

Implementation of Learning Models Picture and Picture in Improving Indonesia Language Learning Outcomes "My Environment" Material for School UPT 060822 Medan

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ABSTRACT

This research is motivated by the low learning outcomes of Indonesian grade IV students of UPT SD Negeri 060822 Medan City on the material "My Surrounding Environment. A learning method that is still dominated by lectures causes students to be less active and unmotivated in the learning process. Therefore, this study aimed to implement a Picture and Picture learning model to improve student learning outcomes. This study used the Classroom Action Research (CAR) method with a repeated cycle design consisting of planning, action, observation, and reflection stages. The subjects of the study were 20 fourth-grade students of UPT SD Negeri 060822 Medan City in the 2025-2026 academic year. Data collection techniques were carried out through observations, tests, and interviews, while data analysis used quantitative and qualitative approaches. The results of this study showed an increase in student learning outcomes. At the pretest stage (initial conditions), the average student score was 66.5 with a completion rate of 20%. After the application of the Picture and Picture model in cycle I, the average score increased to 74.5 with a completion percentage of 60%. In Cycle II, the average score increased again to 87, with a completion percentage of 95%. Based on the results of the study, it can be concluded that the application of the Picture and Picture model is effective in improving the Indonesian language learning outcomes of fourth-grade students. This model not only helps students' understanding through image media but also encourages them to be more active in the learning process. Therefore, the Picture and Picture model is recommended for application in Indonesian language learning to improve student learning outcomes.

Keywords: Learning Outcomes, Picture and Picture, Indonesian Language Learning

I. INTRODUCTION

Education is the main factor for improving the quality of human resources. In the context of basic education, learning Indonesian plays an important role in building good language skills, and is true for students. One of the materials taught in grade IV of elementary school is "My Surroundings," which aims to improve students' understanding of the environment and their ability to express ideas in writing and orally. However, the reality shows that student learning outcomes in this material are still relatively low.

Based on initial observations in class IV of UPT SD Negeri 060822 Kota Medan, many students have difficulty understanding the material "Environment" "Around me" because the learning method is still conventional. Teachers tend to use lecture methods and read texts without involving students to actively participate in the learning process. This is in line with the opinion that Slavin in Fazira and Hadi (2025) stated that learning centered only on teachers is less effective in improving students' understanding and learning outcomes (Fazira & Hadi, 2025).

The Picture and Picture learning model is one method that can be used to improve students' understanding of learning Indonesian. According to Risma and Dewantara (2022), the Picture and Picture model is a learning strategy that utilizes images as the main medium for stimulating students' thinking and analytical skills. This model also encourages students to think logically and systematically to understand the relationship between images and relate them to the material being studied (Risma & Dewantara, 2022).

In addition, research conducted by Agustina et al. (2025) shows that the use of the Picture and Picture model can improve learning outcomes for students because it involves visual aspects that can help them understand

concepts more concretely (Agustina et al., 2025). This is reinforced by Ye et al. (2025), who stated that image-based learning can improve memory and understanding of concepts through dual coding theory, namely a combination of verbal and visual representations in the brain (Ye et al., 2025).

Furthermore, research conducted by Romadlon et al. (2025) found that the use of the Picture and Picture model in language learning in Indonesia can increase students' learning motivation and improve their skills in understanding and composing texts. This model is also in line with the constructivist theory put forward by Piaget (1972), in which students learn by constructing their own knowledge through experience and direct interaction with learning media (Romadlon et al., 2025).

Taking into account various theories and research that have been explained, the implementation of the Picture and Picture learning model in It is hoped that learning Indonesians will improve their learning outcomes. Fourth-grade students of UPT SD Negeri 060822 Medan City in the academic year 2025-2026. Therefore, this study will examine the effectiveness of the Picture and Picture model in improving student learning outcomes on the material "My Surrounding Environment" and analyze the supporting factors for the success of implementing this model in the learning process.

As technology becomes increasingly sophisticated and modern, it is hoped that education and students can face development in accordance with the times. Therefore, education is very important when technological facing current technological developments. Education is one of the manifestations of human culture, which is a condition for change and development within oneself, namely, starting from the child's motor functions and on during the teaching and learning process.

