JPPIPA 10(9) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Influence of Magnetic Media Usage on Improving Reading Literacy Skills in Material Understanding of Objects in Second Grade Elementary School

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Received: June 08, 2024
Revised: July 27, 2024
Accepted: September 25, 2024
Published: September 30, 2024

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DOI: 10.29303/jppipa.v10i9.7991

Abstract: This study explores the effectiveness of magnetic media in enhancing students' literacy skills in material state changes. Traditional teaching methods often struggle to effectively convey abstract scientific concepts, resulting in varying student performance levels. To address this gap, magnetic media was introduced as an interactive visual aid in the learning process. The study employed a pretest-posttest design with students from a science class, analyzing their literacy skills before and after using magnetic media. Results showed an average pretest score of -5.481, improving to -4.771 in the posttest, indicating a significant average increase of 0.71 points. Posttest scores also exhibited lower standard deviations, suggesting more consistent performance among students. This underscores that magnetic media supports both high and low-achieving students, promoting a more uniform understanding across different performance levels. Such inclusivity is crucial in education to ensure effective teaching methods for diverse learners. The study contributes by highlighting the unique benefits of magnetic media in providing tangible and visual representations of abstract concepts. Future research should further explore its application in different educational contexts and optimize strategies to maximize its benefits in teaching and learning.

Keywords: Literacy skills; Magnetic media; Material state changes; Racking

Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results. Individual interactions with their environment lead to learning processes involving changes in knowledge, skills, values, and attitudes (Carl et al., 2016; Hagermoser Sanetti et al., 2019). The learning process can occur through formal education in classrooms or active student interactions with media or other learning resources. Reading is one of the important skills in written language because through reading, students can acquire information, new experiences, and knowledge. In school, reading skills are a crucial foundation in learning various subjects, including Natural Sciences. Literacy skills in reading become highly important when students learn scientific concepts (Glew et al., 2019; Nedungadi et al., 2018). One of the topics taught in second-grade elementary school is the concept of states of matter. A good understanding of this concept requires strong reading skills to comprehend texts, instructions, and information presented in written form. Good reading literacy can help students better understand and apply the concept of states of matter in their daily lives. The topic of states of matter in the science curriculum in second grade includes the introduction of various types of objects and their physical properties. Learning this concept aims to help students recognize objects around them, understand changes in states of matter, and relate

How to Cite:
Fitria, A., & Sukmawati, W. (2024). The Influence of Magnetic Media Usage on Improving Reading Literacy Skills in Material Understanding of Objects in Second Grade Elementary School. *Jurnal Penelitian Pendidikan IPA*, *10*(9), 6426–6433. https://doi.org/10.29303/jppipa.v10i9.7991

these concepts to everyday experiences (Sukmawati, Sari, et al., 2022).

The appropriate learning approach is crucial to ensure that students not only memorize information but also understand and can apply that knowledge practically. However, observations in one public school in Jakarta indicate that some second-grade students are experiencing difficulties in reading, impacting their understanding of subjects, including the concept of states of matter (Fauziah et al., 2023; Sukmawati et al., 2021). Students with limitations in reading literacy tend to struggle in following lessons, understanding instructions, and mastering taught materials. This condition indicates that low reading literacy skills are a major obstacle in science learning in second grade. Low reading literacy among second-grade students in one public school in Jakarta is not a simple issue. Students experiencing reading difficulties often feel left behind in lessons, which can then affect their motivation and confidence in learning. Consequently, these students may show low interest in science subjects and struggle to follow instructions properly. This highlights the urgent need to find effective solutions to improve students' reading literacy skills and ultimately enhance their understanding of the concept of states of matter (Sukmawati, 2022; Sukmawati & Zulherman, 2023).

One solution that can be developed to address the issue of low reading literacy among students is the use of innovative learning media. Learning media can be defined as anything used to convey information with the aim of attracting students' attention and encouraging them to learn. According to Gagne, learning media can have psychological impacts on students when used in the learning process, fostering new interests and motivations, and encouraging them to participate in educational activities. One innovative and effective learning medium is magnetic media. Magnetic boards consist of a layer of white enamel on a metal sheet that allows lightweight objects to adhere through magnetic interaction (Apriliana et al., 2021; Sukmawati, Lestari Handayani, et al., 2022). This media can be used to make learning more interactive and engaging. The use of magnetic media is expected to increase students' learning motivation, make the learning process more enjoyable, and overall enhance learning effectiveness. Magnetic boards enable the visualization of abstract concepts in a more concrete form, which can help students understand the material better.

