Pelita :
Jurnal Kajian Pendidikan dan Pembelajaran Indonesia
2025, 5(1), 11-23
https://doi.org/10.56393/pelita.v5i1.3284

Improving Science and Social Studies Learning Outcomes in Grade 5 through the Inquiry Learning Model Assisted by Interactive Multimedia

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Article History
Received : 14 June 2025;
Revised : 26 June 2025;
Accepted: 13 Juli 2025.

Keywords
Learning Outcomes;
Inquiry Learning Model;
Interactive Multimedia;
Morph PowerPoint;
Natural and Social Sciences.

Abstract
This study addresses the low academic performance of fifth-grade students at Gili Timur 2 Public Elementary School in understanding the solar system topic within the Natural and Social Sciences curriculum. The problem was attributed to conventional teaching methods and the minimal use of visual media. This research aimed to enhance student learning outcomes by implementing an inquiry-based learning model integrated with interactive multimedia using Morph PowerPoint. The study adopted a Classroom Action Research design following the Kemmis and McTaggart model and was conducted in three cycles involving 39 students. Data collection techniques included observations, interviews, and achievement tests, with all instruments validated prior to use. The findings demonstrated a significant improvement in student achievement, with average scores increasing from 59.08 in Cycle I to 79.38 in Cycle II and 83.85 in Cycle III. The percentage of students achieving mastery learning also rose markedly from 23.07% to 97.43%. The integration of inquiry-based instruction with Morph PowerPoint effectively enhanced students' conceptual understanding, engagement, and motivation. This study offers a pedagogical contribution by demonstrating the potential of combining Morph PowerPoint with inquiry-based learning in elementary science education a synergy that has received limited attention in existing research. Nevertheless, challenges such as limited instructional time and diverse student learning preferences should be addressed for broader application.

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How to Cite : Mahendra, F., Rizqillah, A. F. R., Asrulloh, A. F., & Siswoyo, A. A. (2025). Improving Science and Social Studies Learning Outcomes in Grade 5 through the Inquiry Learning Model Assisted by Interactive Multimedia. *Pelita : Jurnal Kajian Pendidikan Dan Pembelajaran Indonesia*, 5(1), 11–23. https://doi.org/10.56393/pelita.v5i1.3284

Introduction

Education plays a pivotal role as the foundation for cultivating a generation capable of contributing meaningfully across various domains (Praswati, 2023). Beyond imparting knowledge, education fosters character development through essential components such as curriculum implementation, appropriate learning models, adequate infrastructure, and structured instructional activities. Learning activities serve as a critical determinant of educational success. Effective learning outcomes are often associated with instructional designs that are well-organized, student-centered, and responsive to learners' needs (Prastawati & Mulyono, 2023). Successful instruction is characterized by active student participation, comprehension of subject matter, and the creation of a supportive learning environment that facilitates optimal achievement.

Creating engaging and enjoyable learning experiences is a key strategy to encourage active student participation and enhance competency achievement. One effective approach in this regard is the use of interactive learning methods. Interactive multimedia, for example, combines various elements such as text, audio, images, and animations into a single digital unit that supports user interaction (Wulandari et al., 2022). However, the effectiveness of this media lies not only in its visual appeal, but also in its alignment with the chosen learning approach and the context of the material being taught.

The use of interactive multimedia in learning activities has been proven to enhance the effectiveness of students' learning outcomes. This type of media can serve as an appropriate alternative to stimulate students' motivation and interest during the learning process, as well as assist them in understanding the material being delivered (Yasa et al., 2021). With its attractive visual presentation and responsive features, this media is capable of sparking students' learning interest and increasing their engagement in the learning process. Through the use of this media, students can explore the subject matter more deeply and in a more accessible way (Yasa et al., 2021). Therefore, interactive multimedia has a positive impact throughout the learning process and contributes to maximizing learning outcomes (Yasa et al., 2021).

