

Implementation of Discovery Learning on the Human Excretory System Material to Improve the Activeness and Learning Outcomes of Class VIII Students

Umami Kalsum^{1*}, Ai Mahmudatussa'adah²

¹⁾ Chemistry Education Study Program, Universitas Terbuka, South Tangerang, Banten, Indonesia

²⁾ Culinary Education, Universitas Pendidikan Indonesia, Bandung, West Java, Indonesia

E-mail*: ummikalsumh19@gmail.com

Article Info	ABSTRACT
Article History: Received July 30th, 2025 Revised October 11th, 2025 Accepted October 13th, 2025 Keywords: Activeness, learning outcomes; discovery learning; excretory system	This research is motivated by the low level of student engagement and learning outcomes of eighth grade students at MTs Kalimbuah on the Human Excretory System. This problem is thought to be caused by the learning process still using conventional methods, where teachers play a more dominant role in the teaching and learning process and students tend to be passive. Furthermore, the human excretory system material is relatively complex, requiring in-depth understanding. This research used the Classroom Action Research (CAR) method, which was implemented through two cycles. Each cycle began with the planning stage, followed by action, observation, and ended with reflection. The learning model applied was Discovery Learning, which is designed in such a way as to encourage students to be active in discovering concepts through a process of exploration and investigation. The results of this study indicate that the application of Discovery Learning successfully increased student engagement during the learning process. This success was marked by increased student participation in discussions, answering questions, and summarizing the material. The percentage of classical class completion also increased, from 57% in the first cycle to 86% after the second cycle. Based on these results, it can be concluded that the use of the learning model Discovery Learning effective in improving the quality of learning on the human excretory system. Therefore, Discovery Learning can be used as an alternative learning model in learning science material. How to Cite: Kalsum, U., & Mahmudatussa'adah, A. (2025). Implementation of Discovery Learning on the Human Excretory System Material to Improve the Activeness and Learning Outcomes of Class VIII Students. <i>Co-Catalyst: Journal of Science Education Research and Theory</i>, 3 (1), 1-10.

INTRODUCTION

Education is crucial for humans because it enables them to distinguish between right and wrong, good and bad. Education is a planned process aimed at guiding and nurturing individuals to become better individuals. Teachers are a key factor in the success of education. The rapid development of technology and science adds dynamics to the learning process. Lack of student engagement, leading to declining learning outcomes, is one of the challenges teachers face in the learning process (Niayah, 2022). The concept of professionalism requires teachers to possess the knowledge, skills, and behaviors necessary to integrate technology into learning effectively, ensuring students remain up to date (Nuraisah et al., 2024).

A teacher must continually strive to improve his or her teaching skills by constantly making improvements in learning. Classroom Action Research (CAR) is

one-way teachers can address problems in their classrooms. Classroom action research is conducted by teachers in their classrooms with the aim of improving their performance as teachers (Wardani and Wihardit, 2023).

Student learning engagement is one indicator of a successful classroom learning process. This engagement encompasses active participation in various activities, such as asking questions, answering questions, discussing, taking notes, and conducting practical or experimental activities. Student engagement is crucial because it forms the basis for developing a deeper understanding and enhancing students' ability to absorb learning materials. Innovative learning methods, strategies, and approaches are needed to hone students' critical thinking skills. Learning that is presented in an engaging and motivating manner will certainly be retained in students' memories (Safitri and Nani, 2021).

Results are everything obtained from an activity. Therefore, learning is the process of acquiring knowledge to change attitudes and behavior for the better through interaction with the environment. Learning achievement is a change in students' attitudes based on the application of the values they have acquired (Husniah et al., 2024). Changes that occur in students, both in the form of affective and psychomotor aspects, are referred to as learning achievements (Nurhayati and Handayani, 2020). Student learning achievement is in line with the teacher's ability to teach. This makes the teacher the most important dominant factor in the achievement of learning goals (Sulfitri, 2020).

Science learning is sometimes a source of complaints from various teachers, particularly regarding the application of science concepts by students. These obstacles are characterized by numerous errors in conceptual understanding, resulting in low student learning outcomes. The low quality of learning indicates a lack of effectiveness in the learning process. Causes can stem from ineffective teaching methods, low student interest and motivation, and inadequate facilities and infrastructure (Fernando, 2024). Therefore, proper planning is necessary to ensure learning proceeds as expected. Instrumental factors, such as the curriculum, teachers, learning resources, and learning methods, must be designed in accordance with the material to achieve learning outcomes that represent the pinnacle of success in the learning process (Yuda, 2022).

