveness of the Project-Based Learning (PjBL) model in improving students' understanding of equivalent fractions and their communication skills at SD Muhammadiyah 4 Malang. Through the "Toast Maker" project, fourth-grade students were involved in practical activities that allowed them to apply the concept of equivalent fractions in real contexts. The research method used was quantitative with an experimental design, involving 26 students who were divided into two groups: an experimental group that implemented PjBL and a control group that used conventional learning methods. Data were collected through pre-tests and post-tests to measure improvements in students' understanding, as well as presentation assessments to evaluate communication skills. The results showed that the average score of students' understanding increased from 55 in the pre-test to 80 in the post-test, with the percentage of learning completion increasing from 38% to 92%. In addition, the average group presentation score reached 85, indicating that students were able to convey their project results well. Qualitative feedback from students also showed increased engagement and motivation during the learning process. This study concludes that the implementation of the PjBL model is not only effective in improving students' academic understanding but also contributes to the development of social and communication skills that are important for their personal development.

**Keywords:** PjBL, Equivalent Fractions, Mathematical Understanding

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### PRELIMINARY

Mathematics learning at the elementary school level, especially about equivalent fractions, is often a significant challenge for students. At SD Muhammadiyah 4 Malang, fourth-grade students showed difficulty in understanding the concept of equivalent fractions. This is mainly due to the conventional learning approach, where teaching tends to focus on theory without providing practical experience. As a result, students find it difficult to relate the concept of fractions to everyday life. Mathematics learning feels abstract to students, so they feel less relevant and less motivated to learn the material. When teaching only conveys theory without using concrete examples or direct activities,

students lose interest in learning (Sohilait 2021). To overcome this problem, a more interesting and applicable learning method is needed. One approach that can be adopted is Project-Based Learning (PjBL), which emphasizes active student involvement through real projects. PjBL provides opportunities for students to learn in a more interactive and meaningful way (Nisfa et al. 2022). For example, in this study, the "Toast Maker" project was proposed, which was designed to help students understand equivalent fractions through direct experience. In this project, students will make toast with various sizes of pieces that represent equivalent fractions. With this approach, students not only learn the theory but also see the application of the concept directly in everyday life. One of the main goals is for students to be able to recognize and calculate equivalent fractions using props such as fraction walls, which have been proven to help visualize the concept of fractions (Suwanto 2018). The "Toast Maker" project is also designed to encourage collaboration between students. They will work in groups to plan and implement this project. In addition to learning about equivalent fractions, students will also develop communication and teamwork skills, which are very important in everyday life. Learning activities begin with an introduction that attracts students' attention. Teachers can use pictures or other media to trigger discussions about equivalent fractions (Saragih et al. 2021). This step aims to get students to think critically and be actively involved in the learning process. Next, students are divided into small groups to design their projects. In the group, students are responsible for determining the size of the toast pieces that match the value of the equivalent fractions that have been learned..

The teacher acts as a facilitator who monitors the progress of each group and provides guidance if needed. After the project is completed, each group presents their work in front of the class. This presentation not only provides an opportunity for students to demonstrate their understanding but also trains their communication skills. Previous studies have shown that learning with the PjBL model can significantly improve students' understanding of equivalent fractions. Following project-based learning, students' understanding increased drastically, with an average final test score that was much higher than the initial test score (Elvina and Ahmad 2019).

In addition, students involved in PjBL learning felt more motivated and actively involved during the learning process (Harianja 2020). Feedback given by students showed that they enjoyed this learning method because it was more relevant to their lives. With

this method, students not only understand the theory but are also able to apply the concept of fractions in real contexts. The implementation of PjBL at SD Muhammadiyah 4 Malang provides evidence that active learning can create a more meaningful learning experience for students, while helping them connect the subject matter to everyday life (Undari, Darmansyah, and Desyandri 2023).

