



Optimizing High School Students' Biology Learning Outcomes: Picture and Picture Method on the Topic of Living Organism Classification

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Abstract

Students' learning outcomes are the main focus of the biology learning process. However, the basic phenomenon regarding students' biology learning outcomes shows that several issues still hinder the achievement of optimal learning outcomes. Therefore, this research aims to enhance students' cognitive learning outcomes by applying the picture and picture method to living organism classification. The research used Classroom Action Research with two cycles, each consisting of 2 meetings. The first cycle covered Monera, Protista, and Fungi, while the second covered Plantae and Mammalia. The number of students involved was 36 (M=18 and F=18). Students' cognitive learning outcomes were assessed using a 10-item multiple-choice cognitive test. The data on students' cognitive learning outcomes were analyzed using percentage techniques. Students were considered to have passed if they achieved a minimum score of 70. The analysis showed a significant improvement in students' cognitive learning outcomes, from 59.8 in cycle 1 to 77.1 in cycle 2. The number of students who achieved learning mastery increased by 43.5%, from 43.5% in cycle 1 to 87% in cycle 2. Therefore, applying the picture and picture method significantly improved students' cognitive learning outcomes regarding living organism classification. The implications of this research indicate that applying the Picture and Picture method effectively enhances students' cognitive learning outcomes on the topic of living organism classification, contributing positively to biology teaching practices in the classroom.

Keywords: biology learning outcomes; living organism classification; picture and picture method

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INTRODUCTION

Biology education is one of the important fields in the education system, with the main goal of improving students' understanding of life and the universe around them. In the biology learning process, students' learning outcomes are the main focus (Abdjul, 2022; Subudi, 2021), as optimal learning outcomes will help students develop a deep understanding of the subject matter (Susanti, 2014). However, the basic phenomenon regarding students' biology learning outcomes shows that several issues still hinder the achievement of optimal learning outcomes. These issues include students' low interest in the subject matter (Pane et al., 2023; Raksun et al., 2023), students' difficulties in



understanding concepts (Tamba et al., 2020), and the lack of varied and effective teaching methods to improve learning outcomes.

Previous studies have attempted to address these issues with various methods, including the use of visual learning media (Ali & Sukanto, 2021; Analicia & Yogica, 2021), laboratory experiments (Riskiana et al., 2020), and group discussions (Rus et al., 2017). However, there is still a need for more innovative and effective teaching methods. One promising teaching method is the Picture and Picture method (Fadhla, 2023), which offers an interactive and enjoyable approach to learning (Aisyah et al., 2023; Mubarok & Jani, 2023). This method uses pictures or videos to visualize complex biological concepts, facilitating better understanding and maintaining students' interest in learning.

However, despite the potential of the Picture and Picture method to improve learning outcomes in biology (Djafar, 2021; Mansur, 2022; Mansur et al., 2021), there is still a clear research gap in the topic of living organism classification. Some studies have shown the effectiveness of this method in improving students' understanding, but further research is needed to comprehensively evaluate the impact of this teaching method on students' learning outcomes in the context of living organism classification.

Based on preliminary analysis, the data on living organism classification learning outcomes for class X MIPA1 in the academic year 2020-2021 had an average score of 62 with a minimum passing grade of 75. Out of 36 students, 15 had reached the passing grade, while 21 had not. Based on the daily test analysis, the percentage of students who passed averaged 15%, while the percentage of students who failed exceeded 85%. The data also showed that the learning in class X MIPA1 had not produced maximum potential.

Based on references, the Picture and Picture teaching method has been proven effective in increasing student engagement and learning outcomes in various subjects. Fuldiaratman & Minarni (2021) showed that the Picture and Picture model assisted by e-comics could increase student activity and learning outcomes. Similarly, Sadli (2022) concluded that the Picture and Picture learning model improved civic education learning outcomes. Furthermore, Prasetyo (2021) highlighted the effectiveness of the Picture and Picture method in improving students' descriptive text writing abilities. These findings are consistent with Sari et al., (2022) research outlining the steps of implementing the Picture and Picture learning model to improve students' achievements in writing recount texts.

