DISCOVERY LEARNING MODEL IN THE IMPLEMENTATION OF MERDEKA CURRICULUM: A LITERATURE STUDY ON SCIENCE LITERACY

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Abstrak

Literasi sains merupakan kompetensi penting dalam pendidikan abad ke-21 karena mencerminkan kemampuan berpikir kritis, pemahaman konsep ilmiah, serta pengambilan keputusan berbasis bukti. Model Discovery Learning dinilai efektif dalam meningkatkan literasi sains karena menekankan pada keterlibatan aktif siswa melalui proses eksplorasi dan penemuan. Penelitian ini bertujuan untuk mengkaji secara sistematis penerapan model Discovery Learning dalam konteks implementasi Kurikulum Merdeka dan dampaknya terhadap literasi sains siswa. Dengan menggunakan metode Systematic Literature Review (SLR) berdasarkan pedoman PRISMA, lima artikel terpilih dari berbagai jenjang pendidikan dianalisis berdasarkan karakteristik model pembelajaran, jenis literasi sains yang dikembangkan, serta keterkaitannya dengan prinsip Kurikulum Merdeka. Hasil kajian menunjukkan bahwa Discovery Learning secara konsisten meningkatkan pemahaman konsep, keterampilan proses sains, dan kemampuan berpikir kritis siswa. Meskipun sebagian besar artikel belum secara eksplisit menyebut Kurikulum Merdeka, pendekatan pembelajaran yang digunakan telah mencerminkan nilai-nilai inti kurikulum seperti diferensiasi, pembelajaran kontekstual, dan penggunaan teknologi. Temuan ini menunjukkan bahwa Discovery Learning memiliki potensi besar untuk diintegrasikan secara sistematis dalam implementasi Kurikulum Merdeka guna memperkuat literasi sains siswa di berbagai jenjang pendidikan.

Kata kunci : Discovery Learning, Kurikulum Merdeka, Literasi Sains, Studi Literatur

Abstract

Science literacy is a crucial 21st-century educational competency, reflecting students' abilities to think critically, understand scientific concepts, and make evidence-based decisions. Discovery Learning is considered effective in enhancing science literacy by encouraging active student engagement through exploration and inquiry. This study aims to systematically review the application of the Discovery Learning model within the implementation of Kurikulum Merdeka and its impact on students' science literacy. Using a Systematic Literature Review (SLR) method based on the PRISMA framework, five selected articles from various educational levels were analyzed in terms of learning model characteristics, types of science literacy developed, and alignment with the core principles of Kurikulum Merdeka. The results indicate that Discovery Learning consistently improves conceptual understanding, scientific process skills, and students' critical thinking. Although most studies did not explicitly mention Kurikulum Merdeka, the learning approaches used reflected key curriculum values such as differentiation, contextual learning, and technology integration. These findings suggest that

Discovery Learning holds strong potential for systematic integration into the implementation of Kurikulum Merdeka to strengthen science literacy across educational contexts.

Keywords: *Discovery Learning, Kurikulum Merdeka, Science Literacy, Literature Study*

I. Introduction

The development of science and technology in the 21st century requires the education system to produce students who can think critically, collaboratively, creatively, and communicate effectively. One indicator of the success of today's education is students' science literacy, which refers to their ability to understand, interpret, and apply scientific concepts in everyday life (OECD, 2019). Science literacy not only includes mastery of scientific content, but also reflects the ability to think scientifically and make evidence-based decisions.

In Indonesia, the Merdeka Curriculum, which began to be implemented gradually since 2022, aims to create learning that is more contextual, flexible, and oriented towards the Pancasila learner profile. One of the approaches emphasized in this curriculum is learner-centered and discovery-based learning (Kemendikbudristek, 2022). This makes Discovery Learning one of the relevant learning models because it places students at the center of learning in discovering concepts through direct learning experiences and exploration. Discovery Learning is considered effective in encouraging students' active involvement, forming higher-order thinking skills, and supporting the development of science literacy (Sahyar & Nasution, 2017).