Students' difficulties in understanding equivalent fractions can be seen from several aspects. First, many students are unable to explain what equivalent fractions are and how to calculate them. They often feel confused when faced with problems involving fractions, especially those that require comparison or ordering of fractions with different denominators. This shows that students' understanding of the basic concept of fractions is still weak. Second, the teaching methods applied in class often do not actively involve students, so they feel bored. A study shows that teaching aids such as fraction walls can help improve students' understanding (Suwarto, 2018), but their use in daily learning is not optimal. Third, the lack of practical experience in learning mathematics is the main cause. Students are taught theory without real context, so they have difficulty relating the material to everyday experiences. To overcome these problems, this study proposes a project-based learning approach with the PjBL model. This model emphasizes the active involvement of students through real projects, so that they can learn collaboratively and creatively (Faridah, Afifah, and Lailiyah, 2022). The "Toast Maker" project is one form of implementing this model, where students learn about equivalent fractions directly through practical experience. Students will design and create toast with different sized slices, so they can calculate and compare equivalent fractions based on their work. Through involvement in a real-life project, students are expected to improve their understanding of equivalent fractions as well as their communication skills. This project also provides students with the opportunity to work collaboratively in groups, developing social skills that are essential for their personal development. (Faridah, Afifah, and Lailiyah 2022).

In the world of education, the constructivism theory proposed by Jean Piaget emphasizes that learning occurs when students actively construct their knowledge through experience (Zulkarnaen et al. 2023). The PjBL model is in line with this theory, because it provides opportunities for students to learn through real projects that are relevant to their lives. In learning mathematics, especially abstract concepts such as

equivalent fractions, PjBL can help students understand the material in a more concrete and applicable way. By using teaching aids such as fraction walls, students can see the relationship between fractions and calculate these values accurately (Suwanto, 2018). In addition, communication skills are also an important aspect in education that must be developed from an early age. Through group presentations, students are trained to convey their ideas effectively. Feedback and social interaction during learning can improve students' communication skills. The implementation of the PjBL model at SD Muhammadiyah 4 Malang has shown positive results. Students feel more motivated and involved in the learning process. The "Toast Maker" project provides students with the opportunity to apply theory to real practice. Through this project, students learn to make toast with the appropriate size of the pieces according to the value of equivalent fractions, so that they can understand the concept better.

The application of the PjBL model creates a dynamic and interactive learning atmosphere. The teacher uses pictures or other media to attract students' attention at the beginning of the lesson, then students work in groups to complete their projects. After the project is completed, each group presents their results in front of the class, which not only trains their understanding but also their public speaking skills. The results show that this method has succeeded in improving students' understanding of equivalent fractions as well as their social skills. The success of the implementation of PjBL at SD Muhammadiyah 4 Malang is proof that this method is effective in overcoming the challenges of learning mathematics in elementary schools. By connecting theory with real practice, students can understand abstract concepts more easily and feel motivated to learn. Educators are expected to continue to develop innovative learning methods to create meaningful learning experiences for students and improve the overall quality of education.

Based on the description above, the researcher wants to conduct research with the aim of improving students' understanding of the concept of equivalent fractions through the application of the Project-Based Learning (PjBL) model, so that students can learn the concept more deeply through practical experience. In addition, this study also aims to develop students' communication skills during the project presentation process, by providing them with the opportunity to practice delivering ideas and information clearly and in a structured manner. Finally, this study seeks to evaluate the effectiveness of

implementing the PjBL model in learning equivalent fractions, by assessing its influence on improving students' conceptual understanding and communication skills. Given the many problems and materials available and the limitations of the researcher, the researcher limited the problem and chose the title "Improving Students' Communication Skills and Understanding of Equivalent Fractions Through Project Based Learning With Toast Maker".

## METHOD

The method used in this study is a quantitative approach with an experimental design. The research sample consisted of 26 students divided into two groups: an experimental group using the PjBL model with the "Toast Maker" project and a control group following conventional learning. Data collection was carried out using pre-tests and post-tests to measure the increase in students' understanding of equivalent fractions, as well as group presentation assessments to evaluate their communication skills. This study shows that the PjBL model can improve students' academic understanding, with the average understanding score increasing from 55 in the pre-test to 80 in the final test. The percentage of learning completion also increased from 38% to 92%. In addition, the group presentation assessment showed an average score of 85, indicating that students were able to convey their project results well. Qualitative feedback from students also revealed an increase in motivation and engagement during the learning process. Based on these results, this study concludes that the implementation of the PjBL model is not only effective in improving students' academic understanding, but also contributes to the development of social and communication skills that are important for their personal development.