Learning Natural and Social Sciences is an integrated approach to subject matter aimed at developing students' critical and logical thinking skills systematically, while also providing learning experiences that enhance their practical abilities (Mazidah & Sartika, 2023). However, the learning process in Natural and Social Sciences often encounters obstacles, particularly due to the abstract nature of certain concepts, the lack of variety in teaching methods, and the use of media that fails to capture students' interest. One solution to address these challenges is to apply an inquiry-based approach in the learning process, especially for Natural Science material. The inquiry learning model emphasizes the active role of students as the center of the learning process, while the teacher acts as a facilitator who provides opportunities for students to explore and discover concepts on their own. Throughout this process, students are encouraged to pose and answer questions that arise from their curiosity, thereby fostering independent critical and analytical thinking skills (Machpud, 2022). In the context of Natural and Social Science learning, the inquiry approach has the potential to strengthen critical thinking abilities and conceptual understanding, particularly when combined with strong visual representations through digital media.

However, the implementation of the inquiry model without adequate visual media support often encounters obstacles. Students find it difficult to imagine processes such as the

Earth's rotation and revolution, and are unable to construct their understanding without the aid of visual representations. This highlights the importance of integrating inquiry-based learning approaches with interactive multimedia, which can present concepts in a more dynamic and engaging way for students. According to Piaget, inquiry-based learning involves students actively participating in experiments and explorations to build understanding. In this process, students are given the freedom to learn independently, make observations, feel encouraged to investigate, ask questions, and find the answers themselves. In addition, they are also encouraged to connect their findings with those of their peers, thereby creating a dynamic and meaningful learning experience (Machpud, 2022).

The use of interactive learning multimedia is closely related to the inquiry-based learning model, making them complementary and supportive in creating a more comprehensive and effective learning process (Adriyani et al., 2021). The inquiry model itself consists of five interrelated main stages: the orientation stage, where the teacher introduces the material and motivates students to actively seek new information; the problem formulation stage, in which students create questions related to the topic; the hypothesis development stage, where students propose temporary assumptions to answer the questions; the data collection stage through observation, experimentation, or discussion; and the conclusion-drawing stage, in which students analyze the findings and discuss them with the teacher and classmates.

Based on the results of an interview with the fifth-grade teacher at Gili Timur 2 Public Elementary School, several obstacles were identified in the teaching of Natural and Social Sciences, particularly regarding the topic of the solar system. Many students struggle to understand the scientific concepts being presented. Although the teacher has implemented an inquiry-based approach, the lack of supporting resources makes it difficult for students to answer exploratory questions and effectively visualize the material. In addition, the teaching method, which primarily consists of direct explanation by the teacher, limits students' active involvement in independently discovering concepts. This condition makes the learning process less engaging and fails to foster critical thinking skills or encourage students to explore the material more deeply.

Based on the interview results, students with high cognitive abilities appeared very active and enthusiastic during learning, especially when using Morph PowerPoint. The animations helped them grasp the concepts of Earth's rotation and revolution more quickly, thereby enhancing their understanding, curiosity, and self-confidence. Students with average abilities were generally able to follow the lessons, although they still required some guidance. Without multimedia support, they enjoyed discussions but often struggled to comprehend the material due to the complex language used in textbooks. The use of Morph PowerPoint improved their understanding, although some felt that the slide transitions were too fast. Meanwhile, students with low abilities tended to face more difficulties when learning independently without visual support and needed direct guidance. However, Morph PowerPoint helped them become more focused and interested in learning because the moving images and vibrant colors made it easier to understand material that was previously difficult to grasp through text alone. This data reinforces the urgency of using Morph PowerPoint as a visually-based learning medium capable of addressing various student learning styles.

The novelty of this research lies in the exploration of the effectiveness of integrating the inquiry-based learning model with Morph PowerPoint in Natural and Social Sciences learning

activities at the elementary school level, particularly when discussing the topic of the solar system. This study was conducted due to the limited number of previous studies that have thoroughly examined the outcomes of combining the use of Morph PowerPoint with the implementation of an inquiry-based learning approach on the topic of the solar system for fifth-grade elementary school students.