A number of previous studies have also shown that the Discovery Learning model consistently improves students' critical thinking skills and science literacy, especially in science and technology subjects. A study by Wibowo and Mustaji (2021) found that the use of Discovery Learning in science learning at the secondary level can significantly improve students' science literacy skills. In addition, the application of this model is also considered capable of overcoming the challenge of low student motivation and engagement in abstract and theoretical science learning (Putra & Sari, 2022). Thus, the integration of Discovery Learning in a more flexible curriculum policy, such as the Merdeka Curriculum, is a strategic step that is in line with today's learning needs.

However, the results of previous studies show that the implementation of Discovery Learning in the context of the Merdeka Curriculum has not been systematically studied, especially in relation to improving students' science literacy. Some studies focus on theoretical aspects or are limited to specific case studies, so there is no comprehensive study available that maps how this model has been implemented and the extent of its effectiveness in improving science literacy in general. This gap in the literature is a research gap and drives the importance of this study.

The preparation of this article aims to conduct a systematic literature review of various studies that discuss the application of the Discovery Learning model in the context of implementing the Merdeka Curriculum and its effect on strengthening students' science literacy. The main questions to be answered through this study are:

how has the Discovery Learning model been implemented in the Merdeka Curriculum to improve science literacy based on existing research results during the 2019-2025 period?

II.   Research Methods

This study uses a Systematic Literature Review (SLR) approach by referring to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Haddaway et al., 2022). The purpose of this SLR is to systematically identify, evaluate, and synthesize research results related to the implementation of the Discovery Learning model in the Merdeka Curriculum and its effect on students' science literacy.

The review process begins with a search for relevant articles through several reputable scientific databases, such as Scopus, Semantic Scholar, and Google Scholar. Articles found were then selected through predetermined inclusion and exclusion stages. Articles that passed the selection were then fully reviewed to extract the main data. The extraction process included publication data, learning models, types of science literacy studied, curriculum implementation approaches, as well as key results and findings from each study.

The inclusion criteria in this study are articles published within the last 6 years (2019-2025), in the form of scientific journal articles that can be accessed in full-text, in Indonesian or English, and focus on the topic of implementing the Discovery Learning model about science literacy and the independent curriculum. Meanwhile, the exclusion criteria included articles other than scientific journals (such as proceedings, editorials, or institutional reports), articles that were only abstracts, not available in full-text, and not relevant to the focus of the research. The description of the criteria can be observed in Table 1.

Table 1. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Year of publication	2019 - 2025	Before 2019
Literature type	Journal Article	Book, book chapter
Accessibility	Full-text	Abstract only
Language	Indonesian & English	Other than Indonesian & English
Research focus	Discovery Learning in the context of Merdeka Curriculum & science literacy	Other than Discovery Learning in the context of Merdeka Curriculum & science literacy

The literature search strategy was conducted systematically by utilizing the Boolean operators "AND" and "OR" to combine relevant keywords. This process was done with the help of the Publish or Perish application as well as a direct search in the Google Scholar database. The keywords used in this process include combinations such as: "Discovery Learning" AND "Independent Curriculum" AND "Science Literacy", as well as "Discovery Learning" AND "Science Literacy" AND "Curriculum Implementation". The use of this keyword variation aims to expand the range of searches for articles