Considering the challenges and research gaps, this study aims to investigate the potential of the picture-and-picture teaching method in improving students' learning outcomes on the topic of living organism classification. It is hoped that this research will significantly contribute to the development of innovative and effective teaching approaches to improve students' learning outcomes in the field of biology education.

METHOD

This study used the Classroom Action Research (CAR) model developed by Kemmis and McTaggart (1988). The four cyclical stages of this model include Planning, Implementation, Observation, and Reflection. Figure 1 summarizes the flow of the action research conducted. This action research involved 36 students (50% male and 50% female) from class X MIPA1 of State Senior High School 1 Depok, Special Region of Yogyakarta, as respondents. This research was conducted in two cycles, from July 2022 to October 2022.

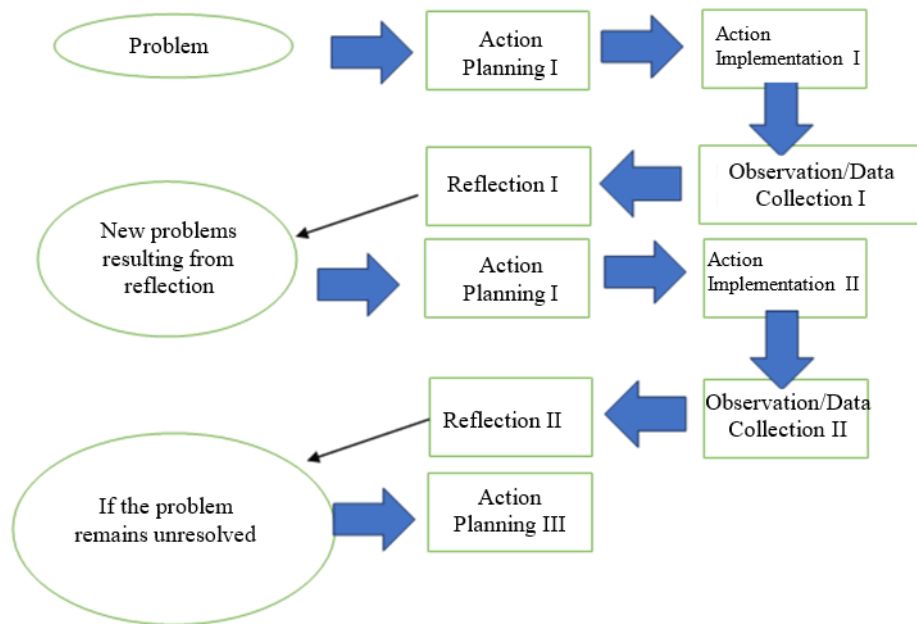


Figure 1 Cycle of CAR according to the Kemmis and McTaggart model

Student learning outcomes were assessed using a 10-item cognitive test. Students' affective learning outcomes were assessed using an observation sheet. The affective observation sheet took the form of a checklist consisting of 10 items: 1) student attention to teacher explanations; 2) student enthusiasm for teacher questions; 3) student participation in group discussions; 4) student performance on prepared worksheets; 5) students taking notes of important information during the learning process, 7) students actively seeking answers from books and other sources, 8) student enthusiasm in presenting group discussion results, 9) student response to the results of other group presentations, and 10) students deserving recognition from the teacher.

All data were analyzed using descriptive percentage techniques (Hasnidar & Elihami, 2020). The individual mastery criteria or minimum passing grade used was 75, while the criteria for students' affective outcomes followed Table 1.

Table 1 Categorization of students' affective learning outcomes

Category	Percentage Range
Low	< 75
Medium	75 – 85
High	> 85

This study used four success criteria: the minimum passing grade used was 75, the class average was 75, a minimum of 75% of students passed, and a minimum moderate category for affective learning outcomes.