Teaching and learning activities at school are activities aimed at developing students' abilities to the maximum extent. The learning process teaching involves two different things, but they form a single unit. To be able to learn well, it is necessary to pay attention to several factors, including internal factors, such as interests, intelligence, desires, feelings, and beliefs that exist within the individual, as well as external factors such as learning structure, study time, study space, and even teaching methods and materials or media learning.

Learning outcomes are the level of mastery of knowledge achieved by students following the learning program, in accordance with the objectives of established education. Learning outcomes have three domains: cognitive; Affective and psychomotor. "Learning a language is a form of learning to communicate" (Sumardi, 2002). Therefore, learning Indonesians are directed towards improving students' ability to communicate in Indonesian.

Both orally and in writing. Indonesians are believed to originate from Malay, so it can be said that Indonesia is included in the Austronesian/Malayo-Polynesian language family (Purwandi, 2015).

The problem of education and teaching is quite complex, and many factors influence it. One of the factors That is the teacher. The teacher is a teaching component that plays an important role because the success of the teaching and learning processes is determined by the teacher. The teacher's job is to convey the lesson material to students through communication interactions in the teaching process. The success of teachers in delivering materials is highly dependent on smooth communication between teachers and students.

Lack of smooth communication can result in the message being conveyed by the teacher, which is difficult for students to understand.

However, the reality experienced by class IV students at the UPT SD Negeri 060822 Medan City in the 2025-2026 academic year, based on preliminary observations and interviews with homeroom teachers, showed that the main problem in the teaching and learning process is less effective. During the learning process, the teacher only explained, and the students listened and then recorded the lessons given by the teacher. The media used in learning are blackboards and textbooks. Therefore, the learning activities are not are not very interesting. Most of the students were not actively involved and did not ask questions or give opinions, even though the teacher repeatedly asked students questions if there was anything that was not clear. When the teacher asked, none of the students tried to ask questions; they just

silent. Furthermore, many students did not pay attention to the lesson and started making noise and joking around. Therefore, many students who look lazy lack confidence in practicing practice questions, and their learning outcomes are unsatisfactory.

During the teaching and learning process, several students talked to themselves to disturb other students as well as the lack of strict rules in regulating student activities. In addition, the use of Picture and Picture learning media has never been used in UPT SD Negeri 060822 Medan City in the 2025-2026 academic year. In addition, student learning outcomes in Indonesian language subjects were also low, as shown in the following table:

Table 1. Grade IV Indonesian Language Test Scores

No	Range Minimum Competency Score: 75	Amount Learners	Percentage	Information
1.	60-65	7	35%	Not yet finished
2.	66-69	4	20%	Not yet finished
3.	80-86	9	45%	Completed
Amount		20	100%	
		Participants Educate		

Based on the table above, the minimum completion criterion (KKM) was 75, with a total of 20 students. Eleven students (55%) did not complete the test, while nine students (45%) completed the test. In addition, communication between teachers and students is still lacking and the learning methods used tend to be conventional. Therefore, the teaching and learning processes are less attractive to students because of the infrequent use of learning media by teachers. One thing that teachers must pay attention to is the use of learning media. In this study, the learning media that will be used to improve student learning outcomes are the Picture and Picture learning models.

II. METHODS

This type of research is called classroom action research (CAR). Classroom action research is a systematic, reflective study of various teacher actions that simultaneously serves as research. This study was structured from planning to conducting research on actual classroom actions in the form of teaching and learning activities to improve learning conditions. Classroom action research (CAR) is a type of research that addresses actual problems faced by teachers in the field.

Using qualitative methods, descriptive research was conducted to systematically, factually, and accurately describe or explain the facts and characteristics of a specific population. Descriptive research can also be defined as research that attempts to explain actual problems, namely, problems that are currently occurring or that have emerged and will become more actual problems.

This research was adjusted according to the implementation procedures of the four components of activities contained in classroom action research (CAR) and is usually called a cycle. According to Kurt Lewin (Kunandar, 2011) action research consists of four stages: planning, action, observation, and reflection. Each cycle is implemented according to the indicators to be achieved, namely, the use of picture and picture learning media as an effort to improve student learning outcomes in Indonesian language subjects increased after an action was carried out. Before planning the cycle, the researcher carried out pre-action activities.

