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The Effectiveness of PBL-Role Playing with the TaRL Approach to Improve Student Learning Outcomes and Activity of Number Counting Operations

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ABSTRACT

Learning mathematics is often considered difficult, scary, and abstract for students at the elementary school level. This has an impact on learning outcomes and students' activeness in mastering material concepts. The PBL-Role Playing model with the TaRL approach is one way to overcome this problem. The purpose of the study is to determine the effectiveness of PBL-role playing learning with the TaRL approach in improving learning outcomes and student activity in numerical counting operation material. This research is classroom action research (CAR). The results showed that the learning completeness in the first cycle was 46.43% and the second cycle was 96.43%. Meanwhile, the results of student activities increased to 67.85% in the first cycle and 83.92% in the second cycle. Based on these results, it was concluded that PBL-Role Playing with the TaRL approach was proven to be effective in improving learning outcomes and student activity.

Keyword: PBL, Role Playing, TaRL, Learning Outcomes, Student Activity

INTRODUCTION

Mathematics learning is actually an important learning for daily life,mathematics teaches student how to know shapes and sizes, problem solved, gather and use information, and permorms calculations (N. K. Dewi et al., 2020). Learning math is often considered difficult, scary, and abstract for students at the elementary school level. This has an impact on learning outcomes and student activeness in mastering material concepts. Mathematics is often considered a terrible scourge that makes students lazy to think and lowers their motivation to learn so that they are not active in learning (Mahmuda et al., 2021). In addition, the diverse conditions of students are a challenge for teachers in accommodating student needs. Each student certainly has differences in understanding the material being taught, such as slow in learning and fast in learning.

The operation of counting numbers is one of the materials taught at the elementary level. Based on the results of observations, it is known that students do not have an active way in learning mathematics, this is because the learning method is conventional and tends to *be direct instruction* (Siahaan et al., 2022). *Direct instruction* learning tends to make students

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passive, have no challenges, tend to be monotonous and result in boredom in learning (Niak et al., 2018). The results of the diagnostic assessment showed that the majority of students had a score below the Learning Objective Completeness Criteria (KKTP) and had different understandings in mathematics learning. Student learning outcomes should achieve a minimum score based on the Criteria for Completeness of Learning Objectives that have been set by the school. Therefore, it is necessary to apply the *PBL-Role Playing* model with the TaRL approach in learning mathematics of numerical number counting operations.

A learning approach called problem-based learning (PBL) uses real-world issues to help students come up with answers. Because the PBL model encourages students to think critically and guides them in solving the challenges that are provided, it will increase student engagement. PBL model will make students more active because in the learning process they are invited to think and directed to solve the problems presented (Putri et al., 2023; Zulfa et al., 2023). The problems presented in *Problem based Learning* (PBL) are simple and not so difficult problems according to the characteristics of students and as a spark in the learning process. This is support report (Hosnan, 2014), that the PBL model contains daily problems as triggers for the student learning process before knowing the concept. PBL aims to make students form their knowledge efficiently, contextually, be capable of critical thought and problem-solving (Suswati, 2021).

Role Playing is a learning model that presents roles in the real world into performances in the classroom which can later be used as material for reflection and assessment for students in playing roles (Permana, 2020). The application of *role playing* can make students directly involved in the learning process and be able to increase student activities (Wulandari et al., 2023). Students' activeness in implementing *role playing* is obtained from students' imagination and appreciation in playing characters to master the concepts of the material taught (Yulianto et al., 2020).

Several reports on PBL have been carried out a lot. PBL has been proven to improve student learning outcomes (N.K. Mardani et al., 2021; Utomo & Hardini, 2023). PBL is also reported in increasing student activity in learning (Karima & Tyas, 2024). However, there are shortcomings in the implementation of PBL, namely if students do not have confidence in solving problems, then students will be reluctant to try to solve problems (Rakhmawati, 2021). The application of the role-playing model has been reported to be able to improve student learning outcomes (Ganda, 2021; Bera, 2022). However, the application of role-playing is also reported to make students still embarrassed in creating scenes because they feel a lack of confidence in other students (Febianto et al., 2024). The TaRL approach that is in accordance with the cognitive level of students is known to make students more confident (Purnomowati, 2016). The combination of learning models is able to complement the shortcomings of another learning model.

