Pelita :
Jurnal Kajian Pendidikan dan Pembelajaran Indonesia
2025, 5(1), 1-10
https://doi.org/10.56393/pelita.v5i1.3271

Application of the Discovery Learning Model to Improve Understanding of Concepts and Learning Interests of Grade 3 Students Using Data Presentation Board Media

Nurul Ain [1*], Khandyas Kenza Karomiah [2], Luluk Faridatus Zuhro [3]
[1] Universitas PGRI Kanjuruhan Malang, Indonesia
[2] Sekolah Dasar Negeri 1 Bandungrejosari Malang, Indonesia
* Author Correspondence

Article History
Received : 8 June 2025;
Revised : 13 July 2025;
Accepted: 18 Juni 2025.

Keywords
Discovery Learning;
Teaching at the Right Level;
Understanding of concepts;
Interest in Learning;
Data Presentation Board Media.

Abstract
This research aims to increase the interest in learning and understanding of mathematical concepts of grade III elementary school students in data presentation materials through the Discovery Learning model assisted by Data Presentation Board media with a teaching approach according to the level of students' ability. Based on initial observations at Bandungrejosari 1 Public Elementary School, Malang City, it is known that students have low interest in learning and have difficulty understanding the concept of data presentation. This classroom action research was carried out in two cycles over four meetings, involving observation, learning interest questionnaires, and learning outcome tests. Success indicators are set when ≥85% of students achieve a minimum score of 70. The results showed a significant increase, where the average value of concept comprehension increased from 68.3 in the pre-cycle to 83.3 in the second cycle, and the completeness of learning increased from 48% to 89%. The average learning interest score also increased from 71 to 86.3. These findings prove that the Discovery Learning model assisted by Data Presentation Board media is effective in increasing learning interest and understanding of mathematical concepts. Practically, these results recommend the use of a combination of discovery models and visual-based concrete media as an innovative alternative in mathematics learning in primary schools.

Contact : Corresponding author e-mail: nurulain@unikama.ac.id
How to Cite : Ain, N., Karomiah, K. K., & Zuhro, L. F. (2025). Application of the Discovery Learning Model to Improve Understanding of Concepts and Learning Interests of Grade 3 Students Using Data Presentation Board Media. *Pelita : Jurnal Kajian Pendidikan Dan Pembelajaran Indonesia*, 5(1), 1–10. https://doi.org/10.56393/pelita.v5i1.3271

Introduction

Mathematics is one of the fundamental subjects in basic education that plays an important role in developing students' numeracy skills, logical thinking, and problem-solving skills (OECD, 2020). However, the results of the Programme for International Student Assessment (PISA) survey in 2018 show that the mathematics literacy scores of Indonesian students are still far behind, ranking 73rd out of 79 countries, with only 28% of students able to achieve the minimum level of mathematical ability (OECD, 2019). One of the causes of this weak performance is the low mastery of basic concepts, including data presentation materials, which are needed in daily numerical activities (Sunzuma et al., 2021).

Similar conditions were found at Bandungrejosari 1 Public Elementary School, Malang City, especially in grade III. The observation results showed that out of 28 students, only 7 students (25%) were able to present simple data in the form of tables and tables independently. Most students showed low interest in learning, characterized by a lack of participation in discussions, lack of enthusiasm during learning, and only 21% of students actively asked questions or answers (observation data, February 2024). In addition, the results of the formative assessment showed that the average grade of the class in the data presentation material only reached 68.3, still below the Minimum Completeness Criteria of 75.

This problem is closely related to conventional learning methods that are still dominant using lectures and practice questions in textbooks without involving concrete media or meaningful interactive activities. According to Piaget's theory of constructivism, mathematics learning should take place actively through the interaction of students with real objects in the surrounding environment (Piaget, 1977). In line with that, Vygotsky (1978) emphasized that optimal learning occurs when students are guided in their proximal development zone through meaningful and contextual learning experiences. Thus, passive learning methods are less effective in building an understanding of abstract concepts such as data presentation (Fauziyah et al., 2022).