The Human Excretory System is one of the materials in the eighth-grade science lesson for junior high school (SMP/MTs). The Human Excretory System discusses a series of processes for removing metabolic waste from the human body through the excretory organs, namely the kidneys, lungs, skin, and liver. The scope of this material is quite broad, covering the functions of each organ, their mechanisms, and the diseases or disorders that can occur in the excretory system organs. The Human Excretory System material, which covers physiological processes like kidney filtration and the excretion of metabolic waste, is highly relevant to study through *Discovery Learning*. It encourages students to discover these concepts for themselves using scientific data and facts. This material is important for students to understand so they can maintain the health of their excretory organs and adopt a healthy lifestyle. However, delivering this material requires an engaging approach and active participation from students to help them grasp abstract concepts more concretely.

Learning with models, Specifically *Discovery learning*, has considerable potential to improve student learning activities and learning outcomes. The model *Discovery learning* Integrated science learning is recommended in the 2013 curriculum,

especially because the learning process will be student-centered (Ariawati et al., 2021). Students are given the opportunity to search for and discover information related to learning using problem-solving techniques, so that learning models can be implemented effectively. Discovery learning can foster a scientific attitude and increase active student participation. By involving students actively and directly in the process of information seeking and problem solving, Discovery learning encourages students to be more active in thinking, discussing, and experimenting (Istidah et al., 2022).

In the application of the model Discovery learning Teachers, as facilitators and motivators, play a role in providing learning resources to encourage students' enthusiasm for the learning process (Ariawati et al., 2021). Various previous studies also explain that *Discovery learning* successfully significantly improved students' academic achievement and learning motivation. This is also consistent with research conducted by Juwitasari (2023), which found that students felt happy, leading to increased activeness in learning due to the use of effective learning methods. Based on this research, the author feels it is important to apply the model of Discovery learning through Classroom Action Research in his class.

METHODS

This research uses a Classroom Action Research (CAR) approach. The purpose of this CAR is to develop new approaches to solving specific problems that occur in schools through the use of scientific methods. Teachers implement CAR in their classrooms to improve the quality of their teaching. Furthermore, CAR also aims to enhance teacher professionalism. CAR is crucial because solving educational problems will help improve the quality of education (Azizah, 2021).

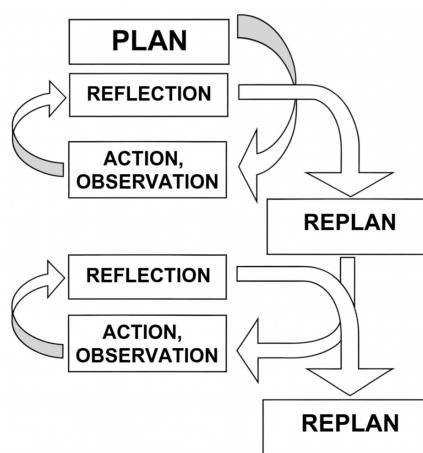


Figure 1. Class Action Research cycle (Bektiarso et al., 2021)

Classroom Action Research (CAR) has characteristics that distinguish it from other research, one of which is its problem-based focus. CAR focuses on solving problems frequently faced by teachers in their own classrooms (Wardani and Wihardit, 2021). This Classroom Action Research was conducted in Grade VIII of the 2024/2025 academic year at MTs Guppi Kalimbua, Baraka District, Enrekang Regency, South Sulawesi. Classroom Action Research is conducted in two cycles, with

two meetings per cycle. Each cycle begins with planning, followed by implementation, observation, and reflection at the end (Azizah, 2022).

The planning stage begins with compiling the lesson plan based on the syntax. *Discovery learning*, creating and compiling teaching materials, student worksheets (LKPD), media, and evaluation tools. The implementation stage is carried out based on the prepared lesson plan (RPP). The learning observation process is carried out during the observation stage by making notes of events during the learning improvement process. The reflection stage involves a comprehensive assessment to identify deficiencies in the cycle process that will be corrected in the next cycle. Thus, the activity stage is carried out repeatedly until a problem is deemed resolved or the improvement objective has been achieved (Juwitasari, 2023).

The data for this study were derived from observations of student activity in class and written test results at the end of each learning improvement cycle using descriptive percentage data analysis techniques. The question development process began with the creation of a grid based on core competencies (KD) and learning objectives, followed by the development of multiple-choice questions. The learning success indicator for this study was the achievement of a minimum classical learning completion of 75% (Nurhamida, 2022) and increased student learning activity.