In this pre-action activity, the researcher first conducted a preliminary study of the conditions of the school to be studied. During this pre-action activity, the researcher conducted several additional activities.

The reflection stage is the evaluation process for the implementation of actions in Cycle I. The results of this evaluation were used as considerations for learning planning in the next cycle. If the expected results were not achieved, improvements were made and implemented in Cycle II. This reflection is crucial for identifying the successes and weaknesses of the actions taken, allowing appropriate improvements to be made to achieve the desired learning objectives.

In this research, two types of data are required: primary data and secondary data, which are obtained directly by researchers in the field. The data obtained came from original sources, commonly referred to as informants. The data sources for this study were fourth-grade homeroom teachers and 20 students, consisting of 9 girls and 11 boys, in the fourth grade of UPT SD Negeri 060822 Medan City in the 2025-2026 academic year. Secondary data sources are complementary to data that are really needed by researchers, namely books, theses, journals, and so on, which are related to this research.

Data analysis is the process of systematically searching for and organizing data obtained from interviews and field notes, breaking it down into units, synthesizing it, arranging it into patterns, selecting what is important and what will be studied, and drawing conclusions so that it can be easily understood by oneself and others (Nuning, 2017).

Data analysis is a crucial part of implementing classroom action research (CAR). If conducted correctly, the results provide a clear picture of the objectives to be achieved. This classroom action research employed both quantitative and qualitative data analysis.

- a. Qualitative data analysis: The qualitative data analysis in this study uses the Miles and Huberman model, namely, data reduction, data presentation, and conclusion drawing.
- b. Quantitative data analysis in this study used descriptive percentage and mean score techniques.

Data reduction is a form of analysis that sharpens, utilizes, and directs data, discards unnecessary data, and organizes them. Data reduction was performed by selecting, simplifying, and transforming the obtained data. In this case, researchers analyzed data deemed necessary and usable for presentation in the research report. Unnecessary data may be discarded or not used in the data presentation.

At this stage, the researchers draw conclusions based on the data presented. These conclusions form the basis of the implementation of the next cycle. These conclusions also provide answers to the problems identified at the beginning of an action.

Based on the types of difficulties experienced by the students, a thought analysis was conducted to address these difficulties in improving student learning outcomes. The analysis was conducted using percentages and data quality. (Zainal Aqib, 2006) This analysis was conducted to determine students' average scores using the following formula.

III. RESULTS AND DISCUSSION

Result

This research activity began with observations conducted by researchers on fourth-grade students of UPT SD Negeri 060822 Medan City in the 2025-2026 academic year during the Indonesian language learning process. The observations conducted by the researchers were to determine the initial conditions of students and teachers during the Indonesian language learning process and student learning outcomes in the Indonesian language subject on the material of my environment. This study was conducted collaboratively by teachers and researchers. In this case, the researcher acted as a teacher and the homeroom teacher acted as an observer. The objective of this research was to examine 20 fourth-grade students in Indonesian language learning using a picture and picture model.

Based on the results of the students' initial pre-test, their scores were still relatively low. They were unable to answer the questions posed by the researcher. This was because they had not yet understood the learning model the researcher had taught, as it had never been implemented at the school. The following are the students' scores from the initial pre-test.

The students' scores on the initial test show that the average student score still has a success rate below the Minimum Requirement Criteria (KKM), namely 66.5, where the KKM value determined by the school is 75. Four students (20%) completed and achieved KKM, while 16 students (80%) did not achieve the KKM score. The students' learning outcomes in the initial pre-test stage are shown in the following table:

Table 1. Percentage of Students' Classical Learning Outcomes Completion in the Pre-Test

No	Range	Amount	Presentation	Level of Completion
	Time	Student	Number of Students	Learning outcomes
1	90-100	0	-	Very high
2	80- 89	4	20%	Tall
3	70- 79	8	40%	Currently
4	60- 69	5	20%	Low
5	0-59	3	15%	Very low

From the table above, the percentage of students' classical learning outcomes in the initial test showed that 0% of students had very high learning outcomes, 20% had high learning outcomes, 40% had moderate learning outcomes, 25% had low learning outcomes, and 15% had very low learning outcomes. Therefore, it can be

concluded that students' initial abilities were still low in the material about the environment. Therefore, researchers should perform classroom actions.