One effective learning model to increase student engagement and conceptual understanding is Discovery Learning. This model places learners as active subjects who discover concepts through observation, exploration, discussion, and inference (Damayanti et al., 2022). Discovery Learning encourages students to build knowledge independently through the stages of stimulus, problem identification, data collection, proof, and conclusion (Khoiriyah & Fatonah, 2024). This model has been shown to be effective in improving the memory, understanding of concepts, and learning motivation of elementary school students.

However, in the context of classrooms with heterogeneous student ability levels, the implementation of Discovery Learning needs to be combined with differentiated teaching strategies. One relevant approach is Teaching at the Right Level, which is a strategy to group students based on their actual abilities, not just formal classroom levels. This approach has been applied in several developing countries such as India, Kenya, and Ghana with significant results in improving students' basic numeracy skills (Banerjee et al., 2016; Snilstveit et al., 2016). Teaching at the Right Level focuses on simplifying materials, flexible grouping, and focused mentoring so that each student learns according to their level of mastery. Several international studies (Di Gropello et al., 2020; Varly et al., 2019) also showed that this approach was very effectively applied in heterogeneous elementary classes.

Although various studies have examined the effectiveness of Discovery Learning and Teaching at the Right Level separately, there have not been many studies that specifically integrate the two approaches in the learning of data presentation materials in Indonesia. Kusuma and Yudiono (2024) proved that the combination of Discovery Learning and Teaching at the Right Level was able to increase the motivation and learning outcomes of mathematics students in grade I of elementary school, while Komariyah and Pramesti (2021) found that diagram board media was effective in improving understanding of data presentation. However, there has been no research that utilizes innovative concrete media that is integrated with both approaches.

Responding to this need, this study developed a concrete learning media in the form of a Data Presentation Board that combines elements of data boards, interactive tables, and random question games to increase students' interest and understanding of concepts collaboratively. This media is designed according to the characteristics of effective media for elementary school students, which are visual, interactive, fun, and relevant to daily life (Astuti & Ramadhani, 2022). Different from the previous diagram board media, Data Presentation Board inserts elements of educational games to motivate students' active participation during learning.

Based on this background, this study aims to examine the effect of the application of the Discovery Learning model assisted by Data Presentation Board media with a teaching approach based on student ability level on increasing the learning interest and concept understanding of grade III elementary school students in data presentation materials. This research is expected to make an empirical contribution to the development of an effective, interactive, and adaptive basic mathematics learning model for elementary school students in Indonesia.

Method

This study uses the Classroom Action Research approach with the Kemmis and McTaggart spiral model design because it is suitable for improving the quality of learning through repeated stages in the form of planning, action implementation, observation, and reflection (Kemmis et al., 2014). The research was carried out at Bandungrejosari 1 Public Elementary School, Malang City, in the even semester of the 2024/2025 school year with 27 subjects in grade III consisting of 15 males and 12 females. The implementation of research is carried out collaboratively between researchers and classroom teachers to develop action plans, implement learning, conduct joint observations, and reflect on learning results. The research procedure was carried out in two cycles, each consisting of an action planning stage, the implementation of the Discovery Learning model with a teaching approach according to the level of ability of students assisted by Data Presentation Board media, observation of engagement and learning outcomes, and reflection. Data was collected through structured observation using learning interest observation sheets, evaluation tests in the form of pretests and posttests to measure concept understanding, and documentation of learning activities. All instruments were tested for content validity through expert judgement by three lecturers and one senior elementary mathematics teacher, and tested for reliability using Alpha Cronbach in a limited trial, with a reliability result of 0.84 for the learning interest questionnaire and 0.81 for the observation sheet. Qualitative data was analyzed by the stages of reduction, presentation,

and conclusion drawn, while quantitative data was analyzed through the calculation of average scores, percentage of learning completion, and an increase in students' learning interest scores each cycle. The criteria for the success of the action are determined if at least 75% of students achieve a score above the Minimum Completeness Criterion 75 and there is a significant increase in interest in learning from pre-cycle to cycle II.