This classroom action research aims to reveal the extent to which the learning outcomes of fifth-grade students in the Natural Sciences subject can be improved through the implementation of an inquiry-based learning model combined with the use of interactive Morph PowerPoint media. The research specifically focuses on enhancing students' understanding of concepts related to the solar system. Through this approach, students are encouraged to actively explore and independently discover concepts in Natural Sciences. The visualizations and animations presented through Morph PowerPoint also help support material comprehension in a more engaging and digestible way. It is expected that this combination will make the learning process more enjoyable and positively impact students' understanding.

Method

This study employed a classroom action research design following the Kemmis and McTaggart model, which consists of four stages in each cycle: planning, action, observation, and reflection. The research was conducted in three cycles involving 39 fifth-grade students at Gili Timur 2 Public Elementary School, focusing on the solar system topic within the Natural and Social Sciences (IPAS) curriculum. An inquiry-based learning model supported by Morph PowerPoint was implemented to improve student engagement and learning outcomes. Although the learning objectives remained consistent across cycles—identifying planet names (C1), understanding planet characteristics (C2), and ordering planets by distance from the sun (C3)—the instructional strategies evolved: Cycle I used lectures, Q&A, and group discussions; Cycle II integrated interactive Morph PowerPoint; and Cycle III emphasized collaborative discussions with classical use of Morph PowerPoint. Data collection methods included short-answer tests aligned with learning indicators, observation sheets on student participation and model implementation, and semi-structured interviews with students and teachers. All instruments were validated by experts in science education and educational technology, and reliability was assessed through inter-item consistency and inter-rater agreement. Quantitative data were analyzed descriptively using mean scores, mastery percentages, and gain comparisons, while qualitative data were processed through reduction, categorization, and conclusion drawing. Data validity was ensured using triangulation and member checking. Ethical considerations included institutional approval, parental consent, and confidentiality of participant identities.

Results and Discussion

Results

The development of students' learning outcomes during the intervention process can be observed through the evaluation results given at the end of each cycle. This evaluation aims to assess students' level of understanding of the solar system material after participating in the learning process using the inquiry model supported by Morph PowerPoint media. The learning

https://doi.org/10.56393/pelita.v5i1.3284

outcome scores are presented as individual achievements in each cycle, which are then analyzed to obtain the average score, individual mastery, and overall class mastery level.

Table 1. The detailed progression of learning outcomes from the first cycle to the third

No	Name	Cycle 1	Cycle 2	Cycle 3
1	HA	68	96	80
2	BI	29	55	50
3	CR	55	90	80
4	DL	45	70	75
5	ER	32	68	85
6	FT	20	50	85
7	GH	20	60	80
8	SA	68	86	95
9	IJ	14	68	80
10	JH	62	84	80
11	YT	32	70	85
12	LK	36	68	80
13	RR	10	70	80
14	NU	50	90	85
15	ON	52	60	100
16	PI	50	98	95
17	QN	34	82	80
18	FH	98	98	90
19	ND	86	98	100
20	DN	80	98	100
21	UW	33	50	85
22	PN	45	98	80
23	ER	68	86	80
24	IN	70	82	75
25	TI	70	98	90
26	ZL	90	98	80
27	AN	68	84	80
28	AR	45	62	85
29	BT	86	86	85
30	DI	14	62	70
31	NI	62	70	85
32	FH	20	68	85
33	GN	82	86	95
34	HL	55	84	95
35	AF	84	98	85
36	AY	62	96	90
37	LK	45	68	70
38	LA	52	86	95
39	MN	62	84	90
Lowest value		10	50	50
Highest score		98	98	100
Average value		59,08	79,38	83,85
Range of values		88	48	50

