The Effect of *Discovery Learning* Model on Basic Science Process Skills and Science Learning Outcomes of Class Vi Students at SDIT Al Madinah Maros

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Abstract

The rapid development of science and technology demands an increase in basic science process skills (KPS) and student learning outcomes, especially in science education. This study aims to examine the effect of the discovery learning model on KPS and science learning outcomes of grade VI students at SDIT Al Madinah Maros. This study used a quantitative approach with a quasi-experimental design involving control and experimental groups without random selection (nonequivalent control group design). Data were collected through validated observation sheets and analysed using the MANOVA statistical test. The results showed that the discovery learning model had a significant effect on improving students' KPS and learning outcomes compared to the conventional learning method. This finding indicates that discovery learning is effective in enhancing students' critical thinking skills and conceptual understanding. The implications of this study support the application of the discovery learning model in the broader context of science education to develop better process skills and learning outcomes. However, further research with more diverse samples and more comprehensive measurement methods is needed to strengthen the generalizability of these findings.
Keywords: Discovery Learning; Basic Science Process Quantities; Science Learning Outcomes

Introduction

In the current era of globalisation and scientific development, basic science process skills are among the important competencies that students at the primary school level, especially in Science subjects, must master.[1] These skills not only equip students with conceptual knowledge about natural phenomena but also develop critical thinking, analytical, and problem-solving abilities that are needed in everyday life.[2] However, at SDIT Al Madinah Maros, there are indications that the basic science process skills and science learning outcomes of grade VI students are still not optimal. This can be seen from the low achievement of student learning outcomes in various academic evaluations.

Schools have made various efforts to improve the quality of science learning, one of which is applying traditional learning models.[3] However, traditional learning models that focus more on the teacher-centred approach are still considered less effective in improving students' science process skills. In this context, the Discovery Learning model emerges as an interesting alternative to be applied in the learning process.[4] Discovery Learning, which encourages students to be more active and independent in discovering science concepts and principles, is seen as having great potential to improve students' basic science process skills and science learning outcomes.[5]

Although the Discovery Learning model has been widely recognised in educational literature as one of the innovative approaches capable of improving students' critical and analytical thinking skills, its application in improving basic science process skills and science learning outcomes at the primary school level, particularly in Indonesia, is still not widely explored. At SDIT Al Madinah Maros, the traditional teaching methods that are still commonly used in grade VI are not fully effective in meeting the learning needs that emphasise the development of science process skills. This can be seen from the

[1] Tri Riswakhyuningsih, "Pengembangan Alur Tujuan Pembelajaran (ATP) Mata Pelajaran Ilmu Pengetahuan Alam (IPA) Kelas VII SMP," *RISTEK: Jurnal Riset, Inovasi Dan Teknologi Kabupaten Batang* 7, no. 1 (2022): 20–30.
[2] S Pd Hisbullah and Nurhayati Selvi, *Pembelajaran Ilmu Pengetahuan Alam Di Sekolah Dasar* (Penerbit Aksara TIMUR, 2018).
[3] Nur Faqih, "Peningkatan Aktivitas Dan Hasil Belajar Siswa Pada Pembelajaran IPA Materi Gerak Benda Melalui Pendekatan Saintifik," *Trapsila: Jurnal Pendidikan Dasar* 1, no. 01 (2019): 8–18.
[4] Fajar Ayu Astari, Suroso Suroso, and Yustinus Yustinus, "Efektifitas Penggunaan Model Discovery Learning Dan Model Problem Based Learning Terhadap Hasil Belajar IPA Siswa Kelas 3 SD," *Jurnal Basicedu* 2, no. 1 (2018): 1–10.
[5] Willes Pangesti and Elvira Hoesein Radia, "Meta Analisis Pegaruh Model Pembelajaran Discovery Learning Terhadap Hasil Belajar IPA Siswa Sekolah Dasar," *Elementary School: Jurnal Pendidikan Dan Pembelajaran Ke-SD-An* 8, no. 2 (2021): 281–86.

results of initial observations, which show that many students have difficulty understanding basic science concepts in depth and their application, which then has an impact on their low learning outcomes.

This study aims to examine the effect of the Discovery Learning model on basic science process skills and science learning outcomes of grade VI students at SDIT Al Madinah Maros. Specifically, this study was designed to achieve several main objectives. *First*, this study aims to determine the extent to which the Discovery Learning model can improve students' basic science process skills. Basic science process skills include the ability to observe, classify, measure, interpret data, and make conclusions, which are important aspects of science learning at the primary school level.