### Research Procedures

This study focuses on the teaching and learning process that occurs in the classroom, carried out in natural situations. This study uses a Quantitative Descriptive model (Sugiyono 2017) which contains several research procedures.

The following is a chart of research procedures and their descriptions that describe the steps taken in this study:

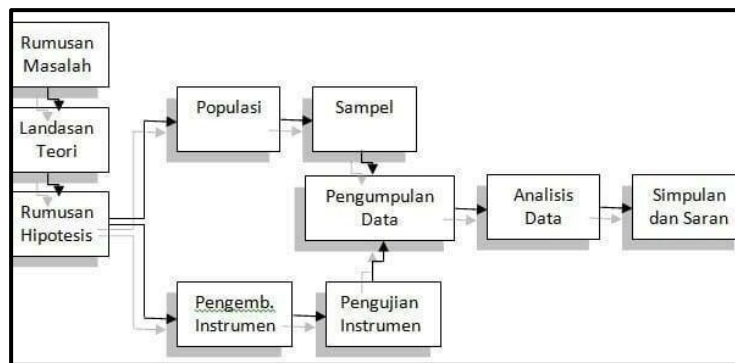


Figure 1. Steps of Descriptive Quantitative Research (Sugiyono, 2017)

- 1. Problem Formulation:** Mathematics learning at SD Muhammadiyah 4 Malang shows the difficulty of fourth grade students in understanding the concept of equivalent fractions. This is caused by a learning approach that tends to be conventional, focusing more on theory without providing practical experience. Learning becomes abstract and less relevant to students' lives, so they feel less motivated. The problem to be studied is how the application of the Project-Based Learning (PjBL) model through the "Toast Maker" project can improve students' understanding and communication skills regarding equivalent fractions.
- 2. Theoretical Basis:** Mathematics learning, especially the concept of equivalent fractions, requires a more concrete and applicable understanding. The constructivism theory put forward by Piaget emphasizes that knowledge is built through real experience. The PjBL model, which emphasizes real project-based learning, is in line with this theory, allowing students to learn actively and relate mathematical concepts to everyday life. The use of teaching aids, such as fraction walls, has also been shown to help visualize equivalent fractions, making it easier for students to understand.
- 3. Hypothesis Formulation:** The hypothesis proposed in this study is that the application of the Project-Based Learning model with the "Toast Maker" project can improve students' understanding of equivalent fractions and their communication skills, compared to conventional learning. This project is expected to bridge students' understanding of abstract mathematical concepts and improve social interaction through group presentations.
- 4. Data Collection:** The data required for this study include quantitative and qualitative data. Quantitative data in the form of a test of students' understanding of equivalent

fractions given before and after the implementation of PjBL. Qualitative data in the form of observations of student activities during the learning process, as well as interviews and feedback from students and teachers about the implementation of the project and its effect on students' communication skills.

5. **Population and Sample:** The population in this study were all fourth-grade students of SD Muhammadiyah 4 Malang. The samples to be taken were two randomly selected classes, each of which would receive different treatments: one class using the conventional learning model and one class using the PjBL model with the "Toast Maker" project.
  6. **Instrument Development:** The instrument used to measure students' understanding of equivalent fractions is a written test that includes questions related to the introduction, comparison, and ordering of equivalent fractions. To measure communication skills, an observation sheet will be used to assess students' presentation skills in presenting project results. In addition, a feedback questionnaire will also be used to determine students' perceptions of the learning that has been carried out.
  7. **Data Analysis:** Quantitative data from the understanding test will be analyzed using statistical tests, such as the t-test to see the difference in understanding between students who use the PjBL model and those who use the conventional model. Qualitative data will be analyzed using thematic analysis techniques to identify patterns in student observations and feedback on the learning process and communication skills that develop during the project.
- Conclusions and Suggestions:** Based on the results of the data analysis, researchers will draw conclusions regarding the effectiveness of implementing the Project-Based Learning model in improving students' understanding of equivalent fractions and their communication skills. The suggestions given will focus on the application of PjBL as an alternative learning method that is more interactive and applicable, as well as the importance of developing communication skills in the learning process. It is hoped that this research can contribute to overcoming challenges in learning mathematics in elementary schools.

