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Implementation of Guided Inquiry Learning Model in Improving Science Learning Outcomes

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Guided Inquiry Learning Model, Learning Outcomes, Ecosystem, Digital Multimedia, Local Wisdom.

Abstract

This study aims to determine whether the implementation of the guided inquiry learning model can improve the learning outcomes of fifth-grade students at MIN 1 Batam on the topic of ecosystems. The research method used is an experimental design with a pretest-posttest control group design. The study was conducted over three meetings, with the subjects being fifth-grade students divided into two groups: the experimental group using the guided inquiry learning model and the control group using the lecture method. Data were collected through formative and summative assessments, consisting of multiple-choice questions, essay questions, and observations. The results showed that the average score of students in the formative assessment was 86.67 and in the summative assessment was 88.67, both indicating satisfactory results that exceed the average passing grade (KKM). This study indicates that the implementation of the guided inquiry learning model can improve students' learning outcomes in science, particularly on the topic of ecosystems. The strength of this study lies in the use of digital multimedia and the integration of local wisdom in the learning process, making the learning more relevant and engaging for students. However, this study has limitations in terms of the time available for outdoor observations and limited supporting facilities. For future research, it is recommended to extend the duration and improve learning facilities, as well as to combine advanced technology or online learning platforms to enhance the effectiveness of learning.

Kata kunci:
Model Pembelajaran Inkuiri Terbimbing, Hasil Belajar, Ekosistem, Multimedia Digital, Kearifan Lokal.

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Abstrak

Penelitian ini bertujuan untuk mengetahui apakah penerapan model pembelajaran inkuiri terbimbing dapat meningkatkan hasil belajar siswa kelas V MIN 1 Batam pada materi ekosistem. Metode penelitian yang digunakan adalah eksperimen dengan desain pretest-posttest kelompok kontrol. Penelitian dilakukan selama tiga pertemuan, dengan subjek penelitian siswa kelas V yang dibagi menjadi dua kelompok: kelompok eksperimen yang menggunakan model pembelajaran inkuiri terbimbing dan kelompok kontrol yang menggunakan metode ceramah. Data dikumpulkan melalui asesmen formatif dan sumatif, yang terdiri dari soal pilihan ganda, soal uraian, dan observasi. Hasil penelitian menunjukkan bahwa rata-rata nilai siswa pada asesmen formatif adalah 86,67 dan pada asesmen sumatif adalah 88,67, yang keduanya menunjukkan hasil yang memuaskan dan melebihi nilai rata-rata KKM. Penelitian ini mengindikasikan bahwa penerapan model pembelajaran inkuiri terbimbing dapat meningkatkan hasil belajar siswa dalam pembelajaran IPA, khususnya pada materi ekosistem. Keunggulan dari penelitian ini adalah penggunaan multimedia digital dan pengintegrasian kearifan lokal dalam proses pembelajaran, yang membuat pembelajaran lebih relevan dan menarik bagi siswa. Meskipun demikian, penelitian ini memiliki keterbatasan dalam waktu observasi di luar kelas dan fasilitas pendukung yang terbatas. Untuk penelitian masa depan, disarankan untuk memperpanjang durasi dan meningkatkan fasilitas pembelajaran, serta menggabungkan teknologi canggih atau platform pembelajaran daring untuk meningkatkan efektivitas pembelajaran.

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INTRODUCTION

The success of education in schools is largely determined by the teacher. Teachers play a very important role in the development and progress of students (Woodring, 1975). The success of teachers in managing the class greatly influences the learning achievements of students in that class. If the teacher is able to shape the character of students who love learning (Levine, 2006), then the quality of education in the school will be good. From this, teachers are expected to carry out their duties as best as possible. To achieve the expected learning objectives, teachers must be skilled in choosing and applying the right models and methods according to students' needs, so that they enjoy learning (Inganah et al., 2023; Malone & Lepper, 1987). The process of teaching and learning is not just about delivering knowledge, but also motivating and building students' knowledge, because psychologically children will feel happy when they are noticed and stimulated in their learning. One way to build students' knowledge is by applying innovative and interactive learning models that are relevant to students (Arif, 2022, 2024).

Science learning in elementary schools plays a crucial role in forming students' understanding of natural phenomena and developing scientific thinking skills through investigation activities and direct experience. However, in practice, particularly at MIN 1 Batam, science learning is still often dominated by lecture methods and memorization of theories. As a result, students tend to be passive, less motivated, and have difficulty relating the subject matter to everyday life. This condition is further exacerbated by the lack of interactive and engaging learning resources, making the learning process less effective in fostering interest and understanding of science concepts.