Secondly, this research aims to evaluate the impact of the Discovery Learning model on students' science learning outcomes, which include conceptual understanding and application of science concepts in the context of everyday life. By evaluating these learning outcomes, the research can provide in-depth insight into the effectiveness of this learning model not only in terms of cognitive but also affective and psychomotor aspects.

By identifying these gaps, this research is expected to make a significant contribution to the basic education literature in Indonesia. In addition, this research offers a new perspective on how the Discovery Learning model can be adapted and implemented effectively in the local context by considering various factors that influence students' learning outcomes and basic science process skills.

This research offers a unique and significant contribution to the basic education literature with several aspects of novelty. *First*, it applies the Discovery Learning model in the context of science learning at the primary school level in Indonesia, an area that has not been extensively researched. While most previous research has focused on the effectiveness of this model at secondary or higher education levels, this study provides new insights into how the Discovery Learning approach can be adapted and implemented for grade VI students, with a particular focus on basic science process skills and science learning outcomes.

Second, this study not only evaluates the effect of Discovery Learning on student learning outcomes in general but also explores its impact on the dimensions of basic science process skills more specifically. This is important because basic science process skills are an important foundation for the development of more complex scientific skills

at higher education levels. Thus, this research provides a more holistic view of the benefits of the Discovery Learning model.

Research Methods

This study used a quantitative approach with a pseudo-experimental design to assess the effect of the discovery learning model on basic science process skills and science learning outcomes of grade VI students at SDIT Al Madinah Maros.[6] This study involved two groups of students: the experimental group using the discovery learning model and the control group using conventional learning methods. Subject selection was purposive, involving 48 students who were evenly divided into the two groups.

The independent variable in this study is the discovery learning model, while the dependent variables are students' basic science process skills and science learning outcomes. Control variables such as learning time, teaching materials, and teaching teachers were controlled to ensure objective results. Data were collected through basic science process skills tests, learning outcomes tests, and observations. Skill tests and learning outcomes were prepared based on the science curriculum used. At the same time, observations were made to monitor the application of the discovery learning model in the experimental class as well as student interaction and engagement during the learning process.

Data analysis was conducted using descriptive statistical techniques to describe the distribution of scores and MANOVA (Multivariate Analysis of Variance) test to test the hypothesis regarding the effect of the discovery learning model. Instrument validity and reliability were tested to ensure measurement accuracy, and data triangulation was conducted by comparing test results, observations, and documentation to increase the reliability of the findings.[7] Prior to the MANOVA analysis, statistical assumption tests such as normality and homogeneity of variance were also conducted to ensure the data met the analysis requirements. Interpretation of results was verified through discussions with teachers and participants to provide appropriate and relevant data interpretation.

[6] Rifka Agustianti et al., *Metode Penelitian Kuantitatif Dan Kualitatif* (Tohar Media, 2022).
[7] Indarini Dwi Pursitasari et al., "Multivariat Analysis Of Variance (MANOVA) Di Bidang Kesehatan Dan Pendidikan MIPA," *Jurnal Ilmiah Kanderang Tingang* 15, no. 1 (2024): 117–26.

Results and Discussion

Basic Science Process Skills

Process skills are an intentional process of diagnosing a situation, formulating a problem, criticising an experiment and finding differences between alternatives, looking for opinions built on incomplete information, designing investigations, finding information, creating models, debating peers using facts, and forming coherent arguments.[8]

Why are process skills important in science learning? The reasons include the following:

a. The development of science and technology is accelerating. Therefore, teachers will have difficulty teaching all the facts and concepts to students.
b. With KPS, students are independent in finding concepts from various sources.
c. Psychologically, students in basic education will easily understand concepts that are abstract and complicated.
d. With KPS, students' understanding will be more meaningful and can be remembered longer.
e. Students need to be trained and stimulated to always ask questions, think critically and objectively, and become used to seeking possible answers to problems.[9]

Indicators of basic science process skills are as follows.[10] :