An approach called *Teaching at the Right Level* (TaRL) centers on cognitive level of student ability, TaRL is generally used for reading and numeracy skills because each student has different abilities (Banerjee et al., 2021). TaRL is a learning strategy that allows for flexibility in instruction based on student capacity, ability level, and needs, it refers to the similarity of students' abilities rather than grade level (Suharyani et al., 2023). Students have different abilities in understanding each material given by the teacher, this is due to the factor of students level of cognition who have not achieved learning achievements. Therefore, the TaRL approach can make students who are left behind so that they can achieve learning outcomes because this approach is adapted to the characteristics of diverse students.

The merger of PBL-Role Playing and TaRL is new, because there are still limited studies that combine the three. This research is very relevant to be carried out considering the importance of mastering the concept of counting numbers as a basis for learning more mathematical material. In addition, In order to raise the standard of mathematics instruction in classrooms, it is anticipated that this research will help create successful learning models and pique students' interest.

This research is extremely important since it can help create more creative and efficient learning models that will raise the standard of education. In order to make mathematics instruction more engaging and significant for pupils, the findings of this study should offer suggestions to instructors. Furthermore, other scholars who are interested in conducting additional research in the same area may find this study to be a useful resource.

The purpose of this study is to determine the effectiveness of PBL-role playing learning with the TaRL approach in improving learning outcomes and student activity in the number counting operation material.

METHOD

Research Design

This research is a Classroom Action Research (CAR). The goal of CAR is to raise the standard of instruction in classrooms and schools generally (Sugiyono, 2014). The implementation of this Classroom Action Research (CAR) took place at the UPT Education Unit of SDN Kersikan I Bangil which is located at Jalan Baru Number 289B, Kersikan Village, Bangil District, Pasuruan Regency, East Java. This research refers to the design developed by Kemmis & Taggart with four main activities, namely planning, acting, observing, and *reflecting* (Komara & Mauludin, 2016).

During the planning phase, student activities and classroom observations are conducted. Analyze the problems that occur and look for the factors that cause learning problems. A diagnostic test is conducted during the planning phase to determine the students pre-learning understanding. The diagnostic assessment's findings serve as a guide when creating learning tools. The learning tools consist of teaching modules, learning media, worksheets, assessment instruments, assessment rubrics, and observation sheets.

The purpose of the implementation stage activities is to carry out learning in line with the teaching modules created for SDN Kersikan I Bangil's class V. Student orientation to problems, student organization, investigation guidance, result development and presentation, and problem analysis and evaluation are all examples of implementation based on PBL terminology. Simultaneously, the role-playing is conducted during the investigation's guidance phase by creating a brief acting script and during the development and presentation of the findings by assuming the role of classroom buying and selling activities based on a previously prepared script. In the meantime, the TaRL method is applied by adapting different worksheets based on the cognitive level of students.

The activities carried out at the observation stage are collecting data and carrying out documentation activities and observing learning carried out in accordance with the observation sheet. Data is collected based on test results and observation sheets that have been prepared by researchers.

Observation and in-depth analysis of the learning activities conducted are the tasks completed during the reflection stage. The researcher considers the limitations, difficulties, benefits, and drawbacks of implementing learning in the first cycle. The outcomes of the

reflection served as information for subsequent consideration and learning activities in the second cycle.

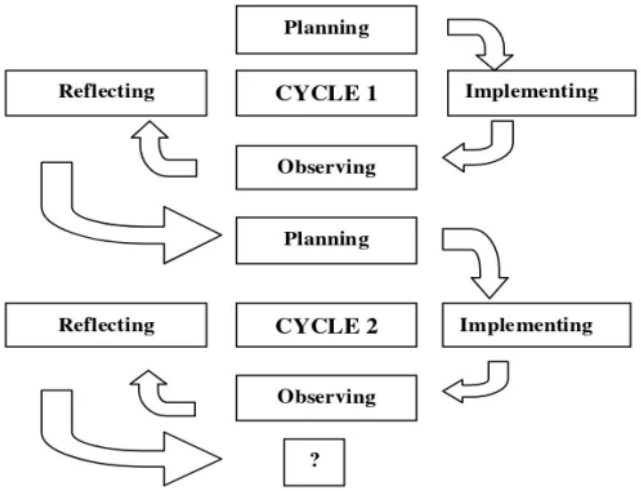

Figure 1. The CAR Cycle of the Kemmis & Taggart Model (Kamala et al., 2022)

Participants

The subject of the study is class 5th students in the odd semester of the 2024/2025 school year. Class V consists of 28 students with details of 17 males and 11 females. The object of the research is the learning outcomes and activity of students in the operation material of counting numbers up to 100,000.