The research findings indicate that the use of an inquiry-based learning model assisted by interactive multimedia (Morph PowerPoint) is effective in optimizing the learning achievement of fifth-grade students at Gili Timur 2 Public Elementary School on the topic of the solar system. There was a gradual improvement in the average student learning outcomes in each cycle. In Cycle I, the average score was recorded at 59.08, which increased to 79.38 in Cycle II, and further rose to 83.85 in Cycle III. Similarly, the percentage of classical learning mastery showed positive progress, increasing from 23.07% in Cycle I to 71.79% in Cycle II, and reaching 97.43% in Cycle III.

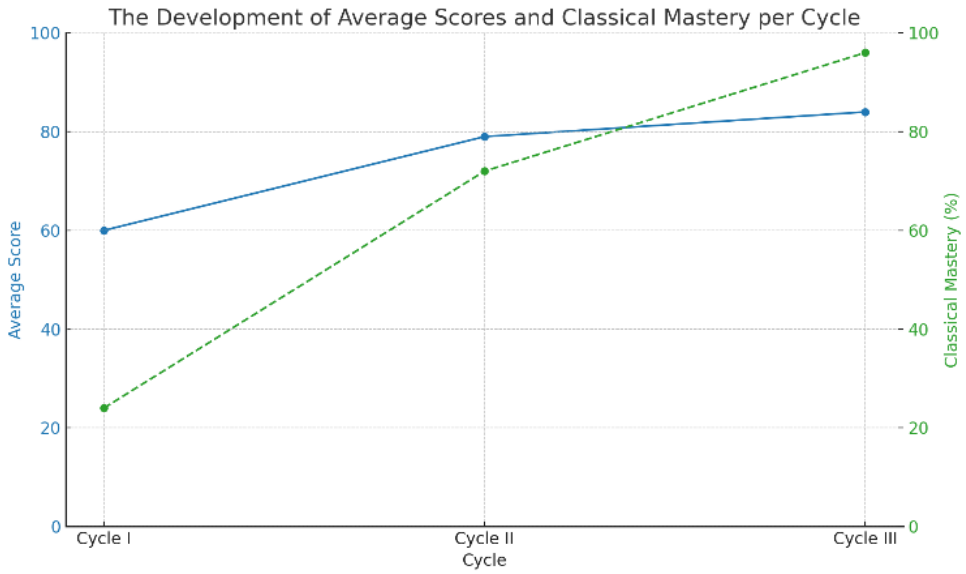

Figure 2. The development of average scores and classical mastery per cycle

The differences in scores between cycles were tested using a paired t-test, which indicated that the improvement in learning outcomes across the cycles was statistically significant ($p < 0.05$). This suggests that the inquiry-based model assisted by Morph PowerPoint was effective in enhancing students' conceptual understanding. In addition to the quantitative data, qualitative data from observations and interviews supported these findings. Students appeared to contribute more significantly and were more focused during learning activities, which was reinforced by an increasingly conducive and interactive classroom atmosphere in each cycle.

To provide a more visual representation of the improvement in student learning outcomes over the three cycles of action, the data presented in the previous table is shown in the following diagram. This diagram illustrates the trend of increasing average scores and the proportion of students who met the mastery standard across the class throughout the implementation of the actions.