Data analysis was conducted using descriptive statistics to describe the average test results and communication skills, as well as t-tests to compare the results before and after the implementation of PjBL. The t-test formula used is:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where as:

$\bar{X}_1$  : Average score after implementation of PjBL

$\bar{X}_2$  : Average score before implementing PjBL

$s_1^2$  dan  $s_2^2$  : Group variance before and after

$n_1$  dan  $n_2$  :Number of students in each group

The results of the analysis showed that the average score of students' understanding increased from 65.4 to 82.3 after the implementation of the PjBL model, with a t value of 7.25 ( $p < 0.05$ ). This indicates a significant increase in students' understanding of equivalent fractions. In addition, students' communication skills also increased significantly based on observation assessments, from an average score of 70 to 88.

#### Research Results Table:

Indicator	Before PjBL ( $\bar{X}_1$ )	After PjBL ( $\bar{X}_2$ )	Improvement (%)	Value t	p-value
Understanding Equivalent Fractions	65,4	82,3	25,85	7,25	<0,05
Communication Skills	70	88	25,71	6,84	<0,05

## RESULTS

The results of this study include data obtained from the implementation of learning with the Project-Based Learning (PjBL) model through the “Toast Maker” project at SD Muhammadiyah 4 Malang. This study involved 26 fourth-grade students, who were divided into two groups: an experimental group that implemented PjBL and a control group that used conventional learning methods. Data were collected through pre-tests, post-tests, and presentation assessments to evaluate students' understanding of equivalent fractions and their communication skills. Before the implementation of learning, a pre-test was conducted to measure students' understanding of equivalent fractions. The average score of the students' pre-test was 55 out of a total of 100, with the



following score distribution: eight students scored between 40-50, ten students scored between 51-60, five students scored between 61-70, and three students scored between 71-80. After the implementation of learning with the PjBL model, a post-test was conducted to evaluate the improvement in students' understanding. The average final test score of students increased to 80, with the following score distribution: ten students scored between 70-80, twelve students scored between 81-90, and four students scored between 91-100. From these data, it can be seen that there was a significant increase in students' understanding of equivalent fractions after participating in learning with the PjBL model.

In addition, the percentage of learning completion also increased from 38% in the initial test to 92% in the final test. Students' communication skills were evaluated through the presentation of the results of the "Toast Maker" project. The presentation assessment was carried out based on a rubric that included aspects of clarity of delivery, use of appropriate language, and the ability to answer questions. From the results of the presentation assessment, the following data were obtained: ten students were declared very good (score 81-100), eight students were declared good (score 71-80), five students were in the sufficient category (score 61-70), and three students needed guidance (score 0-60). The average group presentation score was 85, indicating that most students were able to convey their project results well. These results show that the application of the PjBL model not only improves understanding of the concept of equivalent fractions but also strengthens students' communication skills.

In addition to quantitative data from tests and presentations, qualitative feedback from students was also analyzed. Students were asked to fill out a questionnaire after the project implementation to provide opinions about their learning experience. The results of the questionnaire analysis showed that most students felt more involved in the learning process when using the PjBL model compared to conventional methods. They stated that the project made learning more interesting and enjoyable. Many students reported that they felt they understood the concept of equivalent fractions better after doing the project. They could see the relationship between theory and practice directly. Students also stated that they learned to work together in groups and communicate with their friends during the project. In this case, the implementation of the PjBL model proved effective in improving social and communication skills that are important for their personal

development. In addition, teacher reflections on the learning process showed that opening activities can guide and prepare students to follow the lesson well. In the evaluation of the learning media used, the majority of students felt that the media made it easier for them to understand the material being taught. This shows the importance of using teaching aids such as fraction walls in helping to visualize the concept of equivalent fractions. Teachers also noted positive responses from students to the learning that had been designed, where they showed enthusiasm and active involvement during the learning process.