Table 2.1 Basic Science Process Skills

No.	Skills	Sub Skills
1.	Observing	Using all five senses, make qualitative and quantitative observations and observe changes. Collect or use relevant facts.
2.	Classify categorise	Classify objects according to certain properties.
3.	Communicating	Ability to communicate with others.
4.	Measuring	Find the size of an object and how much space it occupies.
5.	Predict	Proposals of possible outcomes of an experiment. Predictions are based on previous observations.
6.	Summarise	Report results in a structured manner orally or in writing, using charts, diagrams, and illustrations

[8] Warga Nu-muhammadiyah et al., "HARMONI DALAM KERAGAMAN KEAGAMAAN ISLAM STUDI KASUS KHATAMAN AL- QUR ' AN," 2021.
[9] Hariyati Hariyati, M Rudy Sumiharsono, and Muljono Muljono, "PENGARUH MODEL PEMBELAJARAN TEMATIK TERHADAP MOTIVASI BELAJAR DAN HASIL BELAJAR SISWA DI TK DHARMA WANITA JENGGAWAH," *Journal of Education Technology and Inovation* 3, no. 2 (2020): 8–23.
[10] Dimyati, Mudjiono. (2015). *Learning and Learning.* Rineka Cipta. Jakarta.

No.	Skills	Sub Skills
		and created into digital and non-digital media to support explanations,

1. Comparison of Basic KPS Scores of Control and Experimental Classes

Basic KPS variables were measured using a validated observation sheet. The basic KPS measured in this study includes observing, classifying, communicating, measuring, predicting, and concluding. The following is a comparison table of the KPS observation results for six meetings from both classes.

Table 4.6 Basic KPS Acquisition of Both Classes in Six Meetings

No.	Basic KPS Indicator	Control Class Meeting						Experiment Class Meeting					
		I	II	III	IV	V	VI	I	II	III	IV	V	VI
1.	Observing	65	57	65	63	63	68	89	80	100	103	96	91
2.	Classify	68	69	73	60	72	64	80	70	90	102	88	106
3.	Communication	72	74	67	65	64	74	84	65	94	97	96	103
4.	Measuring	68	68	66	71	66	72	86	69	94	98	91	100
5.	Predict	72	72	71	63	72	71	89	79	90	99	89	103
6.	Summarise	72	71	74	68	75	71	88	80	98	103	100	102
Total Score		**417**	**411**	**416**	**390**	**412**	**420**	**516**	**443**	**566**	**602**	**560**	**605**
Average		**69**	**69**	**69**	**65**	**69**	**70**	**86**	**74**	**94**	**100**	**93**	**101**

This study lasted for six meetings with two subjects, namely the special characteristics of plants and the special characteristics of animals related to their habitat. The data in Table 4.6 outlines the score of each basic KPS indicator applied to both classes in each meeting. Among the six meetings conducted, it can be seen that the discovery learning model is most effective in the subject matter of the special characteristics of animals related to their habitat. This is in line with the acquisition of students' basic KPS scores seen in meetings IV, V, and VI, which obtained higher scores than meetings I, II, and III, with a total score of 1,767, while the total score of meetings I, II, and III was 1,525. The factor that causes the increase in the effectiveness of the *discovery learning* model is that students are getting used to the model used.

The following is a graph of the total score of each indicator of basic KPS in the control class for each meeting.

Figure 4.5

Graph of Control Class Basic KPS Indicator Scores for Each Meeting

Furthermore, below is the total score of the experimental class KPS indicators in each meeting.