The results of student scores in cycle 1 show that there were eight students (40%) who did not complete their studies because they had a success rate below the Minimum Completion Criteria (KKM) of 75, while 12 students (60%) had completed their studies with an average score of 74.5. The percentage of classical student completion has not exceeded 75%, and the average score obtained by students has not yet reached the KKM score determined by the school.

Therefore, it can be concluded that the learning completion of fourth-grade students at UPT SD Negeri 060822 Medan City in the 2025-2026 academic year cannot be said to have been achieved; however, students' ability to understand the material "my surrounding environment" has improved. Compared with the initial test (pre-test), the percentage of student learning completion was 20%. After the learning, the completion rate was 60%. Therefore, it can be said that there was a 40% increase in learning outcomes, with an average score of 74.5, which did not reach the KKM score set by the school.

The following are the details of the percentage of students' classical learning outcomes in cycle I:

Table 2. Percentage of Students' Classical Learning Outcomes Completion in Cycle I

No	Range of values	Number of Students	Percentage of Number of Students	Level of Learning Outcome Completion
1	90-100	2	10-%	Very high
2	80- 89	10	50%	Tall
3	70- 79	3	15%	Currently
4	60- 69	5	25%	Low
5	0-59	-	-	Very Low

From the table above, the percentage of completion of classical learning outcomes of students in cycle 1, it is known that 10% of students have a very high level of learning outcomes, 50% of students have a high level of learning outcomes, 15% of students have a moderate level of learning outcomes, 25% of students have a low level of learning outcomes, and 0% of students have a very low level of learning outcomes.

Based on this, the researcher will carry out observation actions again to improve students' learning outcomes in the Indonesian language subject on the material of my surrounding environment, namely continuing to cycle II with the aim of overcoming students' learning difficulties in completing questions while providing students with an understanding of the material of the surrounding environment.

The results of student scores in cycle II conducted during the cycle II post-test showed that 19 students (95%) completed the course with satisfactory scores and met the Minimum Completion Criteria (KKM) requirements. Meanwhile, 1 student (5%) did not complete the course because their success rate was below the KKM, which was 70.

The following are the details of the percentage of students' classical learning outcomes in Cycle II.

Table 3. Percentage of Completion of Classical Learning Outcomes of Students in Cycle II

No	Range of values	Number of Students	Percentage of Number of Students	Level of Learning Outcome Completion
1	90-100	5	25-%	Very high
2	80- 89	14	70%	Tall
3	70- 79	1	5%	Currently
4	60- 69	-	-	Low
5	0-59	-	-	Very Low

From the table above, the results of students' scores in cycle II and the percentage of students' classical learning outcomes in cycle II show that 25% of students have very high levels of learning outcomes, 70% of students have high levels of learning outcomes, 5% have moderate levels of learning outcomes, 0% have low levels of learning outcomes, and 0% have very low levels of learning outcomes.

Discussion

The purpose of this study is to determine whether the improvement of student learning outcomes in Indonesian language learning through the picture and picture learning model of Class IV UPT SD Negeri 060822 Medan City in the academic year 2025-2026. Learning using the picture and picture learning model in Indonesian language subjects can improve students' learning outcomes. The results of the initial research on the implementation of the pre-test or before the implementation of the picture and picture learning model showed that students had an average learning outcome score of 66.5, and only four (20%) people were declared to have completed learning. This level of learning outcomes is below the minimum completion criterion (KKM) for Indonesian language subjects, which is 75. Furthermore, learning actions were performed using the picture and picture learning models in Cycle I. The test results showed that students' ability to understand the material of the environment around me increased to 60% from the original 20%, where 12 students were declared to have completed the learning with an average score of 74.5 (Sugiharti & Oktaviana, 2023).