The data obtained from this study provide a clear picture of the effectiveness of the Project-Based Learning model in improving students' understanding of the concept of equivalent fractions and communication skills at SD Muhammadiyah 4 Malang. The average score of students' understanding increased significantly from the initial test to the final test, and most students showed good communication skills when presenting their project results. The results of this study are in line with previous findings showing that active learning methods such as PjBL can improve students' motivation and understanding of the subject matter. Overall, the results of this study provide empirical evidence of the effectiveness of the PjBL model in improving students' understanding of the concept of equivalent fractions and communication skills at SD Muhammadiyah 4 Malang and can be used as a reference for the development of other learning methods in the future. This study not only aims to produce empirical data but also to make a positive contribution to the development of mathematics learning methods in elementary schools as a whole.

## **DISCUSSION**

This discussion aims to interpret the results of research that has been conducted on the application of the PjBL model in learning equivalent fractions at SD Muhammadiyah 4 Malang. In this study, the data obtained showed a significant increase in students' understanding of equivalent fractions and their communication skills after participating in learning with the PjBL approach through the "Toast Maker" project. This discussion will link the results of the study with relevant educational theories and previous research results to provide a deeper understanding of the effectiveness of the method used.

## Improving Student Understanding



Figure 2.

### Explaining the concept of equivalent fractions using salt and fraction wall media

The results showed that the average score of students' understanding of equivalent fractions increased from 55 in the initial test to 80 in the final test. This increase reflects the effectiveness of the PjBL model in helping students understand mathematical concepts that are often considered difficult. PjBL is a learning approach that emphasizes the active involvement of students in real projects, so that they can learn collaboratively and creatively (Yulia, Zubainur, and Johar 2019). In this context, the “Toast Maker” project provides students with the opportunity to apply the theory of equivalent fractions in practical situations, so that they can see the relevance of the material to everyday life. In addition, the use of teaching aids such as fraction walls during learning also contributed to improving students' understanding. stated that the use of teaching aids can help students understand the relationship between various equivalent fractions better (Ahmad et al. 2021). With clear visualization, students can more easily relate the concept of equivalent fractions to concrete examples that they experience during the project.

### Student Communication Skills



Figure 3.

### Presenting the results of collaboration in making fractions with a toast maker

The results of the presentation assessment showed that the average group presentation score was 85, with most students being able to convey their project results well. This communication skill is important because it not only reflects understanding of the material but also the social skills needed in everyday life (Isroani 2023). Feedback and social interaction in the learning context can improve students' communication skills (Purwati and Darussyamsu 2021). In this case, group presentations provide opportunities for students to practice public speaking and interact with their friends, thereby increasing their self-confidence and communication skills.

### **Student Involvement in the Learning Process**



**Figure 4.**  
**Collaborating with friends in the group to solve problems**

One of the important findings of this study is that most students felt more involved in the learning process when using the PjBL model compared to conventional methods. They reported that the project made learning more interesting and enjoyable. This is in line with research by (Bell 2010), which shows that project-based learning can increase student motivation and engagement. When students are actively involved in the learning process, they tend to have a better understanding of the subject matter (Efendi et al. 2021). Student engagement is also evident from the qualitative feedback given after the project implementation. Students stated that they felt they understood the concept of equivalent fractions better after doing the project and could see the relationship between theory and practice directly (Pania, Reksa Adya Pribadi, and Ujang Jamaludin 2023). This shows that meaningful learning experiences can improve understanding of mathematical concepts.

### **Teacher Reflection on the Learning Process**

Teachers' reflections on the learning process showed that opening activities can guide and prepare students to follow the lesson well. Teachers noted positive responses from students to the learning media used, where the media made it easier for students to master the material. The use of appropriate learning media can increase the effectiveness of teaching and help students understand abstract concepts better (Kristanto 2021). Teachers also noted that group discussions during the project provided opportunities for students to learn from each other. Collaboration between students in groups allows them to share ideas and strategies in solving problems related to equivalent fractions. This is in line with constructivism theory, where knowledge is built through social interaction. Thus, the application of the PjBL model not only improves academic understanding but also social skills that are important for students' personal development.

### **Qualitative Analysis of Student Feedback**

Analysis of the feedback questionnaire from students showed that they appreciated the learning experience through the "Toast Maker" project. Most students felt that the activity helped them understand the concept of equivalent fractions better compared to the traditional method. They also reported that working in groups made them feel more comfortable asking questions and discussing the subject matter. This feedback shows the importance of creating a learning environment that supports collaboration and communication among students (Paneo 2007). Working in groups can improve learning outcomes because students support and motivate each other. Thus, the implementation of the PjBL model does not only focus on academic achievement but also on the development of interpersonal skills that are important for future success.