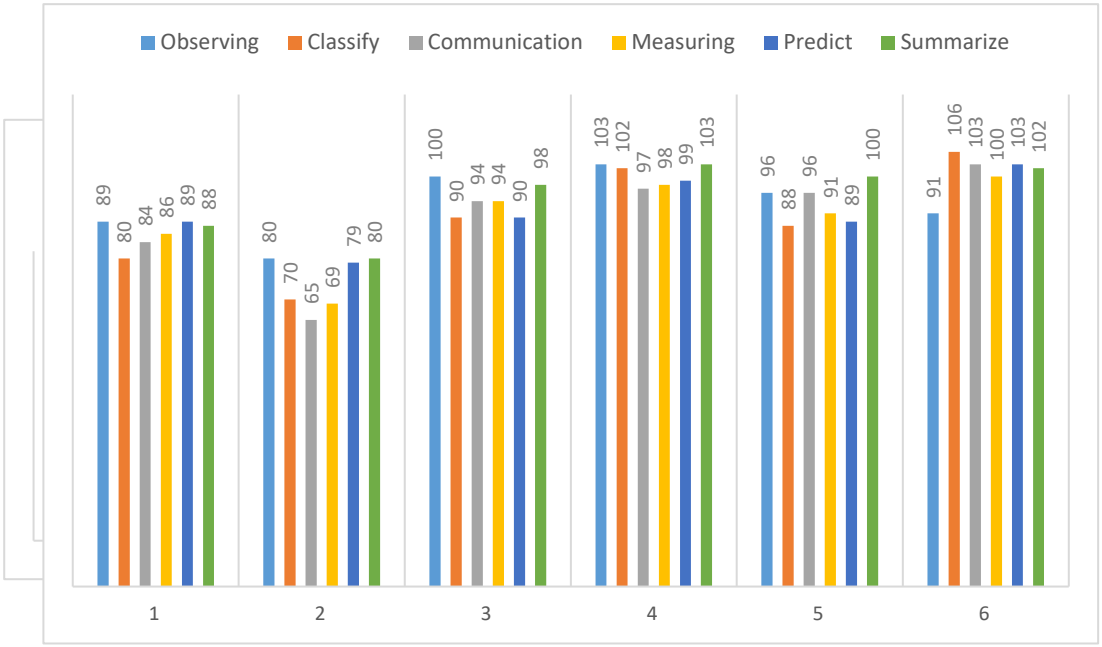


Figure 4.6 Graph of Experiment Class Basic KPS Indicator Scores for Each Meeting

2. Comparison of Learning Outcomes of Control and Experimental Classes

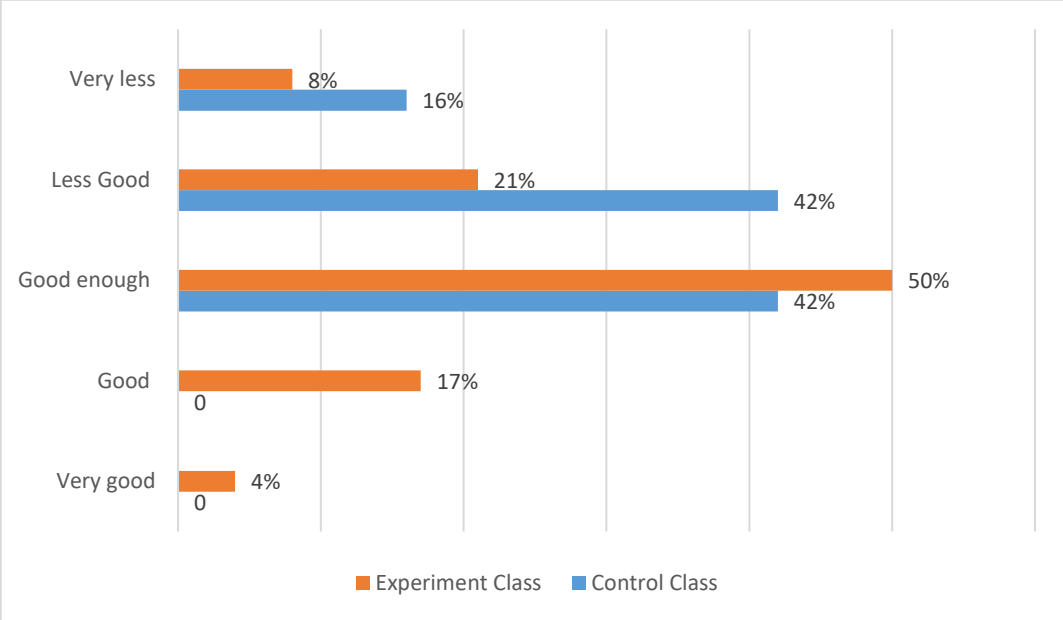
The following are the posttest scores of learning outcomes between the two classes.

Table 4.13 Distribution of Posttest Values of Learning Outcomes of Both Classes

Score	Category	Control Class		Posttest	
		Frequency	Percentage (%)	Frequency	Percentage (%)
86 < x ≤ 100	Very good	-	-	1	4,2%
71 < x ≤ 85	Good	-	-	4	16,7%
51 < x ≤ 70	Good enough	10	41,7%	12	50%
31 < x ≤ 50	Less Good	10	41,7%	5	20,8%
0 ≤ x ≤ 30	Very less	4	16,7%	2	8,3%
Total		**24**	**100%**	**24**	**100%**

Furthermore, it is depicted in graph form as follows.