RESULT AND DISCUSSION

Description of Pre-Cycle Implementation

Before making learning improvements, a pre-cycle stage was first carried out to determine the initial condition of the class. The pre-cycle activity was carried out on May 2, 2025, on the Human Excretory System Material. Based on the pre-cycle activity, the learning outcomes (written test) were obtained, namely 5 students obtained low scores (below the Minimum Completion Minimum) and 2 students obtained scores above the Minimum Completion Minimum, or if the percentage is 28.5% who completed and 71.5% who did not complete. The low student learning outcomes are in line with the very low student activity. The learning process is still dominated by the teacher; students mostly only listen to what the teacher conveys. This condition is because in its implementation the teacher has not used a learning model that can attract students' attention so that students are less enthusiastic about learning which ultimately has an impact on the low grades obtained by students.

Description of Cycle I Implementation

Preparation for improving the learning process in cycle I was carried out by first preparing lesson plans, class observation sheets, assessment tools, and learning support media. Learning improvements in cycle I was carried out on Monday, May 5, 2025. The learning material taught was the Human Excretory System, Basic Competence 3.10 Analyzing the human excretory system and understanding disorders of the excretory system as well as efforts to maintain the health of the excretory system using learning models. *Discoveri Learning* The learning process is carried out through four stages, namely pre-activities, initial activities, core activities, and final activities. Learning activities are carried out through the application of syntax. *Discovery learning* like:

1) Stimulation

Stimulation is done by asking questions such as "Why do humans sweat?", "What happens if humans don't urinate for a day?"

- 2) Identification of problems
Students formulate problems or answer questions such as "What organs play a role in the excretory system?", "How does the process of urine formation occur in the kidneys?"
- 3) Data Collection
Students collect information from various learning sources, in this case the 2013 curriculum Integrated Science textbook, and conduct simple simulations or experiments related to the kidney filtration model.
- 4) Information Processing
Students analyze and organize data to draw conclusions through discussion activities.
- 5) Interesting Conclusion
Students formulate the learning concepts that have been carried out, such as "The kidneys filter blood and produce urine through the processes of filtration, reabsorption, and augmentation."

Implementation of the model *Discovery Learning* The improvements in Cycle I made the material more engaging and allowed students to actively explore the functions of the excretory organs through observation, simple experiments, and discussions. This provided new experiences in the learning process. After completing the improvement activities in Cycle I, the learning process improved. These results can be seen in Tables 1 and Table 2.

Table 1. Results of observations of student activity during the learning process in cycle I

No.	Observed Behavior	Appearance (%)	Information
1	Pay attention to the material presented by the teacher	71,4	There are still students who tend to be indifferent in paying attention to lessons.
2	Provide answers/comments/opinions	42,8	Only 3 students were active in providing answers, comments and opinions
3	Carry out a task	100	All students do the assignment
4	Active in practical activities	57,1	Because the practicals are only carried out by teachers, students become less enthusiastic.

The data in Table 1 shows that student activity tends to be less than optimal, as indicated by the low percentage of students who provide answers, comments or opinions related to learning materials, namely only 42.8% or only 3 students who are active in this assessment category.

Table 2. Results of the first cycle of formative learning tests

No	Value Range	Criteria	Amount	Percentage (%)
1	85 – 100	Very good	1	14
2	80 – 84	Good	3	43
3	51 – 79	Pretty good		0
4	0 – 50	Less Good	3	43
	Amount		7	100

Table 2 shows that the percentage of students completing learning is still not optimal but has improved compared to the pre-cycle stage. However, 43% of students still have scores below the Minimum Competency (KKM). This is consistent with the low percentage of student activity. Due to the low activity and learning outcomes, the program continues to the next stage, Cycle II.

Description of Cycle II Implementation

Cycle II learning improvements were conducted on Friday, May 13, 2025. The planning stage involved creating lesson plans based on the results of cycle I reflections and preparing data collection tools in the form of tests and observation sheets. The learning model was also implemented using *Discovery learning* with the following steps.

- 1) Stimulation
Stimulation is done by asking questions such as "Is it true that the human breathing process produces $CTHAT_2$?"
- 2) Identification of problems
Students formulate problems or answer questions such as "How to explain the formation of CO_2 in the excretion process?"
- 3) Data Collection
Students collect information from various learning sources, in this case the 2013 Curriculum Integrated Science textbook and the internet, and carry out simple practical work on proving that humans produce CO_2 in the excretion process.
- 4) Information Processing
Students analyze and organize data to draw conclusions through discussion activities.
- 5) Interesting Conclusion
Students formulate the learning material that has been studied, such as "Humans breathe oxygen (O_2) and emit carbon dioxide (CO_2)".