Instruments

Diagnostic assessment sheets, test sheets, and student activity observation sheets are data collection tools.The data collection techniques used are test and non-test. Data was obtained from test results, namely diagnostic assessments and test sheets, while data obtained from non-test results were in the form of observation sheets of student activity which refers to (V. C. Dewi et al., 2023).

Data Analyis

Descriptive statistics were used to examine learning outcome data in order to ascertain the findings of both individual and classical completeness with reference to the following formula.

$$\text{Individual Completeness} = \frac{Accepted\ Score}{Maximum\ Score} x\ 100\%$$

$$\text{Classical Completeness} = \frac{\text{Number of students completed}}{\text{Number of students who did not complete}} x\ 100\%$$

Individual completeness is declared complete if the percentage level of completion reaches at least 76%, while for the classical level it reaches at least 85% This is in accordance with the reference for the Operational Curriculum of the Education Unit that has been set by SDN Kersikan I Bangil.

The student activity data refers to the criteria from Dewi et al. (2023), then analyzed using percentages and determined based on table 1.

Table 1. Criteria for Student Activity

Percentage (%)	Information
0-20	Very Less
21-40	Less
41-60	Enough
61-80	Good
81-100	Excellent

RESULTS AND DISCUSSION

Results

This Class Action Research (CAR) was conducted on 28 grade V students of SDN Kersikan I Bangil for the 2024/2025 school year with mathematics subjects. The implementation of activities refers to the teaching modules that have been developed by teachers. The teaching module that was prepared applied PBL-Role Playing with Teaching at the Right Level (TaRL). The content of the teaching module contains problems in buying and selling activities that can later be carried out role-playing games as sellers and buyers. The TaRL approach is in the form of differentiation of low and high cognitive levels of students through the differentiation of questions contained in LKPD that are in accordance with the cognitive level of students. The learning process in this study is: (1) starting with giving a problem by students regarding errors in giving change, (2) grouping students based on the results of the diagnostic assessment and the distribution of worksheets in accordance with the TaRL approach, (3) guiding investigations related to buying and selling problems, at this stage students play the role of sellers and buyers according to the division of roles that have been listed in the worksheet, (4) students present the results of problem solving, and (5) teachers provide evaluation and reflection on the problem-solving process.

Classroom Action Research (CAR) is carried out in 2 cycles. The data obtained are in the form of diagnostic assessment data, post tests, and student activity observation results. The results of the study are described as follows.

Diagnostic Assessment Results

Diagnostic assessments are carried out before the implementation of cycle 1. Diagnostic assessments are used by teachers as a reference in grouping students according to their cognitive level so that the Teaching at the Right Level (TaRL) approach can be implemented. The data obtained from the diagnostic assessment was processed in the form of percentages. The results of the diagnostic assessment can be seen in table 2, while the grouping of students based on cognitive level is obtained based on the results in table 3.

Table 2. Diagnostic Assessment Results

No	Description	Pre Cycle
1	Sum	1836
2	Average	65,57
3	Number of students completed	6
4	Incomplete number of students	22
5	Classical Completeness (%)	21,43
6	Incomplete (%)	78,57

Table 3. Categories of Students' Cognitive Levels based on Diagnostic Assessment

Value	Percentage	Category
<52	7,14%	Low
52<x<79	78,57%	Medium
>79	14,28%	High

Table 2 shows that student learning outcomes are still in the low category. This is shown by the total score of 1836 and the average score of 65.57. There were 6 students who completed with classical completeness of 21.43% and 22 students who did not complete with an incomplete percentage of 78.57%. Table 3 shows the grouping of students based on cognitive level, namely low, medium, and high cognitive level groups.

