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Implementation of Discovery Learning Theory in Science Learning in Madrasah Ibtidaiyah

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ABSTRACT

This study examines the implementation of the discovery learning theory in science education at Madrasah Ibtidaiyah (MI) and its impact on improving students' science skills. The research method used is library research by reviewing various literature sources such as books, journals, and relevant scientific articles. The findings indicate that the application of discovery learning is capable of enhancing students' science process skills, such as observation, classification, hypothesis formulation, and conclusion drawing. The implementation of this method is carried out through exploration activities, simple experiments, group discussions, and reflections tailored to the characteristics of students at MI. However, the implementation of discovery learning faces challenges such as limited facilities and infrastructure, varying teacher competencies, limited learning time, and diverse student abilities. To overcome these obstacles, strengthening strategies are needed, such as teacher training, the development of simple and contextual learning media, support from school leaders, as well as the integration of technology and parental involvement in the learning process. In conclusion, discovery learning is an effective approach to enhancing students' science skills in MI, provided it is supported by various comprehensive and sustainable supporting factors.

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INTRODUCTION

Basic education is an important foundation in shaping students' mindsets, attitudes, and skills that will impact the lifelong learning process. Among the various fields of study, science has a strategic role in training logical, analytical, and systematic thinking skills from an early age. Therefore, science learning in Madrasah Ibtidaiyah (MI) needs to be designed effectively to foster students' science skills, such as observation, classification, prediction, measurement, and drawing conclusions based on empirical evidence.

Science skills are not only limited to mastering theoretical concepts, but also include the science process skills needed in real life. Unfortunately, in learning practices in MI, the science learning process still tends to be conventional, where students only memorize concepts without understanding their meaning and application in everyday life. Teachers often become the center of information, while students only act as passive recipients. As a result, students' science skills do not develop optimally (Rizqiyah, 2025).

To overcome these problems, a more active, creative, and constructive learning approach is needed. One approach that is relevant and proven effective in the context of science learning is the discovery learning theory. This theory was first introduced by Jerome S. Bruner, who argued that an effective learning process is when students are active in finding information and building their own knowledge. In this approach, the teacher acts as a facilitator who guides students to explore, experiment, and draw conclusions from their own learning activities.

The application of discovery learning in science learning in MI is very much in line with the needs of elementary school students' cognitive development. At the concrete operational stage, students need learning that allows them to make direct observations, manipulate objects, and explore the surrounding environment. Through this approach, students not only understand science concepts more meaningfully, but also develop essential scientific skills, such as critical thinking, problem solving, and scientific communication (Ubm et al., 2024).

Various studies have shown that discovery learning can increase student engagement in learning, strengthen concept retention, and encourage high curiosity. However, the success of implementing this approach is highly dependent on teacher readiness, provision of adequate learning resources, and systematic learning planning. In addition, factors such as time allocation, level of difficulty of the material, and student characteristics also influence the effectiveness of its application in the classroom.

In this context, it is important to conduct a study that analyzes in depth how the application of discovery learning theory in science learning in MI can improve students' science skills. This study not only focuses on the stages of method implementation, but also examines various aspects such as the role of teachers, the forms of learning activities used, student responses, and challenges and solutions that arise during the learning process. (Hidayati, 2023). Thus, this article aims to investigate the application of the discovery learning approach in science learning in Madrasah Ibtidaiyah, with a focus on efforts to improve students' science skills. The results of this study are expected to be a reference for educators, policy makers, and researchers in designing more innovative, effective, and contextual science learning models at the elementary school-based education level.

METHOD

This research is a qualitative research with a library research approach, namely a study conducted by reviewing, analyzing, and examining various literatures that are relevant to the topic of discussion, namely the implementation of discovery learning theory in science learning in Madrasah Ibtidaiyah to improve students' science skills.

The data in this study are sourced from various documents and written references that are related to the variables and focus of the study. Data sources include scientific books, articles in accredited national and international journals, previous research results, proceedings, and education policy documents such as curriculum, learning guides, and teacher training modules. All sources used are selected based on relevance, actuality, and scientific validity.

Data collection techniques are carried out through document review (documentary study), with systematic steps such as literature searches, identification and selection of relevant sources, recording important citations, and grouping information based on themes. The main focus of the literature search includes the concept and principles of discovery learning, characteristics of science learning at the Madrasah Ibtidaiyah level, and indicators of student science skills.