Figure 4.9 Graph of Percentage Distribution of Learning Outcomes of Both Classes



3. Hypothesis Test Results of the Effect of *Discovery Learning* Model on Basic Science Process Skills and Student Science Learning Outcomes

The third research hypothesis, $H_{o,\ is\ rejected,}$ and H_1 is accepted because it is proven by the results of the MANOVA test of basic KPS and learning outcomes showing a significance value of 0.000 <0.005, so it can be concluded that there is a significant influence in the implementation of the *discovery learning* model on the basic science process skills and learning outcomes of grade VI students on the material of the special characteristics of plants and animals related to their habitat at SDIT Al Madinah Maros.

After the researchers conducted various analyses and tests on the data obtained, it can be concluded that the discovery learning model simultaneously affects basic science process skills and learning outcomes of grade VI students on the material of special characteristics of plants and animals related to their habitat at SDIT Al Madinah Maros using the MANOVA test.

Table 4.22

The Effect of the *Discovery Learning* Model on Basic KPS and Learning Outcomes Simultaneously

Variables	Sig	Description
The Effect of *Discovery Learning* Model on Basic Science Process	0,000	Significant

Variables	Sig	Description
Skills and Science Learning Outcomes		

The *Multivariate Test* above was conducted with the help of SPSS version 25.0 with the decision-making that the significant value of the *discovery learning* model on basic science process skills and science learning outcomes of Class VI students on the material of the special characteristics of plants and animals related to their habitat at SDIT Al Madinah Maros is 0.000 <0.05 which means that H_1 is accepted H_o is rejected. Namely, the discovery learning model has an effect on basic science process skills and science learning outcomes of Class VI students on the material of the special characteristics of plants and animals related to their habitat at SDIT Al Madinah Maros.

Effect of Discovery Learning Model on Basic Science Process Skills (KPS)

The results showed that the application of the *discovery learning* model significantly improved students' basic science process skills (KPS) compared to the conventional learning method. In the experimental class, the KPS, including the ability to observe, classify, communicate, measure, and predict, experienced a consistent increase over the six meetings, especially in the observing and concluding indicators. This finding is in line with Maulana Wayudi's findings, which emphasise that learning based on self-discovery facilitates critical and analytical thinking processes.[11] In this theoretical framework, students who actively participate in concept discovery not only remember information longer but are also better able to apply it in new situations, which is evident in their improved KPS.

This research also supports Karlina Wong Lieung's findings, which found that the *discovery learning* model allows students to develop scientific skills through direct exploration and manipulation of concepts.[12] In the context of this study, the *discovery learning* model provides opportunities for students to engage in a deep process of exploration and reflection, which strengthens their understanding of basic science concepts. This process allows students to construct new knowledge based on their empirical experience, effectively improving their science process skills.[13]

[11] Mauliana Wayudi, Suwatno Suwatno, and Budi Santoso, "Kajian Analisis Keterampilan Berpikir Kritis Siswa Sekolah Menengah Atas," *Jurnal Pendidikan Manajemen Perkantoran* 5, no. 1 (2020): 67–82.
[12] Karlina Wong Lieung, "Pengaruh Model Discovery Learning Terhadap Keterampilan Berpikir Kritis Siswa Sekolah Dasar," *Musamus Journal of Primary Education* 1, no. 2 (2019): 73–82.
[13] Riani Ayu Utami and Sri Giarti, "Efektivitas Model Pembelajaran Problem Based Learning (PBL) Dan Discovery Learning Ditinjau Dari Keterampilan Berpikir Kritis Siswa Kelas 5 SD," *PeTeKa* 3, no. 1 (2020): 1–8.

In particular, the observation and inference skills that have improved the most can be explained through the basic principles of *discovery learning* that encourage students to interact directly with the objects or phenomena being studied, make detailed observations, and finally draw conclusions based on the data obtained. This is different from the conventional method, which tends to focus on passively receiving information.