that are in accordance with the focus of the study, namely the implementation of the Discovery Learning model in the context of the Merdeka Curriculum and its impact on students' science literacy. The following is a picture of the PRISMA flowchart to explain the article screening process.
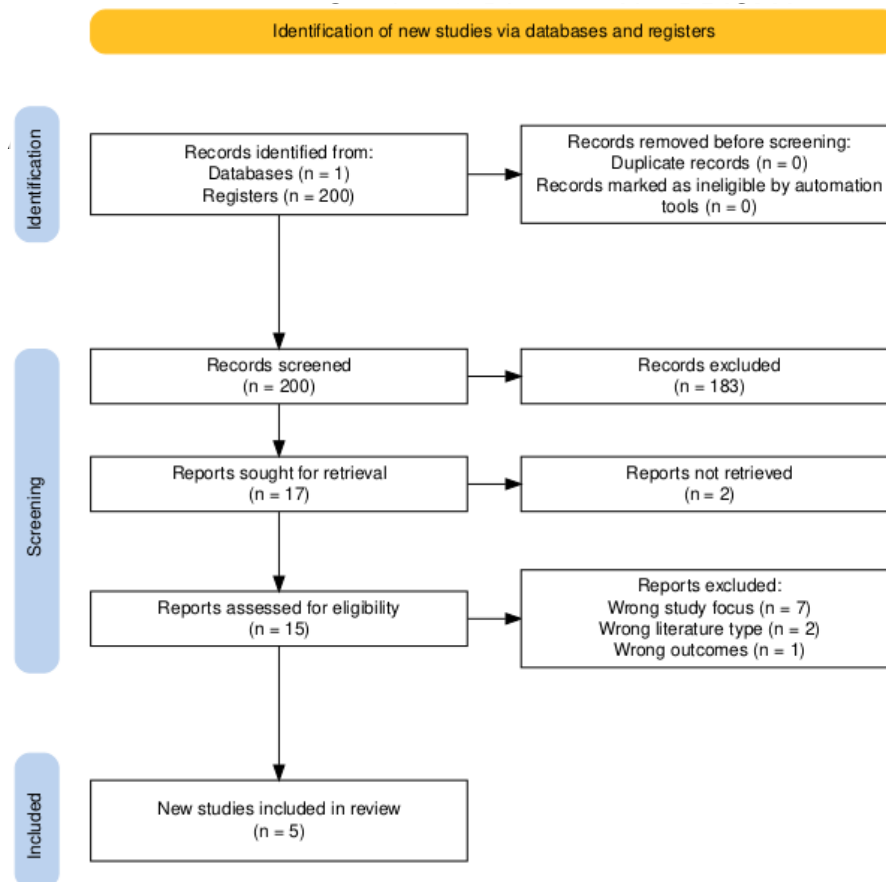

Figure 1 PRISMA Flowchart

III. Results and Discussion
A. Research findings

The results of screening 200 articles from the Google Scholar database resulted in 5 articles that can be accessed in full-text, published in the 2019-2025 period, in the form of journal articles, and in accordance with the research focus of this article, namely Discovery Learning in the context of the Merdeka Curriculum & science literacy. The article discusses studies related to the effect of implementing the Discovery Learning model on students' science literacy in the context of the Merdeka Curriculum. For more complete findings, it is described in Table 2.

Table 2 Findings and Identification of Article Problems

Article	Model & Context	Key findings related to science literacy	Linkage to Merdeka Curriculum