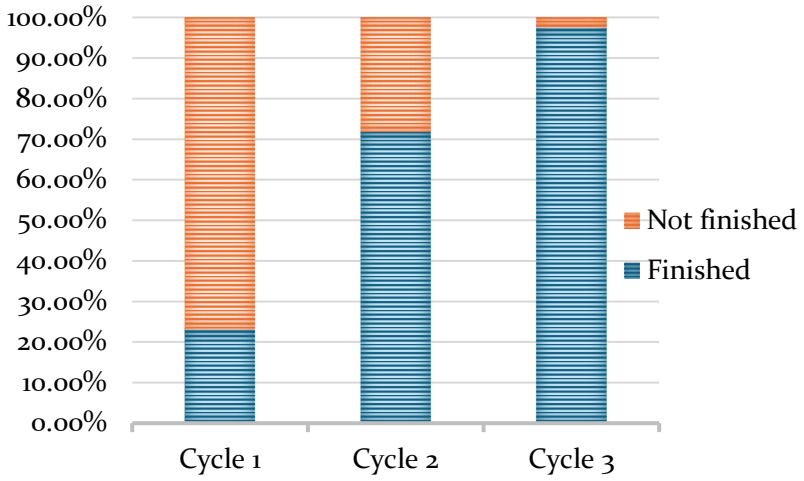

Figure 3. The development of students' learning outcome improvement over three cycles

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The use of the inquiry-based learning approach supported by interactive digital media (Morph PowerPoint) in the Natural Sciences subject for Grade 5 at Gili Timur 2 Public Elementary School has shown positive results and proven to effectively improve students' academic performance. This condition is evident from observation sheets indicating that the teacher consistently implemented the stages of the inquiry model, starting from identifying problems, formulating questions, developing hypotheses, gathering relevant information or data, testing the hypotheses, and finally drawing conclusions based on the analysis results. During the data collection stage, the teacher used Morph PowerPoint as an interactive educational medium that helps students observe and absorb information visually through animations, images, and videos. Students also actively engaged in observing, recording, and discussing their findings based on the information obtained from the Morph PowerPoint.