Furthermore, the data is analyzed using content analysis techniques. This analysis aims to identify patterns, relationships, and relevant findings from the various sources reviewed. The results of the analysis are arranged descriptively-analystically to comprehensively describe how discovery learning is implemented in science learning and how this approach can contribute to improving students' science skills.

Through this approach, it is expected to obtain a complete theoretical and practical picture of the potential and challenges of implementing discovery learning theory in the context of science education in elementary madrasahs. This study also aims to contribute to the development of more effective science learning strategies that are in accordance with the needs of student characteristics at the elementary level.

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RESULTS AND DISCUSSION

1. Basic Concept of Discovery Learning in Science Learning

Discovery Learning is one approach in cognitive learning theory that emphasizes the active learning process, where students are encouraged to discover concepts, principles, and relationships themselves through exploration and investigation. This theory was developed by Jerome S. Bruner, who assumes that students will learn more effectively if they are directly involved in the process of discovering knowledge, not just passively receiving information from teachers (Astari et al., 2018)

Bruner divides the learning process into three stages of representation, namely: enactive (action-based), iconic (image-based), and symbolic (language-based). In science learning, these three stages are very relevant because students are gradually invited to do, observe, and conclude based on real data or phenomena. This approach not only develops cognitive abilities, but also science process skills including observation, classification, measurement, data interpretation, and drawing conclusions (Mandar & Sihono, 2025).

Discovery learning is very much in line with the characteristics of science learning based on the scientific process. In practice, this approach involves six main stages:

a. Stimulation: The teacher provides stimulation to students through questions, demonstrations, or interesting problems.
b. Problem Statement: Students are invited to identify and formulate the problems to be investigated.
c. Data Collection: Students collect various information through observation, experiments, or other learning sources.
d. Data Processing: The data obtained is then analyzed by students to find certain patterns or relationships.
e. Verification: Students prove the truth of their hypotheses or assumptions based on the available data.
f. Generalization: Students conclude principles or concepts based on the learning outcomes that have been carried out (Mariyaningsih & Hidayati, n.d.).

In the context of Madrasah Ibtidaiyah, discovery learning not only helps students understand science material conceptually, but also trains them in critical and scientific thinking. Students learn through real experiences, simple experiments, and direct observation of phenomena in the surrounding environment. This is very important for elementary school students, because they are at the concrete operational development stage, where direct and contextual learning is easier to understand and internalize (Anggareni et al., 2013).

2. Implementation of Discovery Learning in Science Learning in MI Various literature and research results show that the implementation of discovery learning in science learning in MI has had a positive impact on the quality of the process and student learning outcomes. Teachers who apply this approach usually design learning that challenges students to observe phenomena, conduct simple experiments, analyze data, and formulate conclusions independently or in groups. This activity triggers student involvement cognitively, affectively, and psychomotorically (Hamid et al., 2023). Examples of implementation found in the literature are the use of concrete media and simple props in the material on changes in the state of objects, the properties of light, or the respiratory system. Students not only read the theory, but also conduct experiments and discuss the results. This trains observation, measurement, classification, and inference skills which are integral parts of science process skills.
3. Impact of Discovery Learning on Students' Science Skills The application of discovery learning has been proven to improve various aspects of students' science skills. Some of the skills that have improved include:
   a. Observation Skills: Students become more trained in observing objects and phenomena in detail and systematically.
   b. Question Asking Skills: This approach encourages students to think critically and develop questions based on their observations.
   c. Data Collection and Processing Skills: Through practical activities or experiments, students learn to collect information, record data, and interpret it.
   d. Summarizing and Communicating Results Skills: Discovery learning teaches students to convey their findings orally and in writing in a coherent and logical manner (Tyas et al., 2020).

4. Challenges in Implementing Discovery Learning in MI

Although discovery learning offers various advantages in improving the quality of science learning in Madrasah Ibtidaiyah (MI), its implementation in the field is not free from a number of challenges. These challenges are related to internal factors (from teachers and students) and external factors (environment and learning facilities), which can influence the effectiveness of this approach in the teaching and learning process.

a. Limited Facilities and Infrastructure
   One of the main obstacles that is often encountered is the lack of facilities and infrastructure to support discovery-based science learning. Many MIs, especially in remote areas, do not have adequate science

laboratories, teaching aids, or experimental materials. In fact, discovery learning really needs concrete media and simple equipment to support students' exploratory activities. This inadequacy makes it difficult for teachers to design practical activities or experiments that are interesting and meaningful for students.