Sulistiyo, Z., Sunarto, & Arigiyati, T. A. (2024). Improving Science Literacy Skills on Indonesian Ecology and Biodiversity Material with TaRL Integrated Discovery Learning Model in Class VII B SMP N 4 Gamping. Proceedings of the National Seminar on Teacher Professional Education at Sarjanawiyata Tamansiswa University, 3(1).	• Discovery Learning • Teaching at the Right Level (TaRL) • Canva	Differentiated Discovery Learning improves science literacy through contextualized reading and digital exploration activities.	No explicit mention of KM, but the TaRL and Canva approaches are in line with the principles of differentiated and digital learning in KM.
Ilmiati, A. (2024). Application of the Discovery Learning Model to Science Literacy in Physics Learning. Journal of Citra Education, 4(2), 1768-1776. https://doi.org/10.38048/jcp.v4i2.29 89	Discovery Learning in High School Physics	Encourage students' active participation in discovering scientific concepts, improving science literacy through contextualized experiments and discussions.	It does not mention KM explicitly, but the inquiry and active learning approaches are in line with KM characteristics.
Masna, Arda, & Mirnawati. (2024). The Effect of Discovery Learning Model on Science Literacy Ability of Students of Class VII MTs Negeri 3 Palu. Koordinat Journal of Mathematics and Science Learning, 5(2), 88-94.	Discovery Learning (Quasi-experimen)	Significant impact on students' science literacy is shown through improved learning outcomes on the concept of temperature and heat.	It does not mention KM directly, but supports the achievement of scientific literacy competencies that are the target of KM.
Maulana, Rosmaiyadi, & Kariadi, D. (2024). The Effect of the Discovery Learning Model to Improve Students' Science Literacy. JOURNAL OF EDUCATIONAL REVIEW AND RESEARCH, 7(1), 34-49.	Discovery Learning (True-experimen)	Students in the experimental group showed significantly higher science literacy than the control class.	It does not explicitly mention KM, but the use of Discovery Learning syntax reflects the principles of exploration and contextual learning in KM.
Idhayana, P. A., Khamdun, & Kironoratri, L. (2023). Utilization of Magic Spin Board Media through Discovery Learning Model to Improve Science Literacy of Grade V Students of SDN Sendangagung. Pendas: Scientific Journal of Basic Education, 8(1).	• Discovery Learning • Media Magic Spin Board	The use of interactive educational media improved science literacy by 11.65% in two learning cycles.	It does not mention KM directly, but corresponds to active and creative learning based on local potential in KM

B. Discussion

The Discovery Learning model has been proven to contribute significantly to strengthening students' science literacy at various levels and learning contexts. In the study of Sulistiyo et al. (2024), this model is combined with the Teaching at the Right Level (TaRL) approach and Canva media to help students build literacy through visual exploration and contextual reading activities based on ability levels. This approach shows the flexibility of Discovery Learning in responding to the needs of differentiated learning as emphasized in the Merdeka Curriculum.

In the context of physics learning, Ilmiati (2024) argues that Discovery Learning encourages students to build their understanding of concepts through experiments and group discussions, which directly impacts improving science literacy. Students not

only understand science as a theory, but also apply it in real situations through an inquiry approach. This emphasizes the role of this model in building applicable scientific understanding.

From the quantitative side, Masna et al. (2024) reported a significant effect of the Discovery Learning model on improving students' science literacy in temperature and heat material, with statistical test results ($p = 0.00$) showing high effectiveness compared to the control group. Meanwhile, Maulana et al. (2024) confirmed that the application of Discovery Learning directly improved the quality of students' science literacy, as seen from the significantly higher average score in the experimental group compared to the control group.

Learning media support also strengthens the effectiveness of this model. Idhayana et al. (2023) utilized Magic Spin Board media in the implementation of Discovery Learning and noted an increase in students' science literacy by 11.65% over two learning cycles. This shows the important role of contextualized interactive media in strengthening the scientific discovery process.

C. Meta-Analisis

In general and based on the trend of results between studies, all articles reviewed show that the Discovery Learning model consistently contributes positively to the improvement of students' science literacy. This improvement includes aspects of concept understanding, scientific process skills, and critical thinking skills that emerge through the process of exploration and discovery in learning. This kind of active learning has been proven to be relevant at various levels of education and subjects, and encourages students to build scientific understanding independently.

However, of the five articles reviewed, none explicitly link the use of Discovery Learning with the implementation of the Merdeka Curriculum. Although it has not mentioned and linked the discussion to the Merdeka Curriculum directly, the learning strategies used have reflected the principles promoted by the curriculum, such as differentiated learning, the use of digital technology, and student-centered learning. This shows that there is a void in the literature regarding the integration of the Discovery Learning learning model with national curriculum policies. Therefore, it is hoped that this study can be the beginning of further research to further link the application of the Discovery Learning model in the context of the Merdeka Curriculum to students' science literacy. From the quantitative side, Masna et al. (2024) reported a significant effect of the Discovery Learning model on improving students' science literacy in temperature and heat material, with statistical test results ($p = 0.00$) showing high effectiveness compared to the control group. Meanwhile, Maulana et al. (2024) confirmed that the application of Discovery Learning directly improved the quality of students' science literacy, as seen from the significantly higher average score in the experimental group compared to the control group.