Another problem found was the passivity of students in learning activities. Students tend to pay less attention to teachers and friends when explaining in front of the class, lack of a sense of cooperation due to direct instruction learning, lack of trained ability to solve problems when given problems, shy to give opinions in class, and lack of discipline in collecting assignments. The results of the observation of student activity in the pre-cycle can be seen in table 4.

Table 4. Student Activities during Pre-Cycle

INDICATOR					Average
Attention	Collaborate	Troubleshooting	Presenting Ideas	Discipline	
52,67%	41,96%	37,50%	41,07%	50,89%	44,82%

Based on the table, it is known that most students are still not active in learning. This can be seen from the indicators of attention 52.67%, cooperation 41.96%, problem solving 37.50%, putting forward ideas 41.07%, and discipline 50.89%. Student activeness is needed as a provision to face challenges in the era of disruption. The selection of learning models, approaches, and strategies is crucial to creating an active and student-centered classroom. However, teachers need to bridge students during learning according to their needs in order to create a safe and comfortable learning environment.

Analysis of Student Learning Outcomes

Student learning outcomes can be known through a post test that is carried out after the treatment is given. The results of the posttest were used to determine the effectiveness of PBL-Role Playing with the TaRL Approach to Improve Learning Outcomes and Activeness. The learning results in the form of posttests can be seen through table 5.

Table 5. Student learning outcomes

No	Description	Cycle 1	Cycle 2
1	Sum	2070	2440
2	Average	73,92	87,14
3	Number of students completed	13	27
4	Incomplete number of students	15	1
5	Classical Completeness (%)	46,43	96,43
6	Incomplete (%)	53,57	3,57

Based on table 5 above, there is an increase from cycle 1 to cycle 2. The average score increased from 73.92 to 87.14. Classical completeness increased from 46.43% to 96.43%. This shows that students' ability in learning outcomes has increased after being given PBL-Role Playing learning with the Teaching at the Right Level (TaRL) approach. This improvement is in line with students' habits in working on problem-based questions and playing a role based on

the given problem according to their respective cognitive levels.

Results of Student Activity

Student activities during learning are still observed. This is to find out the student's activeness to correct shortcomings during learning. Student activities are observed based on 5 indicators that have been determined. The results of student activity increased during 2 cycles which can be seen in table 6.

Table 6. Results of Student Activity

Indicator	Cycle 1 (%)	Cycle 2 (%)	Increase (%)
Attention	70,53	84,82	14,29
Cooperation	57,14	83,03	25,89
Troubleshooting	74,10	90,17	16,07
Presenting Ideas	58,92	78,57	19,65
Discipline	78,57	83,03	4,46
Average	**67,85**	**83,92**	**16,07**

Discussion

Learning planning activities begins with a diagnostic assessment. This dagnostic assessment aims to determine students' initial abilities so that teachers can design learning according to student needs and teachers can classify students according to their cognitive level (Toprak-Yildiz, 2021). Based on the results of the diagnostic assessment, it was known that 7.14% belonged to the low cognitive level category, 78.57% to the medium category, and 14.28% to the high category. These differences can create gaps, so a Teaching at the Right Level (TaRL) approach is needed in the application of learning (Gunawan et al., 2024; Mustafa et al., 2024).

The grouping based on TaRL is divided into 3 group categories, namely students with low, medium, and high cognitive levels. This TaRL approach is effectively implemented in accordance with previous research. In Haryana, North India, the TaRL approach was able to improve reading ability from 34% to 53% (Stern et al., 2021). As for Indonesia, the TaRL approach is able to increase the reading level to 35.43% (Jazuli, 2022). The TaRL approach can also be applied in mathematics learning, such as the application in Zambia which is able to improve literacy and numeracy through formal and non-formal education so as to create sustainable educational solutions (Akdi & Belamhitou, 2024).

The learning plan carried out by the researcher refers to the results of the diagnostic assessment. The planned learning uses PBL-Role Playing with the TaRL approach on integer counting operation material up to 100,000. As for the activities carried out by providing problems in buying and selling activities, then students practice buying and selling activities. The TaRL approach is carried out by modifying the worksheet which has a variety of different questions based on the student's cognitive level.