Discovery Learning's Contribution to Theory and Application in Practice

This research makes a significant contribution to educational theory, especially in strengthening the argument that the *discovery learning* model is effective in improving students' basic science process skills (KPS). As Piaget explained, an active and constructivist learning process, such as *discovery learning*, allows students to build their own understanding through direct interaction with the learning environment.[14] This finding is in line with I Putu Suardipa's view on the importance of *scaffolding* in learning, where the teacher acts as a facilitator who assists students in reaching their zone of proximal development.[15] In the context of this study, *discovery learning* provides a framework that allows students to explore and understand science concepts with minimal teacher support, thus encouraging the development of their scientific skills.[16]

In addition to theoretical contributions, this research also has significant practical implications. The implementation of the *discovery learning* model in science learning in elementary schools not only improves KPS but also prepares students to face future challenges that demand critical and independent thinking skills. This finding supports the research conducted by Hena Dian Ayu,[17] and Erni Kusrini Sitinjak,[18] Who found that *discovery learning* is more effective than direct instruction in developing conceptual understanding and problem-solving skills in students. In practice, the results of this study suggest that teachers should adopt *discovery learning* as the main learning method in science subjects, especially since this method allows students to be actively involved in the learning process, which ultimately strengthens knowledge retention and transfer.

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[14] Jean Piaget, "Development and Learning," *Reading in Child Behavior and Development*, 1972, 38–46.
[15] I Putu Suardipa, "Proses Scaffolding Pada Zone Of Proximal Development (ZPD) Dalam Pembelajaran," *Widyacarya: Jurnal Pendidikan, Agama Dan Budaya* 4, no. 1 (2020): 79–92.
[16] Yuni Hafidha Arosyidah and Supriyono Koes Handayanto, "Analisis Kebutuhan Terhadap Media Pembelajaran Dan Pemberian Scaffolding Dalam Pembelajaran Daring" (State University of Malang, 2021).
[17] Hena Dian Ayu et al., "Systematic Literature Review: Discovery Learning Terhadap Peningkatan Hasil Belajar Siswa," *RAINSTEK: Jurnal Terapan Sains & Teknologi* 5, no. 2 (2023): 124–33.
[18] Erni Kusrini Sitinjak, Bajongga Silaban, and Elisa Octavia Lumban Raja, "Pengaruh Model Discovery Learning Terhadap Kemampuan Berpikir Kritis Peserta Didik Pada Materi Getaran Dan Gelombang," *Jurnal Pendidikan Tambusai* 7, no. 3 (2023): 24577–85.

Furthermore, this research also provides guidance for curriculum development that is more effective and relevant to the needs of today's students. By emphasising the importance of KPS in science learning, the curriculum can be designed to include more activities that encourage exploration, investigation and discovery. This will not only improve students' learning outcomes in the short term but will also equip them with the necessary skills to succeed in their future professional lives.

Social and Ethical Implications: Application of Technology in Learning and Ethical Aspects in Education

This research not only has implications in terms of the development of basic science process skills (KPS) and learning outcomes but also brings important impacts in the social and ethical context of education must also be considered, especially in the context of applying the *discovery learning* model. Teachers have the responsibility to ensure that this method is used by considering individual differences among students, including differences in learning abilities, learning styles, and readiness levels. According to Bakri Anwar, education should be humanistic and take into account the needs and context of students as active subjects in the learning process.[19] Therefore, teachers must ensure that *discovery learning* is not only a means to achieve curriculum objectives but also supports students' development holistically, with attention to their emotional and social well-being.[20]

Another ethical implication relates to the evaluation and reporting of learning outcomes. In the *discovery learning* model, educators need to adopt an evaluation approach that is fair and transparent and reflects the whole learning process, not just the result. According to Rahma Kharunissa, effective evaluation should focus on student progress and development, as well as provide constructive feedback that can motivate students to continue developing.[21] Therefore, in the implementation of *discovery learning*, teachers need to avoid assessments that are only based on the final result without paying attention to the process that students go through so that the evaluation still supports the principles of justice and integrity in education.

This study provides important insights into the effectiveness of the discovery learning model in improving basic science process skills (KPS) and student learning outcomes.

[19] Bakri Anwar, "Pendidikan Humanistik Dalam Belajar," *Inspiratif Pendidikan* 9, no. 1 (2020): 126–37.
[20] Dyah Ayu Safitri and Nurul Umamah, "Accelerated Learning Integrated by Discovery Learning in History Course: How Z Generation Learn," in *IOP Conference Series: Earth and Environmental Science*, vol. 243 (IOP Publishing, 2019), 12151.
[21] Rahma Kharunissa, "Implementation of the Formative Assessment Model in the Development of Mathematics Learning Evaluation at the Elementary Level," *EduMatika: Jurnal MIPA* 3, no. 2 (2023): 41–43.