After carrying out the learning improvement process in cycle II, the results of observations of student activity and learning outcomes were obtained, which are described in the following Table 3.

Table 3. Results of observations of student activity during the learning process in cycle II

No.	Observed Behavior	Appearance (%)	Information
1	Pay attention to the lesson material	85,7	Almost all students pay attention to the lesson material
2	Provide answers/comments/opinions	71,4	There are still students who are not confident in expressing their opinions.
3	Carry out a task	100	All students do the assignment
4	Active in practical activities	85,7	Almost all students are active in carrying out the practical work

Table 3 shows an increase in student engagement. Most students demonstrated enthusiasm during the learning process. Most students focused on the material, all completed assignments, and most were active in the practical work. Discovery

Learning model facilitates students' active involvement in the learning process of the human excretory system through exploratory activities, such as observing artificial urine or simulating kidney filtration, which can increase curiosity and understanding of the working mechanisms of the excretory organs.

Table 4. Results of the formative test of cycle II learning

No.	Value Range	Criteria	Amount	Percentage (%)
1	85 - 100	Very good	4	57
2	80 - 84	Good	2	29
3	51 - 79	Pretty good	1	14
4	0 - 50	Less Good		0
Amount			7	100

Table 4 also shows an increase in student learning outcomes (written test scores). Fifty-seven percent of students received excellent scores, and 29% received good scores. However, 14% of students still received scores below the Minimum Completion Criteria (KKM), which is 70. Students who scored below the KKM are categorized as students with special needs who experience limitations in cognitive function and adaptive abilities. In percentage terms, the classical learning completion rate was 86%, exceeding the minimum classical completion threshold of 85%.

Based on Figure 2, there was an increase in learning activity from cycle I to cycle II. The percentage of students who paid attention to the lesson increased by 13.6%, the percentage of students who provided responses and answers by 28.6%. The percentage of students completing assignments remained at 100%, and the percentage of students who were active in the practicum increased by 28.6%.

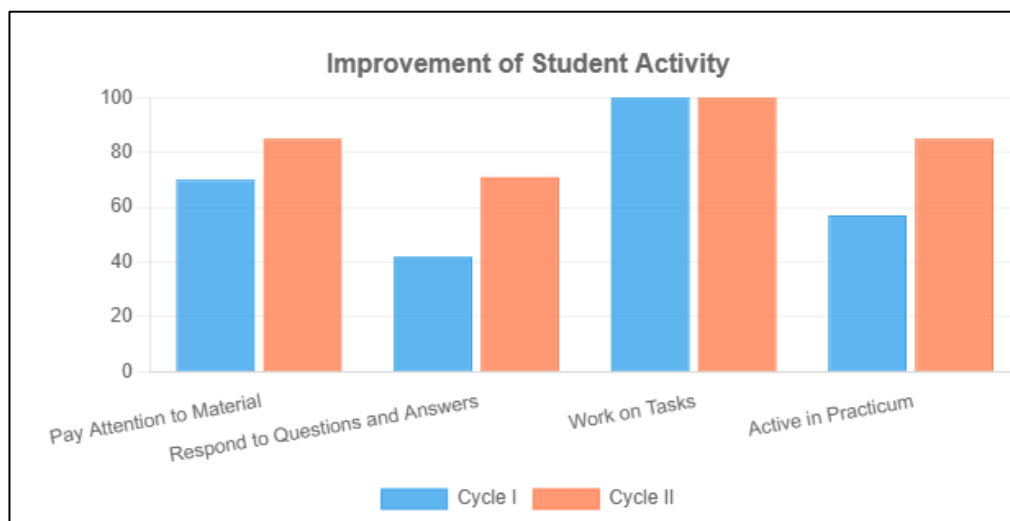


Figure 2. Increasing student activity in cycles I and II

Based on the graph in Figure 3, we can see the scores obtained for each cycle. There was a 43% increase in students' learning completion scores from cycle I to cycle II. This is in line with a 43% decrease in incomplete learning scores. The average class score increased from 65.7 to 85.7. Based on these results, the classical learning completion rate was 86%, successfully achieving the minimum classical class completion rate.