RESULTS AND DISCUSSION

Cycle 1

Cognitive Test Results

Based on the data analysis conducted, Table 2 presents the students' cognitive test results in cycle 1.

Table 1 Students' cognitive test results in cycle 1

No	Criteria	Quantitative Achievement
1	Minimum student score	20.5
2	Maximum student score	92.0
3	Percentage of students achieving a score of 75	43.5
4	Percentage of students not achieving a score of 75	56.5
5	Average	59.8

Based on Table 2, the cognitive test results in the first cycle on the topic of Living Organism Classification showed a wide range of student scores, ranging from a minimum score of 20.5 to a maximum score of 92.0. From the data analysis, it can be seen that only 43.5% of students successfully achieved or exceeded the 75 standard scores (a minimum passing grade), while the remaining students, totaling 56.5%, had not reached the standard passing grade. The average score of students on the cognitive test in cycle 1 was 59.8. These findings indicate that, although some students have reached an adequate level of understanding, there are still challenges in understanding the concept of living organism classification in the first cycle of learning.

Affective Learning Outcomes

The research results summarize in Table 3 data from the affective test in the first cycle of learning on the topic of Living Organism Classification.

Table 2 Affective test results in cycle 1

No	Group	Quantitative Achievement	
		Score	Category
1	Group 1	51.7	Low
2	Group 2	53.4	Low
3	Group 3	51.6	Low
4	Group 4	58.3	Medium
5	Group 5	51.7	Low

Table 3 shows that the range of students' affective scores from group 1 to group 5 exhibits variation, with the highest score being 58.3 and the lowest score being 51.6. However, overall, most students are categorized as low, with three out of five groups having affective scores below 55.0. Only one group achieved a moderate category with a score of 58.3. These results indicate challenges in developing students' affective attitudes towards the topic of living organism classification in the first cycle of learning.

Cycle 2

Cognitive Test Results

Table 4 presents the students' cognitive test results in cycle 2 based on the data analysis conducted.

Table 3 Students' cognitive test results in cycle 2

No	Criteria	Quantitative Achievement
1	Minimum student score	15.0
2	Maximum student score	95.0
3	Percentage of students achieving a score of 75	87.0
4	Percentage of students not achieving a score of 75	13.0
5	Average	77.1

Based on Table 4, the cognitive test results in the second cycle on the topic of Living Organism Classification obtained a varied range of student scores from 15 to 95.0, with the lowest score reaching 15 and the highest score reaching 95.0. The analysis found that the majority of students, totaling 87.0%, successfully achieved or exceeded the 75 standard score, while only 13.0% of students had not reached this standard. The average score of students on the cognitive test in cycle 2 was 77.1. These findings illustrate a significant improvement in student learning outcomes in the second cycle of learning. With a high percentage of students reaching the standard score, it can be concluded that the applied teaching method, possibly the Picture and Picture method, has effectively improved students' understanding of living organism classification.

Affective Learning Outcomes

The research results show data from the affective test in the second cycle of learning on the topic of Living Organism Classification summarized in Table 5.

Table 4 Affective test results in cycle 2

No	Group	Quantitative Achievement	
		Score	Category
1	Group 1	78.1	High
2	Group 2	78.3	High
3	Group 3	75.0	Medium
4	Group 4	78.3	High
5	Group 5	73.3	Medium

Based on Table 5, the range of students' affective scores from group 1 to group 5 shows a significant improvement compared to the previous cycle. Four out of five groups are categorized as high, with affective scores above 75.0. Only one group still achieved a moderate category with a score of 75.0. This improvement reflects an enhancement in the development of students' affective attitudes towards the topic of living organism classification in the second cycle of learning.

Changes in Learning Outcomes

Changes in Cognitive Test Results

To observe changes in cognitive learning outcomes, cycle 1 and cycle 2 results were compared. The comparison results are shown in Figure 2.