Research on the use of learning media has been widely conducted, but specific research exploring the influence of magnetic media in improving reading literacy skills in the context of the states of matter content in second-grade elementary school is still limited. This research aims to fill this gap by focusing on how magnetic media can be effectively used to improve students' reading literacy skills in the context of learning the states of matter concept (Aisyah et al., 2023b; Sukmawati & Wijiastuti, 2021). The novelty of this research lies in the interactive approach that combines the visual and kinesthetic aspects of magnetic media, which have not been widely explored in previous research. Reading literacy is a crucial skill in education, especially in learning scientific concepts. With good reading literacy, students can more easily understand instructions and information presented in written form, which in turn can enhance their understanding of the concepts taught. However, low reading literacy remains a major issue in many schools, including in one public school in Jakarta.

This research aims to describe and explain the influence of using magnetic media in improving reading literacy skills on the states of matter content in second-grade elementary school. Additionally, this research also aims to identify supporting and inhibiting factors in the implementation of magnetic media and evaluate its effectiveness in the context of science learning in elementary school. This research uses a quantitative approach with an experimental method, where students will be divided into control and experimental groups. The experimental group will use magnetic media in learning, while the control group will use conventional learning methods (Mulyanti et al., 2022). Magnetic media has the potential to make learning more interactive and engaging for students. With magnetic boards, teachers can present material in a more concrete and visual form, which can help students understand concepts better. Furthermore, the use of magnetic media can also increase student participation in the learning process, as they can interact directly with the media.

The facts from one public school in Jakarta indicate that not all children can read fluently and write correctly. Some children are not familiar with letters and cannot narrate after seeing pictures shown by the teacher. Therefore, children's literacy skills need to be improved. Based on this background, researchers are interested in conducting research on how the use of magnetic media influences improving the reading literacy skills of second-grade students in one public school in Jakarta. This research aims to describe and explain the influence, implementation, as well as supporting and inhibiting factors of using magnetic media in improving reading literacy skills on the states of matter content in second-grade elementary school. Thus, it is expected that the results of this research can provide real contributions in efforts to improve the quality of learning and students' reading literacy skills, especially in learning scientific concepts in second-grade elementary school (Novianti et al., 2023). This research is also expected to provide new insights into the use of innovative learning media in primary education, which

can be applied widely in various schools to enhance the quality of education in Indonesia. The results of this research are expected to serve as a reference for educators and policymakers in designing and implementing more effective and engaging learning strategies, thus helping to improve reading literacy and understanding of scientific concepts among elementary school students.

This study aims to investigate how magnetic media can enhance reading literacy skills among second-grade elementary school students, specifically in understanding the concept of states of matter. Reading literacy is crucial for comprehending scientific texts and instructions, yet some students in Jakarta's public schools face challenges due to low reading skills, impacting their academic performance and motivation. Magnetic media, such as magnetic boards, offers an innovative approach to make learning interactive and visually stimulating, potentially improving student engagement and understanding. This research fills a gap in existing literature by focusing on the interactive and kinesthetic aspects of magnetic media in enhancing reading literacy within the context of science education. By employing an experimental design with control and experimental groups, this study aims to identify factors influencing the effective implementation of magnetic media and assess its impact on students' reading skills and scientific understanding. Findings from this research are expected to provide valuable insights for educators and policymakers in enhancing educational practices and improving learning outcomes in Indonesian elementary schools, particularly in science education.