Discovery learning is a learning process that is not delivered but rather involves students in organizing and developing knowledge and skills to solve problems (Kailani, 2021). Initially, in cycle I, teachers were still in the process of adjusting the implementation of the syntax. Discovery learning in the learning process, resulting in many shortcomings in its implementation. At the end of Cycle I, although student participation in exploration activities increased, difficulties were still found in understanding the flow of the excretion process. This indicates that the approach used had not fully facilitated students' conceptual understanding. Therefore, the teacher realized that adjustments were needed to stimulate discussion and reinforce concepts before exploration. This reflection led to improvements in Cycle II, by adding visualizations of the excretion process and problem-solving-based practice questions.

Due to the low-test scores, the research was continued to Cycle II. Significant changes occurred in Cycle II, with increased student engagement, as evidenced by the formative evaluation results, indicating improved understanding. This demonstrates that improvements to the learning instruments and a more structured facilitator approach have had a positive impact.

Based on the research results, it was found that there was an increase in students' thinking skills after the Discovery learning model was implemented. Discovery Learning in line with the characteristics of the human excretory system material which demands an understanding of the process, because students are invited to discover the relationship between the structure and function of the excretory organs through direct learning experiences and problem solving.

In the learning model Discovery learning the teacher, as a facilitator and motivator, plays a role in providing learning resources to encourage student enthusiasm in the learning process (Ariawati et al., 2021). Based on this statement, in the implementation of cycle II, the teacher not only directly conveys the excretory system material but also provides opportunities for students to construct knowledge through active investigation, which is essential for building meaningful understanding and not just memorization. Student enthusiasm in learning is demonstrated through their active participation in the learning process. We can see in Figure 3 that there has been an improvement in the student learning process, indicated by a tendency for increased activity from cycle I to cycle II.

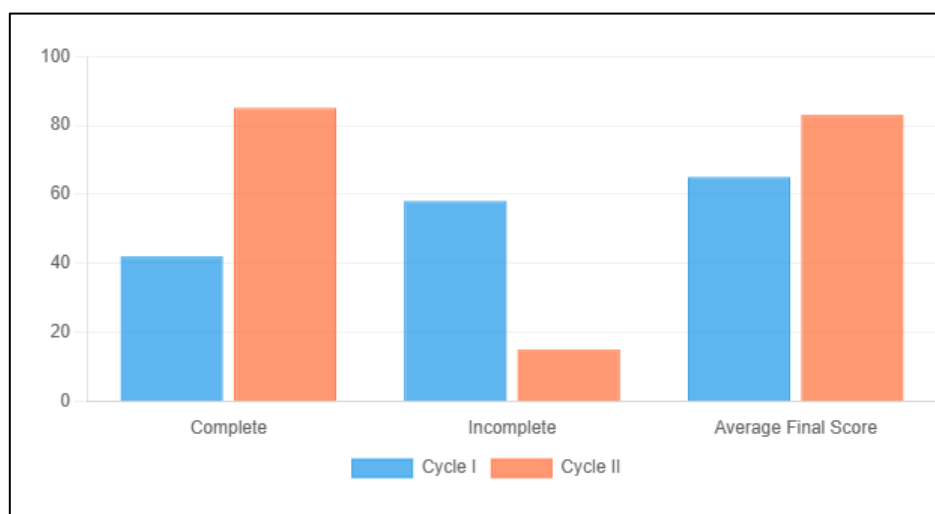


Figure 3. Percentage of learning outcome scores for cycle I and cycle II

This research also supports the results of research conducted by Arrahmah et al., (2024), namely the application of learning models Discovery learning Through a series of structured processes, it successfully encouraged active student participation and developed critical, creative, and collaborative thinking skills. This research aligns with Safitri's (2021) study, which concluded that students' critical thinking skills and learning outcomes improved after implementing this learning model. *Discovery learning* in IPA learning.

CONCLUSION

Based on the results of the learning improvement research that has been carried out, the researcher concluded that applying the learning model Discovery Learning is effective. The application of discovery learning in the Human Excretory System material can enhance the learning process, as indicated by increased student activity and involvement. The application of discovery learning can increase students' learning completion scores from Cycle I to Cycle II, successfully exceeding the minimum classical class completion limit of 86%. Therefore, researchers recommend the use of discovery learning in learning. *Discovery learning* as an alternative learning model in the Human Excretory System material.