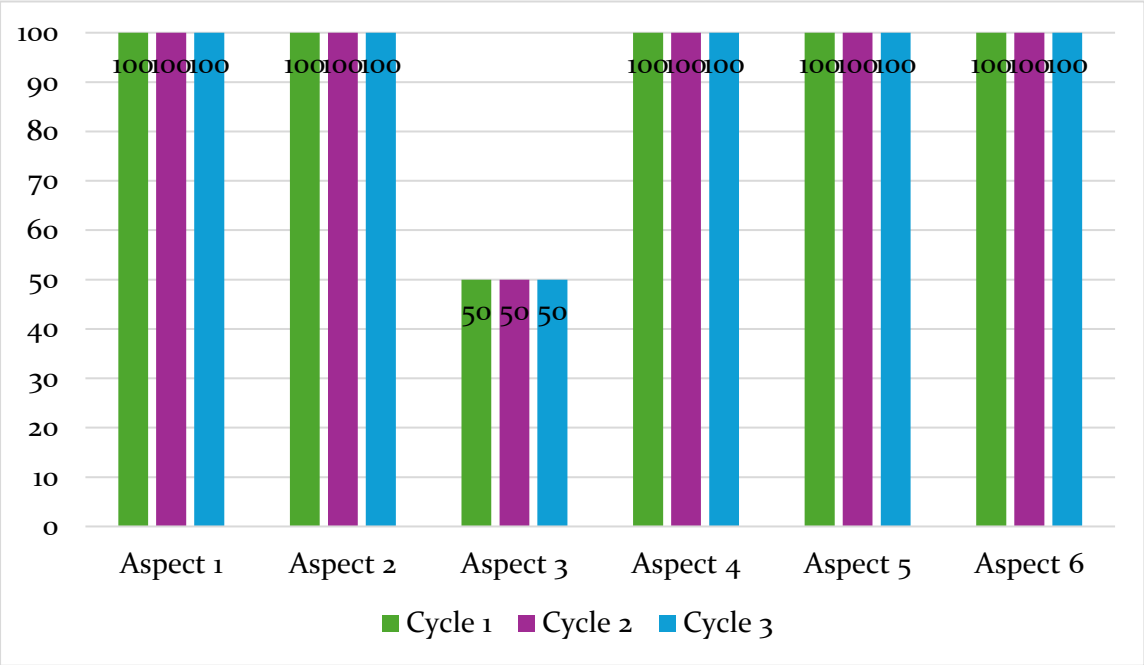

Figure 3. The results of student observations from aspect 1 to aspect 6

Based on interviews with 5th grade students at Gili Timur 2 Public Elementary School, the Natural Science learning using an inquiry-based approach supported by Morph PowerPoint received positive responses. The animations helped them visualize and remember the order of the planets without the need for rote memorization. However, some students felt that the animation transitions were too fast, making it difficult to fully understand the material, and they still needed the teacher's explanation for the inquiry process to be effective. This approach enhances not only cognitive abilities but also affective and metacognitive aspects. Although Morph PowerPoint is very helpful, the teacher's role as a facilitator remains essential to ensure optimal learning.

Discussion

The implementation of the inquiry-based learning model using interactive multimedia Morph PowerPoint. The guided inquiry learning approach is designed to encourage increased student motivation through systematic and well-planned teacher guidance. This method

positions students as active participants in the process of discovering knowledge, while also sharpening their critical thinking skills, learning strategy design, and the effective use of various information sources. Although students are actively involved, the teacher's role remains crucial as a facilitator who provides gradual guidance, especially when students encounter complex material. This model is particularly suitable for application at the elementary school level because it fosters children's curiosity from an early age and balances independent learning with teacher direction, making the learning process more enjoyable, structured, and meaningful (Sukma, 2020).

The guided inquiry learning model has its own advantages and challenges (Hosnan, 2014). The strengths of this model include the balanced development of cognitive, affective, and psychomotor skills, making learning more meaningful. Additionally, this approach can enhance students' learning motivation by providing satisfaction and enthusiasm throughout the learning process. Learners are also given the opportunity to study according to their individual styles and needs, which contributes to greater comfort and learning effectiveness. On the other hand, this model encourages the development of critical thinking and problem-solving skills through activities such as collecting and analyzing data. However, this approach requires strong mental readiness and a high level of motivation from students. Learning may also become less effective if the class size is too large. Teachers and students accustomed to traditional methods may face challenges in adapting. Nevertheless, the benefits of guided inquiry are more significant, as it fosters analytical and reflective thinking patterns, encourages independent learning habits, and creates a more active and in-depth learning environment. Therefore, teachers need to continuously develop their professional competencies so that this model can be implemented optimally and have a positive impact on student learning outcomes.

The inquiry-based learning model that integrates interactive multimedia through Morph PowerPoint was implemented gradually over three cycles with careful and systematic planning. This approach guided students to make observations, formulate problems, generate hypotheses, gather information, test those hypotheses, and draw conclusions from their findings. However, in the first cycle, student engagement was still low, and learning outcomes were not optimal due to the limited use of supportive learning media. This is in line with the opinion of Budiman et al. (2024), who stated that one of the causes of low student achievement is the lack of media utilization that can attract attention and motivate students to learn. Similarly, Luczak-Roesch et al. (2019) emphasized the importance of using media that encourages active student participation during the learning process. The impact of this condition was reflected in the students' average score, which only reached 59.08, with a mastery percentage of 23.07%.

In the second cycle stage, the implementation of Morph PowerPoint had a significant impact on the learning process. This media presented animations, interactive visuals, and text that supported the understanding of scientific concepts, particularly the topic of the solar system. As a result, student engagement and enthusiasm increased, which was reflected in the rise of the average score to 79.38 and the learning mastery percentage reaching 71.79%. In the third cycle stage, the learning approach was enhanced through more balanced group composition, more intensive teacher guidance, and more structured time management. The Morph PowerPoint media was also utilized to its fullest potential during classical learning activities. Evaluation results showed an increase in the students' average score to 83.85, with a

mastery learning rate reaching 97.43%. These findings indicate that the implementation of the inquiry model integrated with interactive multimedia significantly improved learning outcomes. In line with the opinion of Ajizi and colleagues (2020), multimedia-based inquiry approaches have proven effective in deepening conceptual understanding and fostering positive learning attitudes. Moreover, the visual presentation of the interactive multimedia helped students better comprehend previously abstract material, making it more concrete and easier to understand.