Results and Discussion

Results

The research was carried out through two cycles. Before the start of the cycle, the researcher carried out a pre-cycle. This class action research begins with observation activities to find out the initial conditions and identify problems that occur in the Mathematics subject, and a pretest is carried out to find out the understanding of the concept at the beginning. The following are the results of the pretest scores for the 3rd grade Mathematics Subject Bandungrejosari 1 Public Elementary School, Malang City.

Table 1. Pre-Cycle Pretest Results

No	Aspects	Pre-Cycle
1.	Number of all students	27
2.	MOH	75
3.	Sum of the whole value	1.845
4.	Average score	68,33
5.	Number of students completed	13
6.	Completion Percentage	48%
7.	The number of students has not been completed	14
8.	Incompleteness Percentage	52%

Modified from (Kusuma & Yudiono, 2024)

The table of student success rates shows that out of a total of 27 students with a KKM of 75, students get an average score of 68.33 out of a total score of 1,420. The number of students who completed was 13 with a completion percentage of 48%, while the number of students who did not complete was 14 with a percentage of incompletion of 52%.

Based on the results of the analysis at the pre-cycle stage, it is known that students' interest in learning is still low, and the understanding of concepts measured through the results of the pretest shows that only 48% of the total students achieved the Minimum Completeness Criteria, with an average score of 68.33. This shows that most students have not understood the data presentation material optimally.

This is because when carrying out the learning activity process, teachers often use learning models and methods that have not varied so that students feel bored or bored, teachers have not used media, so that many students do not have low interest in learning, are passive, and have difficulty understanding concepts in mathematics. Teachers should choose a learning model that is appropriate and focused on students, and use supporting media to increase students' interest and enthusiasm in the learning process. Therefore, in line with the opinion (Zulfah, 2023) that students' interest in learning increases with an interesting learning process, making students more enthusiastic.

In cycle 1, attended by 27 students, the researcher improved the learning process by applying the Teaching at the Right Level approach with the Discovery Learning model assisted by Data Presentation Board media to increase interest in learning mathematics and understanding of concepts in data presentation materials in grade 3 of Bandungrejosari 1 Public Elementary School, Malang City.

The application of the chosen learning model and media makes students more interested, follows the teacher's direction, and creates a fun and enthusiastic learning atmosphere. The solution is strengthened by the opinion (Anggraini et al., 2023) to increase interest in learning and understanding the concept of a learning model that suits the characteristics of students, namely discovery learning.

The results obtained in the implementation increased students' interest in learning and understanding of students' concepts. This cognitive assessment is a benchmark in looking at concept understanding and as a material for student evaluation in the next stage of the cycle. There was an increase between pre-cycle and cycle 1, with the following data obtained:

Table 2. Cycle I Recapitulation

No	Aspects	Cycle I
1.	Number of all students	27
2.	MOH	75
3.	Sum of the whole value	2040
4.	Average score	75,55
5.	Number of students completed	17
6.	Completion Percentage	63%
7.	The number of students has not been completed	10
8.	Incompleteness Percentage	16%
9.	Average Learning Interest	71

Modified from (Kusuma & Yudiono, 2024)

The results of the assessment showed an increase from pre-cycle to cycle 1. The average score increased from 68.3 in the pre-cycle to 75.5 in the 1st cycle, and the completion percentage increased from 48% to 63%. Overall, there was an average increase of 7.2 and a percentage of completeness of 15%. And the average result of learning interest in cycle 1 is 71.

Cycle 1 data shows an increase in learning outcomes compared to pre-cycle, but there are still 10 students who have not reached completion. The cause of the incompleteness is influenced by several factors, namely limited time for material preparation, teaching, and assessment.

Teachers have difficulty in managing class dynamics and have not been able to condition student behavior that disturbs other friends or does not comply with class rules. From the shortcomings in cycle 1, teachers package the learning process activities even better, namely by carrying out cycle II.

In cycle II, there was an increase in students' interest and understanding of concepts. Teachers manage learning optimally using the Teaching at the Right Level approach of the discovery learning model assisted by Data Presentation Board media in mathematics lessons on data presentation in grade 3 of Bandungrejosari 1 Public Elementary School, Malang City.