However, some limitations need to be considered in interpreting the results. First, the research design that used a sample from one school, SDIT Al Madinah Maros, limits the generalizability of the findings to a wider population. As stated by Cohen, Manion, and Morrison, the generalizability of research results can be limited if the sample is not broadly representative.[22] Therefore, although these results are relevant to SDIT Al Madinah Maros, further research with a more diverse sample is needed to ensure external validity.

Another limitation related to the KPS measurement instrument used is the observation sheet. Although this observation sheet has been validated, some of the more subtle aspects of KPS may not be fully measured. For example, critical thinking skills and the ability to integrate science concepts may require more in-depth measurement methods, such as interviews or student portfolio analysis. Fraenkel, Wallen, and Hyun suggest that comprehensive measurement of KPS should involve a variety of approaches, not only quantitative observations but also more reflective evaluation techniques. Therefore, the results of this study may not capture all dimensions of the KPS that students develop.[23]

The development of more comprehensive measurement instruments is an important area for future research. Combining qualitative and quantitative methods, such as the think-aloud technique, can provide a more thorough picture of the development of KPS. This method allows researchers to capture critical thinking processes that may not be visible in standard observations (Ericsson & Simon, 1993). This multimodal approach will provide deeper insights into how students develop skills through discovery learning.

Conclusion

This study has comprehensively examined the effect of the *discovery learning* model on basic science process skills (KPS) and learning outcomes of grade VI students at SDIT Al Madinah Maros. The results show that the application of *discovery learning* has a significant positive impact on the development of KPS, including the ability to observe, classify, communicate, measure, predict, and conclude. Students who engaged in discovery-based learning not only showed consistent score improvement in KPS but also demonstrated a deeper understanding of the science concepts learned. This is in line with constructivist theory, which emphasises the importance of active and reflective engagement in the learning process.

[22] Louis Cohen, Lawrence Manion, and Keith Morrison, "Mixed Methods Research," in *Research Methods in Education* (Routledge, 2017), 31–50.
[23] Jack Fraenkel, Norman Wallen, and Helen Hyun, *How to Design and Evaluate Research in Education 10th Ed.* (McGraw-Hill Education, 1993).

In addition, this study revealed that *discovery learning* also improved students' overall learning outcomes. Students who learned through this model tended to have higher post-test results compared to those who followed the conventional learning method. This improvement indicates that *discovery learning* is effective not only in developing scientific skills but also in facilitating more meaningful understanding and long-term retention of the subject matter.

Bibliography

Agustianti, Rifka, Lissiana Nussifera, L Angelianawati, Igat Meliana, Effi Alfiani Sidik, Qomarotun Nurlaila, Nicholas Simarmata, Irfan Sophan Himawan, Elvis Pawan, and Faisal Ikhram. *Metode Penelitian Kuantitatif Dan Kualitatif*. Tohar Media, 2022.

Anwar, Bakri. "Pendidikan Humanistik Dalam Belajar." *Inspiratif Pendidikan* 9, no. 1 (2020): 126–37.

Arosyidah, Yuni Hafidha, and Supriyono Koes Handayanto. "Analisis Kebutuhan Terhadap Media Pembelajaran Dan Pemberian Scaffolding Dalam Pembelajaran Daring." State University of Malang, 2021.

Astari, Fajar Ayu, Suroso Suroso, and Yustinus Yustinus. "Efektifitas Penggunaan Model Discovery Learning Dan Model Problem Based Learning Terhadap Hasil Belajar IPA Siswa Kelas 3 SD." *Jurnal Basicedu* 2, no. 1 (2018): 1–10.

Ayu, Hena Dian, Rinda Alfiana, Hilwa Marâ, Shofitri Zuhannisaâ, and Muhammad Nur Hudha. "Systematic Literature Review: Discovery Learning Terhadap Peningkatan Hasil Belajar Siswa." *RAINSTEK: Jurnal Terapan Sains & Teknologi* 5, no. 2 (2023): 124–33.

Cohen, Louis, Lawrence Manion, and Keith Morrison. "Mixed Methods Research." In *Research Methods in Education*, 31–50. Routledge, 2017.