Implementation of PBL-Role Playing with the TaRL Approach to Learning Outcomes

The implementation of PBL-Role Playing with the Teaching at the Right Level (TaRL) approach to learning outcomes in this classroom action research shows an increase from cycle 1 to cycle 2. This can be seen from table 5 which shows that the average score increased from 73.92 to 87.14. Classical completeness increased from 46.43% to 96.43%. This result shows the effectiveness of the combination of PBL-role playing with TaRL. In this regard, there has been no report that examines the combination of PBL-role playing with the TaRL approach to student learning outcomes. However, the implementation of PBL is reported to improve student learning outcomes (Armanta et al., 2019) (Kaharuddin, 2019)(Evendi & Verawati, 2021),

while role playing is also reported to improve student outcomes (Joma et al., 2016)(Yusnarti & Sutyaningsih, 2021) (Khoiro et al., 2021). The TaRL approach can facilitate students who have diverse characteristics so that they can learn according to their learning needs. The TaRL approach is well suited for diverse classes (Ananda & Adi, 2024). The implementation of PBL-role playing with TaRL makes students improve their learning outcomes and can learn according to their needs based on their cognitive level.

The problem-based learning *model* allows students to solve the problems presented. The problems raised in *problem-based learning* are real problems, the problems presented aim to train students in solving problems so that they can get used to thinking creatively, explore ideas, and be able to identify in solving the problems presented (Chen et al., 2021) (Smith et al., 2022). The problem-based learning model is able to make students tend to have better critical and analytical thinking skills than students who learn through conventional methods (Liu & Pásztor, 2022). With real problem solving, students can develop problem-solving skills that are useful in daily life and in the world of work.

The role-playing model can make students directly involved in learning. Role playing is able to make students learn according to real life. Thus, students will not only master the theory but also be able to apply it in the context of daily life. The role playing learning model can also improve communication skills and cooperation between students (N. Nasution et al., 2017). Role playing also allows students to identify roles in real life thus helping them in acquiring social and moral values in playing roles (Sekarpuro &, 2020).

The Teaching at the Right Level (TaRL) approach ensures that students are prepared according to their cognitive level. This approach refers to the needs or learning abilities of students because each student has unique learning abilities, so that TaRL can be seen as a response to the gap in student understanding in carrying out the learning process (Ananda, I.I. Ulfa, J.F., & Yorianda, 2024). Teachig at the Right Level is also an alternative in differentiated learning, namely differentiated learning readiness. In the differentiation of learning readiness, the readiness of students in receiving new material should be considered so that students are grouped into groups that are ready to receive difficult material groups that require a long learning time (Herwina, 2021). The implementation of TaRL makes teachers introduce material concepts in accordance with the learning needs of students, one of which is their learning readiness.

The combination of PBL-Role Playing with TarL makes student learning outcomes increase. This is because this combination has the advantage of making students able to solve the problems that have been presented, communication and cooperation so that learning can be applied in real life through role playing, and students are able to learn according to their respective learning readiness so that they can learn based on their learning needs, both those who have low, medium, and high cognitive levels. The PBL-Role Playing model with TaRL certainly presents a problem that must be solved. Problem solving is carried out in groups by playing roles. When students discuss problem-solving with peers who have the same cognitive level, they are more confident in expressing their opinions. This is in line with research (Purnomowati, 2016), students who have a high cognitive level tend to be diligent and ambitious in learning, while students with low cognitive levels tend to be unconfident so they feel burdened when grouped with students with high cognitive levels.

Implementation of PBL-Role Playing with the TaRL Approach to Student Activity

The implementation of PBL-Role Playing with the Teaching at the Right Level (TaRL) approach to student activity in this classroom action research shows an increase from cycle 1

to cycle 2. This can be seen from table 6 which shows an increase in each indicator. Attention indicators increased by 14.29%, cooperation by 25.89%, problem solving by 16.07%, ideas by 19.65%, and discipline by 4.46%.