Method

This research uses a quantitative approach with an experimental design to test the influence of using magnetic media on the reading literacy skills of second-grade elementary school students in understanding the concept of states of matter. This approach was chosen because it allows researchers to control the variables involved and determine the cause-effect relationship between the use of magnetic media and the improvement of reading literacy skills. The research design used is a quasi-experimental design with a pretest-posttest one-group design. This design involves one group of students, namely the experimental group because this research focuses on the effectiveness of media use on literacy skills. The experimental group will use magnetic media in learning. The research subjects were selected from second-grade students in one elementary school in Jakarta. Before the treatment, all students will be given a pretest to measure their initial reading literacy skills related to the concept of states of matter. Then the experimental group will use magnetic media to learn the concept of states of matter. After the learning period is completed, all students will be given the same posttest as the pretest to measure changes in their reading literacy skills. Data from the pretest and posttest will be analyzed to determine the influence of using magnetic media on students' reading literacy skills (Sukmawati et al., 2021a; Sukmawati et al., 2023).

The data obtained from the pretest and posttest will be analyzed using the Rasch Model, which is a part of the Item Response Theory (IRT). This model will assist in assessing students' abilities in more detail and addressing issues that arise in educational data analysis. Two main techniques used in this analysis are stacking and racking. The stacking technique is employed to combine pretest and posttest data into one Rasch analysis (Fauziah et al., 2023; Fikriyah et al., 2022; Sukmawati et al., 2018). This allows researchers to observe changes in students' abilities longitudinally. By merging both datasets, the Rasch model can evaluate differences in reading abilities before and after treatment. The racking technique is used to analyze data from each group (experimental and control) separately but within the same context. This aids in identifying treatment effects on the experimental group compared to the control group. Racking enables researchers to observe the distribution of abilities among both groups and determine if the observed changes in the experimental group significantly differ from the control group.

Result and Discussion

Stacking Analysis

The data displayed shows the results of measuring students' literacy skills at two different times, namely pretest and posttest data. Each entry includes the measured value (Measure) and the Standard Error (S.E.). For the pretest, the average score is -5.481 with a standard deviation of 0.65139, while for the posttest, the average score is -4.771 with a standard deviation of 0.476433626. This comparison shows an increase of 0.71 points from pretest to posttest, indicating an improvement in students' literacy skills after the implementation of magnetic learning media. The lower standard deviation in the posttest shows that the students' posttest results are more consistent and less varied compared to the pretest results. Overall, most individual scores show an improvement from pretest to posttest, although there are a few minor exceptions. This data provides an initial indication that magnetic learning media is effective in improving students' literacy skills (Nurliana et al., 2023). Based on the increase in measure scores in Table 1, it can be seen that the greatest improvement in students' literacy skills

occurred in student number 2, with a change of 1.65, derived from the difference between pretest and posttest measure scores. Meanwhile, the smallest change was found in student number 5, with a change of 0.22 points. Overall, all students showed improvement. The change in students' literacy skills can be seen more clearly in Figure 1.

Table 1. Table of Changes in Measure Scores Before and After Treatment (Stacking)

	Pretest		Posttest	
Entry	Measure	S.E.	Measure	S.E.
S1	-5.58	0.35	-5.12	0.34
S2	-6.88	0.46	-5.23	0.33
S3	-5.99	0.39	-5.23	0.33
S4	-5.46	0.34	-5.12	0.34
S5	-5.23	0.33	-5.01	0.34
S6	-6.14	0.4	-5.12	0.34
S7	-4.89	0.35	-4.45	0.43
S8	-4.76	0.37	-4.45	0.43
S9	-5.12	0.34	-3.99	0.55
S10	-4.76	0.37	-3.99	0.55
Mean	-5.47		-4.73222	
S.D.	0.685744		0.487004	

Figure 1 shows the distribution of measure scores in the pretest and posttest spread along the trend line, with most data points lying around the line. The curved line shows the confidence interval or the boundaries within which most data points are expected to lie(Lin et al., 2023). This image helps identify subjects who may have extreme results (outliers) that could influence further statistical analysis. Overall, the student data displayed in this plot provides a clear visualization of the distribution and variability of pretest and posttest scores. By understanding this pattern, we can better identify students who show above-average improvement (students number 2, 6, 9, and 10), those who improve according to the average (students number 3, 7, and 8), and those who improve below the average (students number 14 and 5).