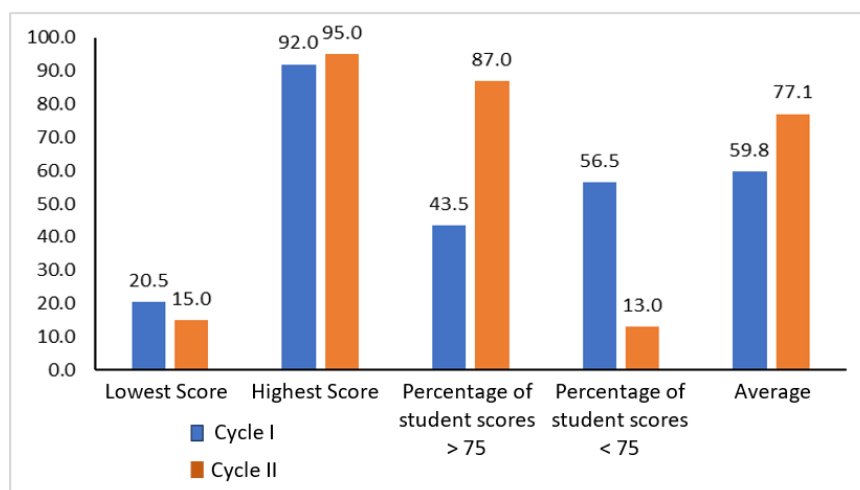


Figure 1 Changes in students' cognitive test results

In comparing cycle 1 and cycle 2, there are striking changes in the cognitive test results on the topic of Living Organism Classification. Firstly, the range of student scores increased from cycle 1 (20.5 - 92.0) to cycle 2 (15.0 - 95.0). This indicates that with the implementation of the Picture and Picture teaching method, students can achieve higher scores and experience improvements in understanding the material. Secondly, the percentage of students achieving a score of 75 or higher experienced a significant increase from 43.5% in cycle 1 to 87.0% in cycle 2. This indicates that the Picture and Picture method can positively impact student achievement in cognitive tests (Prasetyo, 2021; Puteri et al., 2023). Thirdly, the percentage of students not achieving a score of 75 decreased significantly from 56.5% in cycle 1 to only 13.0% in cycle 2. This demonstrates the effectiveness of the Picture and Picture teaching method in assisting students who previously struggled to reach the established standard score (Handayani et al., 2017; Pratiwi & Aslam, 2021).

Fourthly, the average cognitive test score increased significantly from 59.8 in cycle 1 to 77.1 in cycle 2. This improvement indicates that the picture and picture method successfully enhanced students' understanding of the living organism classification material overall. The theory behind the use of the Picture and Picture teaching method, which emphasizes the use of images and visualizations to reinforce understanding of concepts (Fuldiaratman & Minarni, 2021), can explain this improvement by associating it with a higher level of active student engagement and a more engaging learning experience. Thus, the change in cognitive test results from cycle 1 to cycle 2 indicates that the Picture and Picture teaching method effectively improves student achievement in understanding the material. This finding is consistent with previous research findings (Hadrattullaili & Widyadhari, 2023; Mansur et al., 2021).

Changes in Affective Learning Outcomes

To observe changes in affective learning outcomes, cycle 1 and cycle 2 results were compared. The comparison results are shown in Figure 3.