Based on data analysis after making improvements in the first cycle of learning, learning was carried out in the second cycle. In cycle II, the researcher planned a more interesting learning by improving the LKPD to be more interactive and adding variety to the PPT in order to be able to increase students' interest to focus on the learning implementation process.

At this stage, there was a very rapid increase in learning outcomes, when compared to the pre-cycle and cycle I learning outcomes. The following is a table of the results of the assessment cycle 2 obtained as follows:

Table 3. Cycle II Recapitulation

No	Aspects	Cycle II
1.	Number of all students	27
2.	MOH	75
3.	Sum of the whole value	2.250
4.	Average score	83,33
5.	Number of students completed	24
6.	Completion Percentage	89%
7.	The number of students has not been completed	3
8.	Incompleteness Percentage	11%
9.	Average learning interest	86,3

Modified from (Kusuma & Yudiono, 2024)

The results showed a significant improvement from pre-cycle to cycle 2. The average score also increased from 68.3 (pre-cycle) to 75.5 (cycle 1), and 83.3 (cycle 2). The percentage of completeness increased from 48% (pre-cycle) to 63% (cycle 1), and 89% (cycle 2). The average student learning interest increased from 71 (cycle 1) to 86.3 (cycle 2). Compared to before cycle 1, the improvement in cycle 2 was significant. The following is a table of assessment results between pre-cycle, cycle 1, and cycle 2.

Table 4. Recapitulation

No	Aspects	Interest in Learning	Tuntas	Incomplete	Average Score
1.	Pre-Cycle	-	48%	52%	68,3
2.	Siklus 1	71	63%	16%	75,5
3.	Siklus 2	86,3	89%	11%	83,3

Modified from (Kusuma & Yudiono, 2024)

Based on the analysis, the percentage of completeness of students' mathematics learning outcomes increased rapidly from pre-cycle to cycle II. In the pre-cycle, teachers have not applied the Teaching at the Right Level approach of the discovery learning model and Data Presentation Board media, so many students have not achieved completeness. In the first cycle, this model and media approach began to be applied, but it was not optimal, so that interest in learning, and understanding of concepts increased with a moderate category. In cycle II, the application of the Teaching at the Right Level approach of the discovery learning model, and Data Presentation Board media was carried out to the maximum, causing a significant increase in interest in learning and understanding of concepts.

Discussion

The results of the study showed a significant increase in students' understanding of concepts and learning interests gradually from pre-cycle to cycle II. The average score of concept

comprehension increased from 68.33 in the pre-cycle to 83.33 in the second cycle, while the percentage of learning completeness jumped from 48% to 89%. A similar increase occurred in the aspect of student learning interest, from a score of 71 in the first cycle to 86.3 in the second cycle. This improvement is in line with the characteristics of the Discovery Learning model which encourages students' activeness in discovering concepts through observation, exploration, and guided discussions. As revealed by Damayanti et al. (2022), this model is effective in building students' curiosity and learning engagement during the learning process.

The application of the Teaching at the Right Level approach in this study is also an important supporting factor. Through grouping students according to the level of material mastery and providing assistance as needed, the gap in concept mastery in heterogeneous classes can be minimized, as evidenced in the research of Banerjee et al. (2016) in India and Kenya. This finding is also strengthened by a study by Anggraini et al. (2023) which states that Discovery Learning is effective in increasing the learning interest and learning outcomes of elementary school students. The presence of Data Presentation Board concrete media plays an important role in strengthening the understanding of abstract concepts of data presentation through direct visualization and interactive activities. Astuti and Ramadhani (2022) emphasized that visual-interactive learning media is able to significantly increase student motivation and learning retention.