Based on this stacking data, the study shows a significant improvement in students' literacy skills after using magnetic media. The average pretest score is -5.481 with a standard deviation of 0.65139, while the average posttest score increased to -4.771 with a standard deviation of 0.476433626. This average increase of 0.71 points indicates that magnetic media is effective in improving students' understanding of material state changes. The higher consistency in posttest results, indicated by the lower standard deviation, suggests that students are more homogeneous in their understanding after using magnetic media (Lindahl et al., 2016). These findings align with several previous studies that also highlight the effectiveness of interactive and visual learning media in improving students' literacy skills. For example, a study by Smith et al. (2020) shows that using interactive digital media can enhance elementary students' understanding of basic science concepts. The study emphasizes that interactive tools help students visualize complex concepts, making them easier to understand and remember. However, this study contributes uniquely by specifically focusing on magnetic media, which has previously received less attention in educational literature.

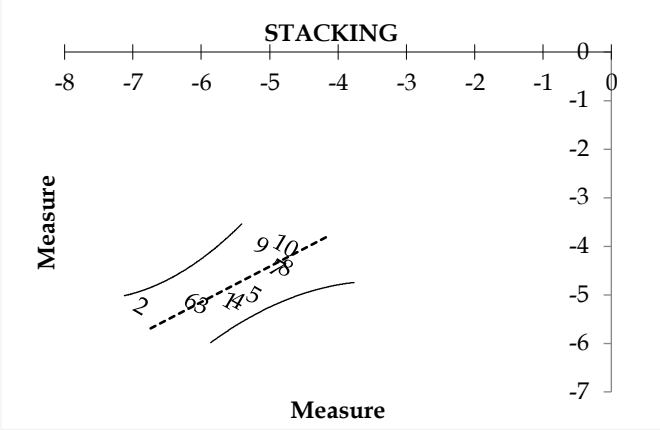

Figure 1. Changes in students' literacy skills based on pretest and posttest measure score changes

The uniqueness of magnetic media lies in its ability to provide visual and physical representations of abstract concepts such as state changes in matter. When students can manipulate magnets and see their direct effects, they can more easily understand how molecules interact and change form in physical processes (Sukmawati et al., 2023; Sukmawati et al., 2021). This not only enhances conceptual understanding but also makes the learning process more engaging and motivates students to be more actively involved in learning.

The study also reveals that students who experienced the highest improvement in literacy skills were those most actively participating in the use of magnetic media during the learning process. For example, student number 2 showed the greatest improvement of 1.65 points, possibly reflecting the engagement and deep understanding gained through interaction with magnetic media. Conversely, student number 5 showed the smallest improvement of 0.22 points, which may indicate lower engagement or initial difficulty in understanding the material before using magnetic media. This can be seen more clearly in Figure 2.

One important finding that has not been widely discussed in previous research is the role of magnetic media in enhancing the consistency of understanding among students. The lower standard deviation in the posttest indicates that this media not only helps high-performing students but also low-performing students

to achieve a more uniform level of understanding. This is an important aspect of education as it shows that this teaching method is inclusive and capable of reaching students with various levels of ability.

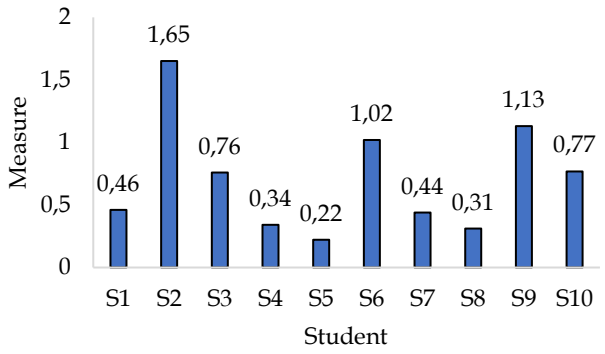

Figure 2. Data on the improvement of students' literacy skills on the content of changes in the state of matter

Furthermore, the distribution of scores shown in Figure 1 indicates that most posttest scores are close to the trend line, signifying that the majority of students experienced improvement. The curved line indicating the confidence interval helps identify subjects who may have extreme results (outliers), providing further insights for future research on factors influencing individual student understanding. Thus, this study not only confirms the effectiveness of magnetic media in improving science literacy but also offers new insights into how this media can be used to achieve consistency of understanding among students with varying abilities (Sukmawati & Zulherman, 2023). This signifies a step forward in science teaching methods, which can be more widely adopted to enhance the quality of education. Future studies can further explore the use of magnetic media in other contexts and identify additional strategies to maximize its benefits in the teaching and learning process.