Realizing these issues, the application of innovative and interactive learning models becomes very important. The innovative and interactive learning model chosen in this study is the guided inquiry learning model, aimed at encouraging students to be actively involved in the learning process through exploration and real-world experiences. The inquiry model is a learning model that focuses on using critical thinking and analysis to find solutions to the problems being faced. According to Piaget in Jakub (Saddam Akbar, et al. 2023), the inquiry method involves learning in situations where students are given equal opportunities to conduct experiments or trials themselves in a prepared setting (Shea et al., 2022). According to Vygotsky in Cornelia, et al. (2024), learning with the guided inquiry model requires teachers to design learning that actively involves students. In other words (Lee et al., 2004; Zhang et al., 2021), the guided inquiry learning model is designed to guide students through the learning process via investigation and explanation in a short period of time with the help of the teacher. The guided inquiry learning model defines scientific inquiry as a complex cognitive process that requires students to have a background knowledge in scientific concepts to investigate, pose questions, identify, operationalize variables, make hypotheses, and design appropriate experiments (Andrade, 2021; Arnold et al., 2023).

One aspect that differentiates this study from previous research is the application of the guided inquiry learning model in science education at MIN 1 Batam, integrating

technology as a supporting tool. In this study, in addition to involving students in experiments and hands-on trials, interactive technology tools such as digital learning apps and tech-based instructional aids will be used to enrich the students' learning experience (Arif et al., 2021; Jesica Dwi Rahmayanti & Muhamad Arif, 2021). The use of technology aims to enhance the effectiveness and motivation of students in science learning, allowing them to access more varied and engaging learning resources. This way, it is expected that the guided inquiry learning model, integrated with technology, will significantly improve students' understanding of science concepts and enhance their critical thinking and scientific skills.

Based on the background above, the purpose of this research is to determine whether the implementation of the Inquiry-based learning model can improve the learning outcomes of fifth-grade students at MIN 1 Batam on the topic of Ecosystems. This study aims to identify how the application of the guided Inquiry learning model can encourage active student participation in the learning process, enhance their understanding of ecosystem concepts, and improve the learning outcomes achieved by the students. Therefore, this research is expected to contribute to efforts in improving the quality of science education at MIN 1 Batam, particularly on the topic of ecosystems, through the application of a more innovative and interactive teaching method.

RESEARCH METHODS

The research method used in this study is an experimental method with a pretest-posttest control group design. The research was conducted at MIN 1 Batam with the subject of the study being fifth-grade students who were selected randomly. Before applying the guided inquiry learning model, a pretest was conducted to determine the students' initial understanding of the ecosystem material (Arif, 2023). Afterward, the experimental group was taught using the guided inquiry learning model, while the control group was taught using the conventional lecture method. After the learning process was completed, a posttest was administered to measure the improvement in students' learning outcomes in both groups.

The instruments used in this study include a test consisting of multiple-choice questions and open-ended questions to assess students' understanding of ecosystem concepts. In addition to the tests, observations were made to monitor student activity and involvement during the learning process. Throughout the learning activities, the researcher also recorded the development of students' attitudes and motivation, particularly those actively engaged in the guided inquiry learning model (Creswell, 2011).

The data collected from the pretest and posttest results were analyzed using descriptive statistics and t-tests to determine whether there was a significant difference in learning outcomes between the students who used the guided inquiry learning model and those who used the conventional lecture method. The results of this analysis are expected to provide an overview of the effectiveness of the guided inquiry learning model in improving students' learning outcomes on ecosystem material.

RESEARCH RESULTS AND DISCUSSION

Implementation of the Guided Inquiry Learning Model to Improve Student Learning Outcomes on Ecosystem Material at MIN 1 Batam

The learning activities in the first meeting began with a diagnostic assessment to map the initial abilities and adjust the learning needs. The diagnostic assessment was conducted by providing 5 multiple-choice questions and 5 essay questions to the students. This was followed by the introductory activity. In this phase, the teacher provided motivation, conducted apperception, and asked triggering questions by showing pictures of the natural environment. The teacher then explained the steps and objectives of the lesson. Next, the teacher divided the students into several groups and distributed learning materials and worksheets. During the core activity, students were asked to read and understand the text provided about ecosystems and the environment. After reading the material and understanding the instructions in the worksheets, the teacher took the students outside the classroom to observe the school garden and the tilapia pond in order to classify biotic and abiotic components and analyze the interdependencies in the ecosystem. The students were very enthusiastic when taken outside to directly observe the environment. They were also actively engaged in group discussions when the teacher asked questions based on their observations. However, several issues arose during the process. The first issue was the limited time for observing the environment outside the classroom and the lack of supporting facilities such as a science laboratory. The learning strategy used was a contextual learning strategy summarized in the guided inquiry learning model. In this case, students worked together in their groups to observe the environment and classify the biotic and abiotic components found in the garden and tilapia pond ecosystem. Contextual learning, which links the benefits of maintaining the environment in everyday life, made the learning more effective and meaningful.