Observation showed that all stages of the inquiry-based learning process were carried out effectively. The teacher provided motivation, guided students in formulating problems, presented Morph PowerPoint as an information source, and facilitated data analysis and conclusion drawing. Student interviews also reinforced these findings; students felt more supported in mastering the lesson content, were more enthusiastic about learning, and became more confident in answering questions due to the visual aids and animations provided by Morph PowerPoint.

The improvement in Science learning outcomes was achieved through the use of an inquiry-based learning model combined with interactive multimedia media in the form of Morph PowerPoint. The inquiry-based learning approach combined with the use of interactive media featuring the Morph function in PowerPoint has proven effective in improving the academic achievement of fifth-grade students at Gili Timur 2 Public Elementary School in the subject of Natural Sciences. This classroom action research was carried out in three consecutive cycles and showed significant progress, both in students' cognitive abilities and the quality of the learning process. These findings align with Istianah (2020), who stated that PowerPoint as an interactive learning medium can be utilized to enhance students' learning motivation. This is further supported by the research of Tarigan and Siagian (2015), which revealed a significant difference in learning outcomes between students who used interactive media and those who did not, indicating that such media can contribute positively to the effectiveness of the learning process and students' academic achievement.

In the first cycle, although we implemented the inquiry model, the learning process was not yet supported by optimal media. As a result, most students still did not meet the learning mastery criteria. Out of a total of 39 students, only 9 or approximately 23.07% managed to meet the learning mastery standard, with an average class score of 59.08. The main obstacles in this cycle included the lack of supportive learning media, ineffective classroom management, and low student focus and engagement during the learning process. This indicates that using the inquiry model without adequate supporting media has not yet succeeded in optimizing the improvement of student learning outcomes.

Entering Cycle II, the researcher implemented several improvements, including incorporating interactive multimedia-based learning media using Morph PowerPoint, revising the teaching module, and enhancing guidance during group discussions. These changes had a notable impact: the classroom atmosphere became more conducive, and students showed increased interest and active participation in the lessons. The improvement in learning outcomes was evident from the rise in the class average score to 79.38, and the number of students who achieved mastery significantly increased to 28 (71.79%). Nevertheless, overall mastery learning had not yet reached the target of 85%, and several challenges remained, such as limited time and unequal student participation.

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In Cycle III, the learning process was further reinforced. The inquiry strategy was arranged more systematically, the use of Morph PowerPoint was optimized, and student groupings were adjusted based on academic ability to create more balanced discussions. The learning process was also made more structured and efficient, allowing all stages of inquiry to be carried out without being rushed. The results were very satisfying the average student score increased to 83.85, and 38 out of 39 students (97.43%) achieved mastery learning. The classroom atmosphere also became much more orderly and interactive, with increased participation and more evenly distributed student understanding.

The learning outcomes of students are influenced by two main categories: internal and external factors. Internal factors include aspects within the individual, such as physical condition, mental or psychological state, and fatigue. Meanwhile, external factors originate from outside the student, including the family environment, school atmosphere, and social conditions in the community (Parwati et al., 2018). These two types of factors interact with each other and collectively influence the learning process and student achievement. By identifying these factors, the effectiveness of learning can be assessed more comprehensively.

The implementation of the inquiry-based learning model combined with interactive media such as Morph PowerPoint has proven effective in enhancing students' learning outcomes in Science subjects. The visual presentation of this media helps students better understand abstract concepts, such as the movement of planets in the solar system, by making them more concrete, while also increasing their participation in learning activities. This is in line with the findings of Nurma (2025), who stated that the use of media in Science learning at the elementary school level is effective in improving the quality of the learning process. Through evaluation and improvement at each stage of instruction, any obstacles that arise can be addressed, making the learning process more optimal and significantly improving students' academic achievement.