Racking Analysis

The data presented shows the results of measuring the difficulty level of literacy questions on content related to changes in the state of matter experienced by students before (pretest) and after (posttest) using magnetic learning media, which includes the measured value (Measure) and Standard Error (S.E.). In the pretest, the average score is 0.4985 with a standard deviation of 0.912191, while in the posttest, the average score decreases to -1.031 with a standard deviation of 0.973611. Although the average posttest score shows a decrease of 1.5295 points, this can be interpreted as students experiencing a decrease in the difficulty level of the questions, meaning that questions considered difficult by students during the pretest became easier to answer after students participated in learning using magnetic media (Aisyah et al., 2023a; Sukmawati, 2017). Questions that were initially answered correctly by only a few students became more frequently answered correctly after learning using magnetic media. This data can be seen in Figure 3.

Table 2. Table of Changes in Measure Item

Question Number	Pretest		Posttest	
	Measure	S.E.	Measure	S.E.
1	0.05	0.72	-2.66	1.83
2	0.53	0.68	-2.66	1.83
3	1.9	0.71	-2.66	1.83
4	-1.39	1.07	-1.39	1.07
5	-0.53	0.82	-0.53	0.82
6	1.9	0.71	0.05	0.72
7	0.98	0.66	-0.53	0.82
8	1.42	0.67	-1.39	1.07
9	0.53	0.68	-0.53	0.82
10	1.42	0.67	-0.53	0.82
11	0.05	0.72	0.05	0.72
12	-0.53	0.82	0.53	0.68
13	0.98	0.66	-0.53	0.82
14	0.98	0.66	-2.66	1.83
15	-1.39	1.07	0.05	0.72
16	0.98	0.66	-0.53	0.82
17	0.05	0.72	-0.53	0.82
18	0.53	0.68	-1.39	1.07
19	0.53	0.68	-1.39	1.07
20	0.98	0.66	-1.39	1.07
Mean	0.4985		-1.031	
S.D.	0.912191		0.973611	

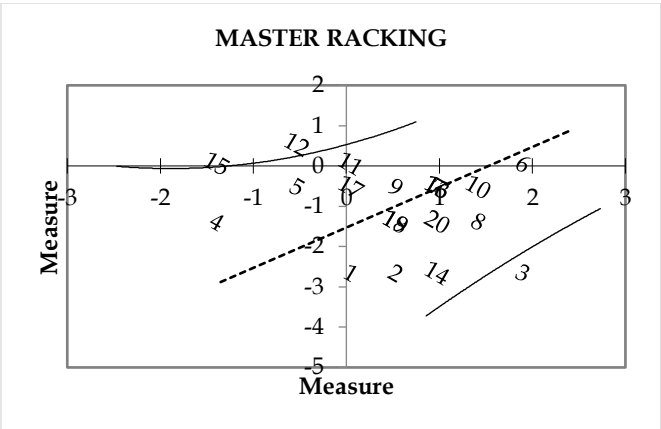

Figure 3. Changes in question difficulty on pretest and posttest measure score changes

In the figure, it can be seen that there is a decrease in the difficulty level of questions such as questions number 1, 2, 3, 6, 7, 8, 9, 10, 12, 14, 16, 17, 18, 19, and 20, an increase in the difficulty level of questions number 13 and 15, and no change in questions number 4, 5, and 11. For a clearer visualization, refer to Figure 4.

This data shows variation in the difficulty levels of the questions, which can be attributed to the use of

magnetic media in teaching content related to changes in the state of matter. Questions that experienced a decrease in difficulty level (numbers 1, 2, 3, 6, 7, 8, 9, 10, 12, 14, 16, 17, 18, and 20) may have become easier for students due to the effective use of magnetic media. This media may have helped students better understand the concept of changes in the state of matter through visualization, simulation, or interactive demonstration, thus preparing them better to answer questions related to the material (Lorenzo-Romero et al., 2014; Setiawan et al., 2018).