The percentage of student completion increased from the previous 60%, and the average score was 74.5; however, the students' achievement did not reach the KKM score determined by the school, which was 75, so the researcher had to continue to cycle II. In cycle II, the learning process is repeated using the learning model picture and picture (Magdalena et al., 2023). The application and improvement of this model shows that students' ability to understand the material of their surrounding environment has increased with an average value of 87 and a classical completion rate of 95%, where 19 students were declared to have completed it with a percentage of 95% of students and one person did not complete it with a percentage of 5% so that researchers do not have to continue to the next cycle because student learning outcomes have reached the KKM value and the criteria expected by researchers. Thus, it can be proven that lessons using the picture and picture learning model can improve student learning outcomes in the material of my surrounding environment in Indonesian Language subjects in grade IV UPT SD Negeri 060822 Medan City in the 2025-2026 academic year (Hafidz et al., 2023).

The average classical score increased during the initial study period. After conducting a pre-test, students had an average learning outcome score of 66.5, with only four (20%) students declared to have completed the learning process. This level of learning outcome is below the minimum completion criterion (KKM) for the Indonesian Language subject, which is worth 75. The results of Post-test I showed that students' ability to understand the material in the environment around me had increased to 60% from the original 20%, with 12 students declaring to have completed the material with an average score of 74.5. In Post-test II, the learning process was repeated using the picture and picture learning model. The application and improvement of this model showed that students' ability to understand the material in the surrounding environment increased with an average value of 87 and a classical completion rate of 95%, where 19 students were declared to have completed the course with a percentage of 95% of students and one person did not complete it with a percentage of 5%, so that the researcher did not have to continue to the next cycle because the students' learning outcomes had reached the KKM value and the criteria expected by the researcher.

IV. CONCLUSIONS

Based on the results of the discussion and research findings, it was found that the picture and picture learning model was able to improve student learning outcomes in the Indonesian Language Subject on the material of my surroundings, as evidenced by the learning outcomes of fourth-grade students of UPT SD Negeri 060822 Medan City in the 2025-2026 academic year in the Indonesian Language Subject on the material of my surrounding environment before the application of the picture and picture learning model, were still low, namely, four students completed the subject or with a classical completion percentage of 20% and 16 students did not complete it or a percentage of 80% with an average value of 66.5. Through the application of the picture and picture learning model in the Indonesian Language Subject on the material of my surrounding environment in fourth grade UPT SD Negeri 060822 Medan City in the 2025-2026 academic year, it was proven to improve students' learning responses. In the first cycle, students' abilities to respond, answer, and listen to teacher explanations remained poor. In the second cycle, students' abilities to respond, answer, and listen to teacher explanations were still in the very good criteria, so it could be said to have increased. The improvement in student learning outcomes also successfully reached the level of classical learning completion in cycle II. Students' learning outcomes after applying the picture and picture learning model in the Indonesian Language Subject to the material of my environment in class IV UPT SD Negeri 060822 Medan City in the 2025-2026 academic year, namely in cycle I (post test I) students who completed the course were 12 students or with a percentage of 60%, and students who did not complete the course were 8 students or with a percentage of 40% with an average score of 74.5. The percentage of classical student completeness did not reach the KKM (75%)

and the average score of 74.5 students had not reached the KKM determined by the school, so the researcher continued to cycle II. In cycle II (post-test II), 19 students completed the course (95%), and one student did not complete the course were 1 student with a percentage of 5%), with an average score of 87. Therefore, it was concluded that the researcher did not have to continue with the next cycle.

Funding Statement

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Ethical Compliance

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Data Access Statement

A Data Access Statement is a section in a scientific publication or research report that explains how the data used or generated in a study can be accessed by readers or other researchers. This statement aims to promote transparency, support research reproducibility, and comply with open-access policies, where applicable.

Common Elements in a Data Access Statement:

1. Data Location: Specifies where the data are stored, such as in online repositories (e.g., Zenodo, Dryad, or institutional repositories).
2. Access Instructions: Provides information on how to access the data, such as direct links, digital object identifiers (DOI), or contact details.
3. Data Availability: Indicates whether the data are publicly accessible, available upon request, or restricted due to ethical, legal, or privacy considerations.
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1. Open Data:
 - o "The data supporting this study are openly available in Zenodo at [DOI:10.xxxx/zenodo.xxxx]."
2. Restricted Data:
 - o "The data that support the findings of this study are available upon request from the corresponding author. Due to privacy concerns, the data are not publicly available."
3. No Data Available:
 - o "No datasets were generated or analyzed during the current study."
4. Conditional Access:
 - o "The data supporting this study are available under restricted access and can be obtained upon reasonable request to the corresponding author and with the permission of the ethics committee."