The second meeting involved investigation and discussion stages. The introductory activity began with the teacher conducting a discussion related to the topic studied by students in the previous meeting. Then, the students were asked to observe a learning video about food chains in various ecosystems, which the teacher presented using a projector. After watching the video, the students discussed in their groups to explain the different types of food chains in ecosystems and wrote them down on the provided worksheets. In the core activity, students were asked to create a scrapbook about food chains and note the relationships between living organisms in the ecosystem they chose. The teacher observed and provided guidance, giving positive feedback to each group. In the closing activity, the teacher gave a quiz in the form of a food chain puzzle game to reinforce the students' understanding of the concept. The teacher then appreciated each group that successfully created a correct food chain scrapbook. The third and final meeting was the presentation stage. The opening activity began with the teacher explaining the discussion topic from the previous meeting. The core activity started with group presentations by each group representative. During the presentations, each group had to pay attention and respond to the groups that presented

and provide feedback. The teacher held a competition to evaluate the group presentations. The group with the best and most creative presentation was given a prize. After all groups finished their presentations, the students were given a worksheet designed by the teacher, and they answered each question on the worksheet. In the closing activity, the teacher provided reinforcement and prizes to the best group. The teacher and students then concluded the discussion about ecosystems that had been studied during the three meetings.

From the first to the third meeting, students showed improvement in learning outcomes, with an average formative score of 86.67 and a summative score of 88.67. This shows that at the process and the end of the lesson, the students achieved satisfactory learning outcomes. Thus, it can be concluded that the implementation of the guided inquiry learning model can improve the learning outcomes of fifth-grade students at MIN 1 Batam on the topic of ecosystems. The students were very enthusiastic and actively participated in solving the problems given by the teacher. However, there were still some challenges faced, such as when conducting the observation outside the classroom, some students were less focused and tended to play around. Additionally, when making the food chain scrapbooks, some were not neat, and during the preparation of presentation materials, some groups rushed due to the limited time.

Throughout the learning activities, the teacher conducted assessments covering cognitive, affective, and psychomotor aspects. The students' cognitive scores were taken from short quizzes administered by the teacher through discussions, question-and-answer sessions, and written tests on ecosystem and environmental material. In class discussions, all students were encouraged to participate actively. The assessment criteria in the discussion included active involvement, relevance of arguments, and the ability to answer questions. The affective aspect of the students was assessed through observations of their attitudes during the activities, including how they interacted during practical activities and discussions. The criteria for attitude assessment included concern for the environment, collaboration with group members, and enthusiasm for learning. The affective assessment was also based on the students' self-reflection on their learning experiences and attitudes toward the environment. Self-reflection assessment criteria included honesty and concern. The psychomotor assessment was conducted during the food chain scrapbook activity and the presentation. The assessment criteria included conceptual accuracy, use of language, and delivery methods. Psychomotor assessment was also done through group observation, evaluating students as they worked within their groups. The criteria for psychomotor assessment included teamwork ability, contribution to group tasks, and skills in completing assignments. The summative assessment also included cognitive, affective, and psychomotor aspects. The summative assessment was conducted at the end of each learning session or at the conclusion of the material taught during the three meetings. The cognitive scores were derived from the final exam, consisting of multiple-choice and essay tests, as well as the evaluation of the observation report, including writing conclusions. The criteria for evaluating the observation report included completeness of information, data analysis,

and conclusions drawn. The affective scores were based on the presentation of the group's discussion results. The assessment criteria included self-confidence, responsibility in completing tasks, collaboration during presentations, and a positive attitude toward feedback. The affective aspect was also assessed through the final reflection. Students were asked to write a final reflection on what they learned about ecosystems and the environment, as well as how they felt about maintaining environmental balance. The criteria for the final reflection included depth of thought, honesty, and relevance to the learning experience. The psychomotor assessment was based on the food chain scrapbook activity. The assessment criteria included accuracy and neatness. Psychomotor skills were also assessed from the demonstration of abilities. The criteria for assessment included communication skills and the ability to explain steps to classmates.