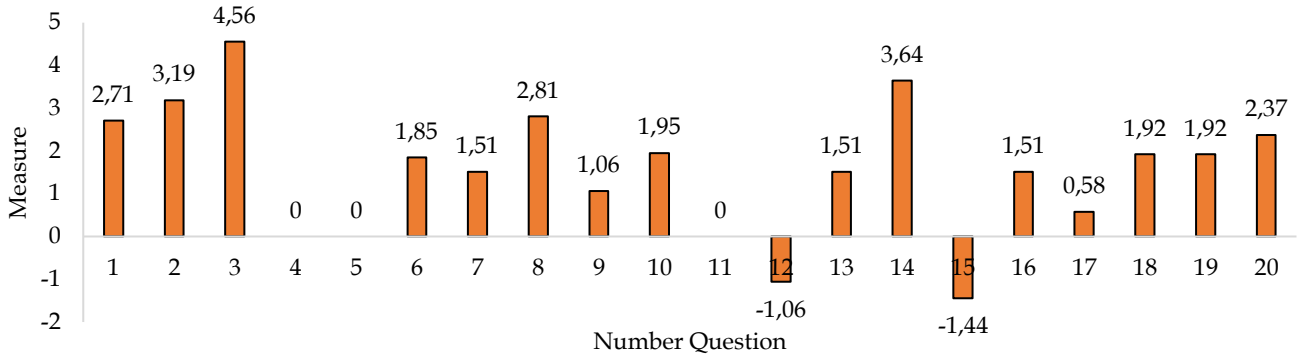

Figure 4. Data measure on changes in question difficulty level

On the other hand, questions that experienced an increase in difficulty level (numbers 13 and 15) indicate that although magnetic media was used, the complexity of the material tested in those questions may be higher than what can be conveyed through the media. This shows that the use of magnetic media alone may not be sufficient to overcome the higher difficulty levels in understanding complex concepts. Additional approaches, such as using supplementary reading materials, discussions, or further exercises, may be needed to help students understand more complex concepts.

Questions that did not change in difficulty level (numbers 4, 5, and 11) may indicate that the use of magnetic media did not have a significant impact on students' understanding of the concepts tested in those questions. Possibly, the material presented in those questions was not heavily influenced by the magnetic media or was already at a standard difficulty level, so it did not undergo significant changes.

Figure 5. Learning activity

From previous studies, the distinguishing finding is that the use of magnetic media can influence the difficulty level of questions in learning about changes in the state of matter. This finding adds new understanding that magnetic media not only affects students' understanding of the material but can also influence the difficulty level of questions given to students. In relation to previous research, this finding strengthens the idea that the use of magnetic media in learning can play a significant role in modifying question difficulty levels and helping improve students' understanding of the taught concepts. Therefore, it is important to continue integrating educational technology effectively in learning design to optimize students' learning outcomes.

Conclusion

In conclusion, this study demonstrates that magnetic media effectively enhances students' literacy skills in understanding material state changes. Traditional teaching methods often struggle with abstract scientific concepts, leading to varied student performance. Introducing magnetic media as an interactive visual aid significantly improved students' comprehension, as evidenced by the average increase from -5.481 to -4.771 in pretest to posttest scores, respectively. The reduced standard deviations in posttest scores indicate more consistent performance across student abilities. The findings highlight magnetic media's ability to support both high and low-achieving students, fostering a more equitable understanding of complex scientific concepts. This inclusivity is pivotal in education, ensuring effective learning for diverse learners. The study underscores the importance of

tangible and visual representations in enhancing conceptual understanding, which is particularly beneficial in science education.Future research should expand on this study by exploring magnetic media's application across various educational settings and refining strategies to optimize its effectiveness. By continuing to investigate innovative teaching tools like magnetic media, educators can further enhance teaching methodologies and improve learning outcomes in science education and beyond.

Acknowledgments
We would like to express our deepest gratitude to our supervising lecturer, teachers, and students who have significantly contributed to the successful completion of this research. Your support, guidance, and participation have been invaluable, and we truly appreciate your efforts and dedication. Thank you for your continuous encouragement and for making this study possible.

Author Contributions
For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, A.F contributed to the data collection process, data processing, and article writing. W.S contributed to the data processing and article writing.

Funding
This research was funded by personal funds.

Conflicts of Interest
The authors declare no conflict of interest.

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