Purpose of a Data Access Statement:

- Reproducibility: Enables other researchers to replicate or verify the findings.
- Collaboration: Encourages further collaboration by sharing data.
- Compliance: Adheres to the policies of funding agencies or journals that require open access to data.

Conflict of Interest Declaration

No Conflict of Interest.

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REFERENCES

- [1] Agustina, T., Hamdan, H., & Egok, A. S. (2025). Implementation of the Picture and Picture Learning Model in Science Learning for Grade V Students. *Global Education Journal*, 3(2), 821–828. <https://doi.org/10.59525/gej.v3i2.848>
- [2] Fazira, L., & Hadi, A. (2025). IMPLEMENTING STUDENT-CENTERED LEARNING TO

FACILITATE STUDENTS' READING COMPREHENSION OF REPORT TEXTS: A CASE STUDY.
Datokarama English Education Journal, 6(1), 1–16. <https://doi.org/10.24239/dee.v6i1.114>

[3] Hafidz, A., Hasanah, M., Mahmudi, I., Saffi, A. M., & Wahid, A. (2023). Using Picture Media in Improving Students Learning Outcomes on The Lesson of Muthala'ah. *Arabi : Journal of Arabic Studies*, 8(2), 162–171. <https://doi.org/10.24865/ajas.v8i2.693>

[4] Kunandar. (2011). *Penelitian tindakan kelas sebagai pengembangan propesi guru*. Jakarta: Rajawali Pers.

[5] Magdalena, I., Melyana, A., & Agustin, R. (2023). Penerapan Model Pembelajaran Picture and Picture pada Siswa Kelas II SDN Rancailat 1 Kabupaten Tangerang. *TSAQOFAH*, 3(3), 355–362. <https://doi.org/10.58578/tsaqofah.v3i3.969>

[6] Nuning, I. P. (2017). *Penggunaan Media Video Call dalam Teknologi Komunikasi*. *Jurnal Ilmiah Dinamika Sosial*, Volume 1, No. 2, Agustus 2017, hlm. 215.

[7] Purwandi, R. (2015). *Buku Pintar Bahasa Indonesia*. Yogyakarta: Istana Media.

[8] Risma, R., & Dewantara, A. H. (2022). The effectiveness of the guided inquiry learning model assisted by picture card media in improving students' critical thinking skills in natural science subjects. *Ekspose: Jurnal Penelitian Hukum Dan Pendidikan*, 21(1), 1362–1368. <https://doi.org/10.30863/ekspose.v21i1.3404>

[9] Romadlon, F. N., Romi, A. A., & Nurcahyo, A. D. (2025). Exploring Vocational High School Students' Perceptions of Picture Series in Learning Descriptive Texts. *Educalingua*, 3(2), 152–165. <https://doi.org/10.26877/educalingua.v3i2.2587>

[10] Sugiharti, R. E., & Oktaviana, S. (2023). PENERAPAN MODEL PICTURE AND PICTURE SEBAGAI SOLUSI UNTUK MENINGKATKAN KETERAMPILAN MENULIS KARANGAN NARASI SISWA SEKOLAH DASAR. *Pedagogik : Jurnal Pendidikan Guru Sekolah Dasar*, 11(1), 32–40. <https://doi.org/10.33558/pedagogik.v11i1.4615>

[11] Sumardi. (2002). *Buku Pembelajaran Bahasa Indonesia*. Jakarta: PT Grasindo.

[12] Ye, W., Zhang, L., Jiang, X., Yang, D., & Zhu, Y. (2025). Dual-Stream Contrastive Learning for Medical Visual Representations Using Synthetic Images Generated by Latent Diffusion Model. *IEEE Access*, 13, 129648–129658. <https://doi.org/10.1109/ACCESS.2025.3591544>