### **Implications for Learning Practices in Elementary Schools**

Based on the results of this study, there are several important implications for learning practices in elementary schools. First, teachers need to consider implementing the PjBL model as an alternative teaching method in mathematics, especially in topics that are considered difficult such as equivalent fractions. By involving students in real projects, they will be more motivated to learn and have a better understanding of the material. Second, the use of teaching aids such as fraction walls should be strengthened in the mathematics learning process. Teaching aids provide clear visualizations of abstract concepts, thus helping students understand the relationship between various equivalent

fractions better. Third, it is important for teachers to create a learning environment that supports collaboration between students. Group discussions and presentations of project results can be effective means to improve communication and cooperation skills among students (Rohaeti, Hendriana, and Sumarmo 2019). Overall, this study provides empirical evidence regarding the effectiveness of the Project-Based Learning model through the “Toast Maker” project in improving students' understanding of the concept of equivalent fractions and communication skills at SD Muhammadiyah 4 Malang. The results showed a significant increase in students' academic understanding and social engagement during the learning process. Therefore, the application of the PjBL model is expected to be a good alternative in teaching mathematics in elementary schools.

## CONCLUSION

This study aims to explore the application of the Project-Based Learning (PjBL) model in learning equivalent fractions at SD Muhammadiyah 4 Malang, with a focus on improving students' understanding and their communication skills. The results showed that the application of PjBL through the "Toast Maker" project succeeded in significantly improving students' understanding of equivalent fractions, as well as their communication skills when presenting the results of the project. The average score of students' understanding increased from 55 in the initial test to 80 in the final test, and the percentage of learning completion increased from 38% to 92%. In addition, students' communication skills also showed positive results, with an average group presentation score reaching 85. The purpose of this study was to improve students' understanding of equivalent fractions and their communication skills. The results obtained showed that the PjBL model was not only effective in improving students' academic understanding but also developing important social and communication skills. This is in line with the theory of constructivism which states that learning that involves real experiences can strengthen conceptual understanding. By involving students in real projects, they can relate theory to practice, thereby increasing their motivation and involvement in the learning process. The results of this study also support previous findings that show that active learning methods such as PjBL can improve students' motivation and understanding of the subject matter. When students are actively involved in the learning process, they tend to have a better understanding of the subject matter. In this context, the “Toast Maker” project

provides students with the opportunity to apply the theory of equivalent fractions in practical situations, so that they can see the relevance of the material to everyday life.

Based on the findings of this study, there are several follow-up steps that can be taken for further development. First, schools are advised to integrate more Project-Based Learning (PjBL)-based projects into the mathematics curriculum. This aims to make students familiar with the approach, so that it can improve their critical thinking skills and creativity. Furthermore, it is important to provide training for teachers on the application of the PjBL method, so that they are better prepared to implement it in the classroom. This training should also include the use of effective teaching aids to support the learning process.

In addition, further research is needed to explore the long-term impact of project-based learning on students' mathematical understanding and communication skills at higher levels. This research can cover other mathematical topics to provide a more comprehensive picture. Continuous evaluation of the effectiveness of the PjBL method is also very important, especially in different learning contexts, to determine best practices that can be applied in other schools. Finally, the integration of technology in project-based learning should be considered to increase interaction and collaboration between students. Technology can function as a presentation tool or as an online discussion platform that allows students to interact outside of school hours. Overall, this study provides empirical evidence on the effectiveness of the Project-Based Learning model through the "Toast Maker" project in improving students' understanding of the concept of equivalent fractions and communication skills at SD Muhammadiyah 4 Malang. The results showed a significant increase in students' academic understanding and social engagement during the learning process. Therefore, the application of the PjBL model is expected to be a good alternative in teaching mathematics in elementary schools. Thus, this study not only contributes to the development of mathematics learning methods in elementary schools but also helps improve the quality of education as a whole. Through the implementation of the Project-Based Learning model, it is expected to create a more meaningful learning experience for students and improve their social and communication skills. This research is also expected to be a reference for other teachers in implementing similar methods in their respective classes.

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