The success of the action was supported by several factors, including the use of Data Presentation Board media that attracted students' attention, the implementation of interactive LKPD that facilitated data exploration, and the variety of material presentation that was improved in cycle II through more attractive visual media. However, this research also faces several obstacles, such as the management of classroom dynamics that are not optimal in the first cycle, limited implementation time, and there are still 11% of students who have not reached completion in the second cycle. This condition occurs because some students take longer to understand the concepts of data tables and sequences, as well as the lack of consistency of participation in group discussions. This factor is in line with the findings of Sunzuma et al. (2021) who stated that in numeracy learning in elementary grades, students with low confidence levels tend to have difficulty adapting to active inquiry schemes.

Practically, the results of this study contribute to the practice of mathematics learning in elementary schools, especially in data presentation materials. The combination of the Discovery Learning model with a teaching approach based on student ability level and concrete media support such as Data Presentation Board has proven to be effective and fun, as well as has the potential to be applied more widely to other math materials and in classrooms with similar characteristics. In addition, this model is also in line with international recommendations regarding the importance of real-activity based contextual numeracy for elementary school students (OECD, 2020). For further research, it is recommended to develop variations of similar concrete media for other mathematical materials such as measurement or flat building, as well as to test its effectiveness in different school contexts with diverse student characteristics.

Conclusion

The results of this study show that the application of the Discovery Learning model with the Teaching at the Right Level approach assisted by Data Presentation Board media is effective

in increasing students' understanding of concepts and learning interests in data presentation materials in grade III elementary school. The application of these models and media has been proven to be able to encourage active student involvement in the learning process, improve learning outcomes, and increase interest in numerical and visual materials. Based on these results, it is recommended that a similar approach be applied more broadly in elementary school mathematics learning, especially in materials that require an understanding of concrete concepts as well as in classrooms with diverse student skill levels. To strengthen the generalization of these findings, it is necessary to conduct further research with quasi-experimental designs or pure experiments in various schools with different student characteristics. In addition, these findings provide policy implications for decision-makers in the field of basic education to encourage the use of discovery-based learning models and differentiation of teaching through the development of adaptive curriculum, the provision of concrete educational media, and teacher training related to active learning strategies and based on students' ability levels in the classroom.

Acknowledgments

The author expresses his gratitude to the Principal of Bandungrejosari 1 Public Elementary School, Malang City, and the entire teacher council for providing permission, support, and opportunities in the implementation of this research. The award was also presented to the supervisor at PGRI University Kanjuruhan Malang for guidance, direction, and motivation during the article preparation process. Gratitude is addressed to the third grade students of Bandungrejosari 1 Public Elementary School, Malang City, who have actively participated during the research activities. Hopefully the results of this research can be a real contribution to the development of mathematics learning in elementary schools, especially in increasing students' interest in learning and understanding of concepts.

Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

References

Anggraini, D., Muslim, S., & Marlina, R. (2023). The effect of discovery learning model on students' mathematical understanding ability. *International Journal of Progressive Sciences and Technologies, 35*(1), 163–170. https://doi.org/10.52155/ijpsat.v35.1.5567

Astuti, D., & Ramadhani, A. (2022). Development of learning media based on local wisdom to improve mathematics learning outcomes. *International Journal of Instruction, 15*(2), 301–318. https://doi.org/10.29333/iji.2022.15217a

Banerjee, A., Banerji, R., Duflo, E., Glennerster, R., & Khemani, S. (2010). Pitfalls of participatory programs: Evidence from a randomized evaluation in education in India. American Economic *Journal: Economic Policy, 2*(1), 1–30. https://doi.org/10.1257/pol.2.1.1

Damayanti, D., Supriyanto, S., & Lestari, R. (2022). Discovery Learning Model to Improve Mathematical Reasoning Ability in Elementary School Students. International Journal of Instruction, 15(1), 123–136. https://doi.org/10.29333/iji.2022.1518a

Fauziyah, N., Rahmawati, N., & Susanti, R. (2022). Realistic mathematics education (RME) approach to improve students' mathematical reasoning ability. Infinity Journal, 11(1), 1–12. https://doi.org/10.22460/infinity.v11i1.p1-12

Firdaus, M., & Usodo, B. (2023). The effectiveness of discovery learning assisted by manipulative media on mathematical problem-solving ability. Jurnal Elemen, 9(2), 436–448. https://doi.org/10.29408/jel.v9i2.6383