The attention indicator increased from 70.53% to 84.82%. PBL-Role Playing with TaRL can increase student attention in learning. Students become more attentive to the material taught because they directly act out the concept of counting numbers through problematic activities in buying and selling. Student attention is one of the keys to the implementation of learning properly. Attention is a view or concentration on something that is the main focus by putting other things aside (F. R. Nasution et al., 2022). Good attention has been shown by students even though at the beginning of the cycle, there are still many who have not concentrated in learning because there are still students who do not understand the activities to be carried out, but in the next cycle they have been able to give better attention to learning activities because they already understand the activities to be carried out and ask questions if there are things that are not understood.

Cooperation indicators have increased from 57.14% to 83.03%. Group learning activities require cooperation between group members. Cooperation allows students to interact with each other (Topping et al., 2017). The interactions that are formed refer to two principles, namely positive interdependence and individual accountability (Johnson & Johnson, 1999). Positive interdependence means that students can achieve goals if their group mates have goals to achieve together, while individual accountability relates to the responsibilities of members in group work (Abramczyk & Jurkowski, 2020). In this study, students have the same goal, namely to solve problems presented by the teacher, and they are able to divide group tasks with responsibilities. First, students who have a low cognitive level have difficulty solving problems. However, teachers provide scaffolding as a comprehensive guidance effort in solving problems.

The problem-solving indicator also increased from 74.10% to 90.17%. This increase occurred in line with the application of the PBL-role playing model with TaRL. Problem-based learning trains students to solve problems that have been presented by the teacher. Problem-based learning combined with role play and TaRL can make students solve problems through real experiences in the form of role-playing. This is in line with research related to PBL by (Marchy et al., 2022) showing that PBL trains students to solve problems through various knowledge and real experiences by identifying problems and finding the right way to solve problems. In investigation, students use various skills so that they are motivated to solve problems, especially if they are done cooperatively.

The next indicator is to come up with an idea. This indicator rose from 58.92% to 78.57%. Presenting ideas requires good communication. Students experience an improvement in speaking class, they bring up their ideas when discussing, presenting, and responding to other groups. When presenting ideas, it is necessary to make efforts to understand each other, build communication and feelings precisely and clearly, and be able to put yourself in place with the interlocutor (Rambe et al., 2022). Students are already able to express their ideas during the implementation of learning, learning that implements group discussion activities can improve the communication of opinions in students because they are trained to compose effective sentences and present them with the right voice and intonation when speaking (Nurhayati et al., 2019). Putting forward ideas through good communication can be an indicator of learning success. When student communication in learning is carried out well, students' understanding of the material becomes good (Wati et al., 2019).

The discipline indicator increased from 78.57% to 83.03%. This increase shows that learning has a positive impact on shaping students' character. Discipline can be seen from students' behavior in paying attention to teachers, participating in learning according to the specified allocation, and collecting assignments. This is in accordance with the report (Mardilla et al., 2021), Individuals are said to be disciplined if they have an attitude of attention in learning, have good attendance, participate in learning, be on time in class and collect assignments.

Based on the results and discussion in the research that has been described. The novelty of this research is the combination of the PBL-Role Playing model with the Teaching at the Right Level (TaRL) approach. The implementation of this model has proven to be effective in improving learning outcomes and student activity. However, this study has limitations, namely the application of differentiated learning only focuses on student learning readiness so that it only uses the Teaching at the Right Level approach. It is hoped that for the next research, researchers will develop research with other differentiation learnings such as differentiation of products, content, and processes and can integrate elements of entrepreneurship and *culturally responsive teaching* (CRT).

CONCLUSION

Based on the results of the research, classroom actions that have been implemented using the PBL-Role Playing model with the TaRL approach have proven to be effective in improving learning outcomes and student activity. The percentage of completeness of learning outcomes in the pre-cycle was 21.43%, in the first cycle it was 46.43% and in the second cycle it was 96.43%. Meanwhile, the percentage of student activity in the pre-cycle was 44.82%, the first cycle was 67.85% and the second cycle was 87.92%. Through these findings, PBL-Role Playing research with the TaRL approach is highly recommended to be applied. Training and dissemination of this combination need to be carried out so that teachers can apply more diverse and innovative learning models. In addition, further research is needed with the development of other differentiated learning such as differentiation of products, content, and processes and can integrate elements of entrepreneurship and *culturally responsive teaching* (CRT).

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