b. Teacher Readiness and Competence
The implementation of discovery learning requires teachers to have high pedagogical competence, especially in designing open learning scenarios, guiding the exploration process, and conducting authentic assessments. However, not all MI teachers have a deep understanding of the theory and practice of discovery learning. Some teachers are still accustomed to the traditional lecture-based and teacher-centered approach, so they are less flexible in managing learning that is oriented towards the discovery process (Febriana, 2021).

c. Limited Learning Time
Discovery-based learning takes relatively longer than conventional methods. This is because the learning process includes various stages such as formulating problems, experiments, group discussions, to concluding results. In a dense curriculum system and limited time allocation, teachers often feel that there is not enough time to complete all stages of discovery learning thoroughly. As a result, the learning process can be rushed and less than optimal (Suherti, 2023).

d. Heterogeneity of Student Abilities
Students at the MI level have diverse learning abilities. Some students may be able to participate in exploration activities independently, but others require more intensive guidance. In this condition, teachers need to adjust learning strategies so that all students can participate actively and equally.

e. Complex Learning Evaluation
Assessment in discovery learning does not only focus on the final results, but also the learning process that involves critical thinking skills, collaboration, and scientific attitudes. This requires teachers to use authentic assessment techniques, such as observation, project assessment, learning journals, and performance rubrics. (Ibda, 2022).

5. Strategy for Strengthening the Implementation of Discovery Learning in MI

In order for the implementation of discovery learning in science learning in Madrasah Ibtidaiyah (MI) to run optimally, a comprehensive and sustainable strengthening strategy is needed (Arief, 2024). This strategy not only targets improving teacher competence, but also involves providing supporting facilities, strengthening institutions, and policy support that supports the active learning approach.

a. Improving Teacher Competence through Practice-Based Training One of the main strategies is organizing training or workshops for MI teachers on the practical application of discovery learning. The training must be applicative, emphasizing the design of discovery-based lesson plans, the creation of exploratory LKS, discussion facilitation techniques, and the use of authentic assessment instruments. The training program also needs to pay attention to the local context so that the material provided is in accordance with the reality of each school (Salirawati, 2018).

b. Development of Simple and Contextual Science Media and Demonstrations
Because limited facilities are still a major obstacle, it is important to develop science learning media that are inexpensive, easily obtained, and relevant to the students' environment. Teachers can be empowered to utilize used goods or natural materials as experimental props. For example, plastic bottles, used glasses, soil, leaves, or water as simple science practice materials.
This approach is not only cost-effective but also trains the creativity of teachers and students (Fadhillah et al., 2024).

c. Strengthening Support from the Principal and Supervisor The implementation of learning innovations will be more successful if it gets support from the leadership of the education unit. The principal can allocate special time for experimental activities, provide an operational budget for science learning, and facilitate collaboration between teachers in the learning community. The madrasah supervisor also plays an important role in providing professional assistance, academic supervision, and motivation so that teachers do not hesitate to apply the discovery learning method.

d. Integration of Information Technology in Learning
The use of information and communication technology (ICT) can be a solution to overcome the limitations of learning resources. Teachers can use science learning videos, interactive simulations, and science-based educational applications to support discovery activities. By using devices such as laptops, projectors, or even smartphones, students can explore science concepts more visually and interactively (Norpin et al., 2024).

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e. Collaboration with Parents and the Surrounding Community
Support from parents and the surrounding community is also important in strengthening students' learning experiences. Teachers can involve parents in home experiments or environmental-based project assignments. This collaboration makes science learning not only take place in the classroom, but also become part of students' daily lives.

f. Curriculum Improvement and Learning Time Allocation
In order for all stages of discovery learning to be carried out properly, there needs to be flexibility in the allocation of learning time. The school-level curriculum (KTSP) must provide space for active learning models and are not too dense with material targets. (Nurafiati et al., 2022).

CONCLUSION

The implementation of discovery learning in science learning in Madrasah Ibtidaiyah has been proven to have asignificant positive impact on improving students' science process skills, including observation, classification, hypothesis testing, and conclusion skills. This approach places students as active actors in the learning process, so that it can increase motivation and interest in learning science meaningfully.

However, the implementation of discovery learning in MI faces various challenges, such as limited facilities and infrastructure, teacher competency readiness, limited learning time, and variations in student abilities. To overcome these obstacles, a comprehensive strengthening strategy is needed, including practice-based teacher training, development of simple and contextual learning media, support from madrasah leaders, and utilization of technology and collaboration with parents and the community.

With the implementation of the right strategy, discovery learning can be an effective and relevant method for building strong science skills in MI students, while preparing them to face increasingly complex learning and life challenges in the future.

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