Faqih, Nur. "Peningkatan Aktivitas Dan Hasil Belajar Siswa Pada Pembelajaran IPA Materi Gerak Benda Melalui Pendekatan Saintifik." *Trapsila: Jurnal Pendidikan Dasar* 1, no. 01 (2019): 8–18.

Fraenkel, Jack, Norman Wallen, and Helen Hyun. *How to Design and Evaluate Research in Education 10th Ed.* McGraw-Hill Education, 1993.

Hariyati, Hariyati, M Rudy Sumiharsono, and Muljono Muljono. "Pengaruh Model Pembelajaran Tematik Terhadap Motivasi Belajar Dan Hasil Belajar Siswa Di Tk Dharma Wanita Jenggawah." *Journal of Education Technology and Innovation* 3, no. 2 (2020): 8–23.

Hisbullah, S Pd, and Nurhayati Selvi. *Pembelajaran Ilmu Pengetahuan Alam Di Sekolah Dasar*. Penerbit Aksara TIMUR, 2018.

Kharunissa, Rahma. "Implementation of the Formative Assessment Model in the Development of Mathematics Learning Evaluation at the Elementary Level." *EduMatika: Jurnal MIPA* 3, no. 2 (2023): 41–43.

Lieung, Karlina Wong. "Pengaruh Model Discovery Learning Terhadap Keterampilan Berpikir Kritis Siswa Sekolah Dasar." *Musamus Journal of Primary Education* 1, no. 2 (2019): 73–82.

Nu-muhammadiyah, Warga, D I Desa, Sana Daja, Kecamatan Pasean, Kabupaten Pamekasan, Moh Dannur, Abdul Bari, and Institut Agama Islam Al-khairat. "Harmoni Dalam Keragaman Keagamaan Islam Studi Kasus Khataman Al- Qur ' An," 2021.

Pangesti, Willes, and Elvira Hoesein Radia. "Meta Analisis Pegaruh Model Pembelajaran

Discovery Learning Terhadap Hasil Belajar IPA Siswa Sekolah Dasar." *Elementary School: Jurnal Pendidikan Dan Pembelajaran Ke-SD-An* 8, no. 2 (2021): 281–86.

Piaget, Jean. "Development and Learning." *Reading in Child Behavior and Development*, 1972, 38–46.

Pursitasari, Indarini Dwi, Bibit Harianto, Sinta Srie Wulan, Dody Hermanto, and Didit Ardianto. "Multivariat Analysis Of Variance (MANOVA) Di Bidang Kesehatan Dan Pendidikan MIPA." *Jurnal Ilmiah Kanderang Tingang* 15, no. 1 (2024): 117–26.

Riswakhyuningsih, Tri. "Pengembangan Alur Tujuan Pembelajaran (ATP) Mata Pelajaran Ilmu Pengetahuan Alam (IPA) Kelas VII SMP." *RISTEK: Jurnal Riset, Inovasi Dan Teknologi Kabupaten Batang* 7, no. 1 (2022): 20–30.

Safitri, Dyah Ayu, and Nurul Umamah. "Accelerated Learning Integrated by Discovery Learning in History Course: How Z Generation Learn." In *IOP Conference Series: Earth and Environmental Science*, 243:12151. IOP Publishing, 2019.

Sitinjak, Erni Kusrini, Bajongga Silaban, and Elisa Octavia Lumban Raja. "Pengaruh Model Discovery Learning Terhadap Kemampuan Berpikir Kritis Peserta Didik Pada Materi Getaran Dan Gelombang." *Jurnal Pendidikan Tambusai* 7, no. 3 (2023): 24577–85.

Suardipa, I Putu. "Proses Scaffolding Pada Zone Of Proximal Development (ZPD) Dalam Pembelajaran." *Widyacarya: Jurnal Pendidikan, Agama Dan Budaya* 4, no. 1 (2020): 79–92.

Utami, Riani Ayu, and Sri Giarti. "Efektivitas Model Pembelajaran Problem Based Learning (PBL) Dan Discovery Learning Ditinjau Dari Keterampilan Berpikir Kritis Siswa Kelas 5 SD." *PeTeKa* 3, no. 1 (2020): 1–8.

Wayudi, Mauliana, Suwatno Suwatno, and Budi Santoso. "Kajian Analisis Keterampilan Berpikir Kritis Siswa Sekolah Menengah Atas." *Jurnal Pendidikan Manajemen Perkantoran* 5, no. 1 (2020): 67–82.