REFERENCE

- Ariawati, K. N., Suarjana, I. M., & Sudarmawan, G. A. (2021). Implementation of the PowerPoint-Assisted Discovery Learning Model on Science Learning Outcomes. *Scientific Journal of Education and Learning*, 5(2), 332. <https://doi.org/10.23887/jipp.v5i2.36781>
- Arrahmah, J., Kusuma, Y. Y., & Fadhilaturrahmi, F. (2024). Improving Student Learning Independence by Using the Discovery Learning Model in Elementary Schools. *Journal of Educational Research*, 5(2). <https://doi.org/10.37985/jer.v5i2.919>
- Azizah, A. (2021). The Importance of Classroom Action Research for Teachers in Learning. *Auladuna: Journal of Elementary Madrasah Teacher Education Study Program*, 3(1), 15–22. <https://doi.org/10.36835/au.v3i1.475>
- Azizah, N. (2021). Efforts to Improve Science Learning Activity and Outcomes on the Excretory System Through the Application of the Discovery Learning Model to Class VIII I Students of SMP Negeri 1 Margasari in the Even Semester of the Academic Year 2019/2020 *academic year*, *Dialectics of Education Journal*, 5(2), 78–87.
- Bektiarso, S., Jember, U., & Artikel, I. (2021). *Classroom Action Research (CAR) Training for Teachers at Panarukan Situbondo Senior High School*. 1(1), 54–62.
- Husniah, Yeni Sulaiman, R. A. N. (2024). The Use of Discovery Learning Methods to Improve Student Learning Outcomes. *Educational serum*, 01(2), 115–119. <https://jbasic.org/index.php/basicedu>
- I am G.A.K. Wardani, KW (2023). *Classroom Action Research*. Open University.

- Istidah, A., Suherman, U., & Holik, A. (2022). Improving Science Learning Outcomes on the Properties of Light Through the Discovery Learning Method. *Indonesian Journal of Education: Theory, Research, and Innovation*, 2(1). <https://doi.org/10.59818/jpi.v2i1.187>
- Juwitasari, N. T. (2023). Science Material on Mastering the Concept of Pressure Through the Discovery Learning Method in Class VIII of SMP Negeri 2, Bogor City. *Journal of Social Sciences, Arts, and Humanities*, 03(01), 60–65.
- Kailani, A. (2021). *Learning Model for the 5.0 Society Era (Blended Learning)* (December Edition).
- Niayah, N. (2022). Classroom Management in Improving the Teaching and Learning Process of Islamic Religious Education at SMP Negeri 1 Aikmel, Aikmel District, East Lombok Regency, NTB. *Journal of Management and Culture*, 2(2), 33–50. <https://doi.org/10.51700/manajemen.v2i2.341>
- Nuraisah, S., Yuniati, S., Rahmi, D., & Kurniati, A. (2024). Organizing the Teaching Profession: Shaping Professional Teachers with Character in the Era of Globalization. *Exemplary Journal: Journal of Educational Science and Learning*, 9(1), 25–34. <https://doi.org/10.55719/jt.v9i1.1143>
- Nurhamida, B. (2022). Implementation of Heat Learning Through a Scientific Approach with the Discovery Learning Model for Science Subjects for MTs. *STRATEGY: Journal of Innovation in Learning Strategies and Models*, 2(1), 101–107. <https://doi.org/10.51878/strategi.v2i1.946>
- Nurhayati, H., & Langlang Handayani, N. W. (2020). Basicedu Journal. *Basicedu Journal*, 5(5), 3(2), 524–532. <https://journal.uui.ac.id/ajie/article/view/971>
- Safitri, W. C. D. (2021). Application of the Discovery Learning Model in Science Learning to Improve Critical Thinking Skills and Learning Outcomes of Elementary School Students. *Basicedu Journal*, 5(3), 1321–1328. <https://jbasic.org/index.php/basicedu>
- Sulfitri. (2020). *Discovery Learning Model and Learning Motivation*. Guepedia.
- Yogi Fernando, Popi Andriani, & Hidayani Syam. (2024). The Importance of Learning Motivation in Improving Student Learning Outcomes. *ALFIHRIS: Journal of Educational Inspiration*, 2(3), 61–68. <https://doi.org/10.59246/alfihris.v2i3.843>
- Yuda, Z. (2022). Improving Science Learning Outcomes of Grade VI Students of Sdn 11 Mandau Through the Discovery Learning Method. *JOURNAL OF EDUCATION AND TEACHING*, 6(5), 1506. <https://doi.org/10.33578/pjr.v6i5.8955>