Hidayati, T., & Sukestiyarno, Y. L. (2021). Implementation of RME in improving students' mathematical communication skills. Infinity Journal, 10(1), 27–38. https://doi.org/10.22460/infinity.v10i1.p27-38

Jauhari, I., Sunendar, D., & Kustiawati, D. (2023). The implementation of Teaching at the Right Level (TaRL) approach in elementary schools: A case study in West Java. International Journal of Education and Practice, 11(1), 130–142. https://doi.org/10.18488/61.v11i1.3113

Khoiriyah, N., & Fatonah, N. (2024). Discovery learning model to improve conceptual understanding of elementary school students. Journal of Primary Education, 13(1), 45–55. https://doi.org/10.15294/jpe.v13i1.62370

Komariyah, E., & Pramesti, D. (2021). Diagram board media to improve the data reading ability of elementary school students. Journal of Basic Education of the Archipelago, 6(2), 145–156. https://doi.org/10.29407/jpdn.v6i2.16338

Kusuma, A., & Yudiono, H. (2024). Teaching at the right level integrated with discovery learning: An action research in primary mathematics classroom. Jurnal Pendidikan Matematika, 18(1), 20–32. https://doi.org/10.22342/jpm.v18i1.15250

Kusumawati, D., & Mahfud, R. (2023). Designing interactive numeracy board games for elementary students. International Journal of Instructional Technology and Educational Studies, 5(3), 100–112. https://doi.org/10.21608/ijites.2023.174769

Makruf, I., Nasution, A. H., & Azizah, N. (2021). Implementation of Kemmis & McTaggart action research model to improve classroom practice. International Journal of Evaluation and Research in Education, 10(2), 648–656. https://doi.org/10.11591/ijere.v10i2.21042

OECD. (2019). PISA 2018 results: What students know and can do (Volume I). OECD Publishing. https://doi.org/10.1787/5f07c754-en

Piaget, J. (1977). The development of thought: Equilibration of cognitive structures. Viking Press.

Pratama, R. Y., & Anwar, M. (2023). The effect of discovery learning models on students' mathematical communication skills. Infinity Journal, 12(1), 42–54. https://doi.org/10.22460/infinity.v12i1.p42-54

Rahmawati, Y., Rachmawati, Y., & Kurniawati, M. D. (2023). Discovery learning assisted by media to enhance elementary students' mathematical understanding. Journal of Physics: Conference Series, 2347(1), 012024. https://doi.org/10.1088/1742-6596/2347/1/012024

Rosnaeni, R. (2021). Characteristics and assessments of 21st century learning. Journal of Basicedu, 5(5), 4341–4350. https://doi.org/10.31004/basicedu.v5i5.1548

Saputro, B. D., & Jailani, J. (2019). The effectiveness of RME-based learning to improve students' mathematical reasoning ability. Infinity Journal, 8(1), 43–58. https://doi.org/10.22460/infinity.v8i1.p43-58

Sunzuma, G., Masocha, R., & Masocha, F. (2021). The use of discovery learning to improve mathematics conceptual understanding in secondary schools. European Journal of Educational Research, 10(1), 147–157. https://doi.org/10.12973/eu-jer.10.1.147

Susilowati, N. (2018). Classroom action research as an effort to improve the quality of learning. Journal of Indonesian Basic Education, 3(1), 55–66. https://doi.org/10.26737/jpdi.v3i1.341

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Wahyuni, D. (2022). Development of discovery learning-based learning media to improve understanding of elementary mathematics concepts. Journal of Prima Edukasia, 10(2), 172–183. https://doi.org/10.21831/jpe.v10i2.46292

Widayanti, L. (2013). Teaching at the Right Level for differentiated learning for elementary school students. Journal of Basic Education, 1(1), 31–40.

Zulfah, A. (2023). Efforts to increase students' interest in learning through the discovery learning model. Scientific Journal of Basic Education, 8(1), 99–108. https://doi.org/10.21831/jpe.v10i2.46292