The teacher also made efforts to create a classroom environment that motivates students by using teaching aids and demonstrations, as well as relating the material to local wisdom to capture students' attention. In this case, the teacher used a laptop and projector to show videos introducing natural environments, such as rivers, rice fields, forests, lakes, seas, and beaches. Specifically for the natural environment of the sea and beaches, the teacher asked students to observe them directly with the help of parents or family members, as the geographical characteristics of Batam City are surrounded by seas, and many students live near the beach. The teacher provided positive affirmation during the discussion to encourage students to ask questions and provide answers. The teacher created space for students to be active in asking questions, giving responses, and offering feedback. With the efforts made by the teacher to create a class that builds student motivation, the students became more active, adaptive, collaborative, and focused during learning. The students also felt challenged and highly motivated because of the positive efforts made by the teacher. The students appeared more independent, and even when a group member encountered difficulties, the other students helped by providing understanding based on their own comprehension.

Discussion

Implementation of the Guided Inquiry Learning Model to Improve Student Learning Outcomes on Ecosystem Material at MIN 1 Batam

Based on the research that has been conducted, the improvement in learning outcomes of class V students at MIN 1 Batam can be seen in table 1 below with formative and summative assessments.

Table 1: Student Learning Outcomes for Fifth Grade

Assessment	Number of Students	Average Student Score	Remarks
Formative	24	86.67	Satisfactory
Summative	24	88.67	Satisfactory

Based on the table above, it can be concluded that the implementation of the guided inquiry learning model can improve the science learning outcomes of class V students of MIN 1 Batam. It can be seen in the table, by using formative and summative assessment tools, it is shown that students get satisfactory average scores. In the formative assessment, the average student learning outcomes get a score of 86.67, which means that learning with the guided inquiry learning model can improve students' science learning outcomes (Nisa & Astriani, 2022; Novitra et al., 2021). Likewise, in the summative assessment carried out, the average student learning outcomes get a score of 88.67. This means that learning with the guided inquiry learning model can improve students' science learning outcomes. So it can be concluded that the research conducted was successful. The success of the implementation of the guided inquiry learning model in improving students' science learning outcomes can also be seen in the following diagram (Orosz et al., 2023; Yuliana et al., 2022).

In the diagram above, the assessments conducted using formative and summative assessment instruments show that the average scores in both formative and summative assessments exceed the average passing grade (KKM). In the formative assessment, the result is 86.67, meaning the average score of the students is above the average KKM score. In the summative assessment, the result is 88.67, meaning the average score of the students is also above the average KKM score. This indicates that the application of the guided inquiry learning model in science (IPA) has yielded satisfactory results. The students were also very enthusiastic throughout the learning process, from the first meeting to the third. The researcher has implemented the guided inquiry learning model with question-and-answer sessions (Ayyubi et al., 2024; Jansson et al., 2021), involving students in problem formulation, experiment design, conducting experiments, analyzing data, making generalizations, and presenting observation results.

This was done with some guidance from the teacher in creating an active classroom, such as providing appreciation, positive affirmation, holding small competitions through games, giving praise and positive feedback (Harahap, 2024; Yanto et al., 2025), and using digital multimedia devices. This study shares similarities with previous research in the use of digital multimedia devices as a supporting learning tool; however, it differs in that the previous study did not incorporate local wisdom from the research location. This greatly affects the students' knowledge and experience of the material being taught. Various efforts designed to build student motivation have a significant impact on the learning process (Agustin & Kistoro, 2024; Sintasari et al., 2024). When the teacher, as a learning facilitator, provides meaningful instruction, the experiences gained by the students will also be meaningful, leading to optimal learning outcomes (Huda et al., 2024; Saim & El-Muhammady, 2025).

CONCLUSION

The analysis results from the descriptive quantitative research conducted over three meetings using the guided inquiry learning model show that it can improve the science learning outcomes of fifth-grade students at MIN 1 Batam. This can be seen from

the results of the formative and summative assessments with satisfactory average scores. In the formative assessment, the average student learning outcome was 86.67, which means that learning with the guided inquiry learning model can improve the science learning outcomes of students. Similarly, in the summative assessment, the average student learning outcome was 88.67, which indicates the same conclusion—that learning with the guided inquiry learning model can improve the science learning outcomes of students. Based on this data, it can be concluded that the implementation of the guided inquiry learning model can improve the science learning outcomes of fifth-grade students at MIN 1 Batam in the ecosystem material of the science subject.

The limitations of this study include the limited time for conducting outdoor observations and the lack of supporting facilities for learning, such as an inadequate science laboratory. Additionally, some students were still less focused during the observation and practical activities, which affected the final outcomes of these activities. However, this study has the advantage of applying the guided inquiry learning model, which successfully created an active classroom and directly involved students in the learning process. The use of digital multimedia and the integration of local wisdom also provided relevant context for students in understanding the subject matter. For future research, it is recommended to extend the duration of the study and improve the supporting learning facilities. Furthermore, future studies could explore combining the inquiry learning model with advanced technologies or online learning platforms to expand the learning scope and enhance its effectiveness.

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