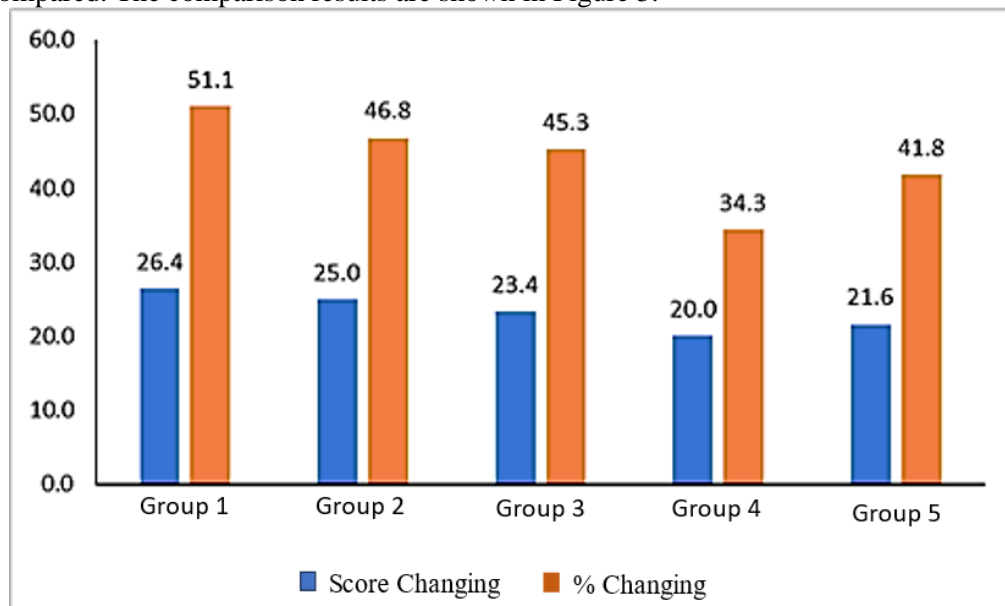


Figure 2 Changes in students' affective test results

In comparing between cycle 1 and cycle 2 in Figure 3, there are significant changes in affective test results on the topic of Living Organism Classification. Firstly, all groups

have a quite drastic increase in affective scores. In cycle 1, the group's affective scores were in the low category, ranging from 51.6 to 58.3. However, in cycle 2, all groups experienced an increase in affective scores, with some reaching the high category. This indicates that using the Picture and Picture teaching method can enhance students' affective response to the learning material, making them more emotionally engaged and enthusiastic about learning. This is consistent with the research conducted by Kasdriyanto dan Wardana (2021). They developed a Picture and Picture-based scrapbook media oriented towards national insight for early childhood (6-8 years old) in elementary school. The research results show that the Picture and Picture-based scrapbook media showed positive results.

Secondly, there are changes in categories in each group. In cycle 1, most groups were in the low category, but in cycle 2, most groups had moved up a category, with some even reaching the high category. This indicates that the Picture and Picture method provides a more positive learning experience and builds strong emotional connections to the material, thus enhancing students' motivation and interest in learning (Mansur, 2022). The theory behind the Picture and Picture teaching method, which emphasizes the use of images and visualizations to reinforce understanding of concepts, can explain this improvement by associating it with a higher level of active student engagement and a more engaging learning experience. Thus, the change in affective test results from cycle 1 to cycle two indicates that the Picture and Picture teaching method is effective in improving students' affective response to the learning material and building strong emotional connections, which in turn can enhance overall motivation and learning outcomes (Elisabet et al., 2019; Harahap & Siregar, 2020; Mansur, 2022).

CONCLUSION

The conclusion of the research results indicates a significant improvement in students' cognitive and affective test results in the second cycle of learning on the topic of Living Organism Classification compared to the first cycle. In the first cycle, the cognitive test results showed a large variation in the range of student scores, with most students not reaching the established standard score. However, after implementing the Picture and Picture teaching method in the second cycle, there was a quite drastic increase in student scores, the percentage of students achieving a high standard score, and the average cognitive test score. Similarly, most groups experienced increased scores and categories with the affective test results. These findings indicate that the Picture and Picture teaching method effectively improves students' understanding and affective response to the topic of living organism classification.

The limitation of this research may lie in the experimental design, which may not adequately consider external factors such as student characteristics or learning environment. Additionally, the research focus was only on one learning material, so the generalization of findings may be limited to the same context. For future research, it is recommended to expand the scope of learning materials and consider the influence of other variables, such as students' learning styles or support from the learning environment. Furthermore, further research can deepen the understanding of effective teaching mechanisms and processes in the context of using the Picture and Picture method and explore more innovative and interactive teaching strategies. Thus, future research is expected to make a greater contribution to developing more effective and inclusive education.

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