The obstacle encountered in the learning process using interactive multimedia-assisted Morph PowerPoint in Science education. Although the use of interactive multimedia-based Morph PowerPoint has proven effective in improving students' learning outcomes, its implementation still faces several obstacles. One of the main issues is the limited instructional time, which is only 2 x 35 minutes, often making it insufficient to complete all stages of the inquiry model thoroughly. Fauzi (2023) also stated that time constraints pose a significant challenge for teachers, as they must divide their attention among various other responsibilities. As a result, activities such as group discussions and student reflections are often rushed. Furthermore, student engagement is not yet evenly distributed, as many still tend to be passive and rely heavily on their groupmates, making the effort to foster active participation among all students a challenge in itself.

The use of Morph PowerPoint has proven helpful in the learning process for students who tend to have visual or audiovisual learning styles. However, some students reported that the material was presented too quickly, leaving them without enough time to read and fully understand the information. Roby (2024) also explained that students with a kinesthetic learning preference grasp lessons more easily through hands-on activities or physical experiences. Therefore, relying solely on Morph PowerPoint may not fully meet the needs of all student learning styles. Additional strategies are needed to effectively reach and support various types of learning styles.

The reflection on the implementation of the inquiry model supported by interactive Morph PowerPoint media has proven effective in improving the science learning outcomes of fifth-grade students at Gili Timur 2 Public Elementary School. This approach encourages active student engagement through the stages of inquiry, while the teacher serves as a facilitator. Morph PowerPoint functions as a visual aid within the zone of proximal development, making it easier for students to understand abstract concepts such as the solar system through animation. Referring to Mayer's multimedia theory, the combination of text and images effectively supports memory processing and comprehension. The average student score increased from 59.08 in the first cycle to 83.85 in the third cycle, while the learning mastery rate rose from 23.07% to 97.43%. Students also expressed that the learning process became more engaging and easier to understand. However, several challenges emerged, such as the potential Hawthorne effect, teacher bias, time constraints, and differences in learning styles, especially for students with a kinesthetic tendency. Nevertheless, the refinement of the learning strategy in each cycle successfully addressed these obstacles and improved concept understanding, learning motivation, and the overall quality of instruction.

Conclusion

Based on the implementation of the classroom action research that has been conducted, it can be concluded that the use of the inquiry-based learning model supported by interactive multimedia Morph PowerPoint in Natural Science learning for fifth-grade students at Gili Timur 2 Public Elementary School showed positive results and was successfully carried out through three cycles. This model proved effective in facilitating the visualization of abstract concepts, such as the solar system, and in enhancing student engagement and independence in learning activities. The learning outcomes showed a significant improvement from Cycle I to Cycle III, marked by an increase in the average score from 59.08 to 83.85 and in learning mastery from 23.07% to 97.43%. This affirms that integrating the inquiry model with interactive media can help improve students' conceptual understanding and academic achievement. However, there were still obstacles, such as time constraints, uneven participation, and the Morph PowerPoint animation speed that was not suitable for all students. Moreover, the effectiveness of this approach tended to be more optimal for students with visual and auditory learning styles, indicating the need for complementary strategies to accommodate kinesthetic learners. These findings are contextual and apply within the scope of the limited research setting; therefore, further studies in different contexts are needed to test the validity and generalizability of these findings more broadly.

Acknowledgments

The authors would like to express their deepest gratitude to Universitas Trunojoyo Madura for the academic support, facilities, and opportunities provided throughout the course of this research. Sincere appreciation is also extended to Gili Timur 2 Public Elementary School for the support and cooperation given during the study. Special thanks are conveyed to the Principal, the teachers of the Natural and Social Sciences subject for Grade Five, and all fifth-grade students who participated actively and showed remarkable enthusiasm throughout the implementation of the learning activities. Their contributions were instrumental in ensuring the smooth execution of the research and in achieving meaningful and impactful outcomes.

Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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