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Learning and noted an increase in students' science literacy by 11.65% over two learning cycles. This shows the important role of contextualized interactive media in strengthening the scientific discovery process.

IV.   Conclusion

Based on the review of five articles, it can be concluded that the Discovery Learning model consistently has a positive impact on improving students' science literacy at various levels of education. This model is proven to be able to encourage concept understanding, scientific process skills, and critical thinking skills through active, exploratory, and contextual learning. Although most articles have not explicitly linked the application of Discovery Learning to the Merdeka Curriculum, the approach used has reflected its key principles, such as differentiated, student-centered, and technology-based learning. Therefore, Discovery Learning has strong potential to be integrated more systematically in the implementation of the Merdeka Curriculum, especially in strengthening science literacy. This study is expected to be an initial reference for the development of learning in line with national curriculum policies and encourage further research that explores the direct relationship between learning models and these educational policies.

V.   Bibliography

Haddaway, NR, Page, MJ, Pritchard, CC, & McGuinness, LA 2022. PRISMA2020: Sebuah paket R dan aplikasi Shiny untuk menghasilkan diagram alir yang sesuai dengan PRISMA 2020, dengan interaktivitas untuk transparansi digital yang dioptimalkan dan Open Synthesis Campbell Systematic Reviews, 18, e1230. https://doi.org/10.1002/cl2.1230

Idhayana, P. A., Khamdun, & Kironoratri, L. 2023. Utilization of Magic Spin Board Media through Discovery Learning Model to Improve Science Literacy of Grade V Students of SDN Sendangagung. Pendas: Scientific Journal of Basic Education, 8(1).

Ilmiati, A. (2024). Penerapan Model Discovery Learning terhadap Literasi Sains pada Pembelajaran Fisika. Jurnal Citra Pendidikan, 4(2), 1768–1776. https://doi.org/10.38048/jcp.v4i2.2989

Ministry of Education and Culture. 2022. Independent Curriculum Learning and Assessment Guidelines. Jakarta: Directorate General of GTK.

Masna, Arda, & Mirnawati. 2024. The Effect of Discovery Learning Model on Science Literacy Ability of Students of Class VII MTs Negeri 3 Palu. Koordinat Journal of Mathematics and Science Learning, 5(2), 88-94.

Maulana, Rosmaiyadi, & Kariadi, D. 2024. The Effect of Discovery Learning Model to Improve Students' Science Literacy. JOURNAL OF EDUCATIONAL REVIEW AND RESEARCH, 7(1), 34-49

OECD. 2019. PISA 2018 Assessment and Analytical Framework. Paris: OECD Publishing. https://doi.org/10.1787/b25efab8-en

Putra, A. H., & Sari, D. P. (2022). Implementation of Discovery Learning Model to Increase Participation and Science Literacy of High School Students. Journal of Equatorial Education and Learning, 11(2), 1-9. https://jurnal.untan.ac.id/index.php/jpdpb/article/view/53911

Sahyar, & Nasution, H. (2017). The Effect of Discovery Learning Model on Student's Critical Thinking and Cognitive Ability in Physics. Journal of Education and

Practice, 8(6), 35–40.

Sulistiyo, Z., Sunarto, & Arigiyati, T. A. 2024. Improving Science Literacy Skills on Indonesian Ecology and Biodiversity Material with TaRL Integrated Discovery Learning Model in Class VII B SMP N 4 Gamping. Proceedings of the National Seminar on Teacher Professional Education at Sarjanawiyata Tamansiswa University, 3(1).

Wibowo, A., & Mustaji, M. (2021). The Effect of Discovery Learning Model on Science Literacy Skills of Junior High School Students. Journal of Science Education, 9(1), 10-17. https://doi.org/10.26714/jps.9.1.2021.10-17