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EFFORTS TO IMPROVE SCIENCE LEARNING OUTCOMES THROUGH AN INQUIRY-BASED LEARNING MODEL AMONG YEAR 5 PUPILS AT SDN 067245 MEDAN SELAYANG

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ABSTRACT

This study aims to improve learning outcomes in Natural Sciences (IPA) on the topic of Natural Resources (SDA) through the application of the Inquiry-based Learning Model to Year 5 pupils at SDN 067245 Medan Selayang. This study is a Classroom Action Research (PTK) project conducted over two cycles, each comprising the stages of planning, implementation of actions, observation and reflection. The research sample comprised 25 pupils. Data were collected through learning outcome tests, observation sheets recording teacher and pupil activities, and documentation. The research results showed a significant improvement: at the outset, the average student score was 45.44 with a classical mastery rate of 12 per cent; this increased in Cycle I to 66.40 (40 per cent mastery), and reached 82.72 in Cycle II with a classical mastery rate of 88 per cent. Similarly, teacher activity increased from 68 per cent to 90 per cent, whilst student engagement rose from 60 per cent to 84 per cent. This demonstrates that the Inquiry-Based Learning model is effective in making learning more meaningful and active, and is capable of enhancing students' conceptual understanding and learning outcomes through investigative activities and self-discovery.

Keywords: *Inquiry-Based Learning Model, Learning Outcomes, Science, Natural Resources, Classroom Action Research.*

INTRODUCTION

Education is one of the key aspects in improving the quality of human resources. Law No. 20 of 2003 on the National Education System provides a clear definition of education: *"Education is a conscious and planned endeavour to create a learning environment and learning process, so that learners can actively develop their potential and possess spiritual strength in their religious practice, self-control, character, intelligence, good moral character, and the skills required by individuals, society, the nation, and the state."*

The education required is one that can transform pupils' behaviour into something more positive and responsible, whilst developing their personality holistically ( ). One of the primary settings for receiving quality education is the school. As an institution playing a crucial role in providing formal education, schools have a significant impact on the quality of that education. In carrying out the teaching and learning process

at school, a teacher acts as the primary implementer. As teaching staff who provide guidance to pupils, teachers have a very significant influence on pupils' learning achievements. Pupils' success in the learning process is greatly influenced by the extent to which a teacher masters the subject matter and how the teacher conveys that material to their pupils.

Efficient and effective learning will undoubtedly lead to positive outcomes in terms of learning achievement. Budiana et al. (2020) state that learning outcomes represent a shift in pupils' abilities, encompassing cognitive, affective and psychomotor aspects. Learning outcomes can be defined as pupils' self-assessment, as well as observable, verifiable and measurable changes in their abilities or achievements resulting from the learning process they have undergone. Learning outcomes serve as an indicator of the extent to which pupils understand the material taught. Satisfactory learning outcomes must clearly meet the standards of mastery criteria as the expected results.

Learning outcomes are obtained following an assessment, enabling us to gauge the level of students' academic achievement. Success in improving learning outcomes is also closely linked to the teacher's capacity to facilitate the learning process and the methods employed. Educators need to implement learning strategies and methods that are relevant and tailored to the needs of their pupils. Low learning outcomes are often caused by a lack of pupil engagement in the learning process. Pupils tend to merely receive information passively without being given the opportunity to discover the concepts being studied for themselves. This results in a superficial understanding of the subject matter, which directly impacts their learning outcomes.

Natural Sciences (IPA) is one of the key subjects taught at primary school level. Natural Sciences (IPA) is a field of study that is analytically structured and systematic (Fitria & Indra, 2020). The teaching of Natural Sciences aims to introduce pupils to various natural phenomena, as well as living organisms and their environments, through a scientific approach. From an early age, pupils are encouraged to develop a sense of curiosity, critical thinking skills, and the ability to observe, ask questions, and draw conclusions from what they encounter around them. In the context of primary education, science education focuses not only on the mastery of concepts but also on fostering a scientific attitude and concern for the environment.

However, in practice, science education is still often delivered in a conventional, *teacher*-centred manner, resulting in pupils being less active in the learning process. Based on the results of initial observations in Year 5 at SDN 067245 Medan Selayang, it was found that pupils' learning outcomes in science are still relatively low. This is indicated by the fact that a significant number of pupils have not yet achieved the Minimum Pass Mark (KKM $\geq$ 70). Furthermore, pupils appear less active in following lessons, are reluctant to ask questions, and are not sufficiently engaged in discussion activities.

One of the main problems faced is that many pupils are unable to pay full attention when the teacher is delivering the material in class. A teaching approach that remains teacher-centred results in pupils being less engaged during the learning process

in class, leading to boredom and a lack of focus whilst following the lesson. All these learning issues indicate low pupil achievement.

Based on daily assessment data for the Natural Resources module in Science, out of 25 pupils, only 7 (28 per cent) achieved the minimum passing mark, whilst the remaining 18 (72 per cent) did not meet the standard. This indicates the presence of underlying issues causing low learning outcomes, one of which is the teacher's insufficient use of appropriate learning models and strategies tailored to pupils' needs.

Therefore, in order to improve and enhance pupils' learning outcomes, teachers need to implement learning models that are suited to their needs. By applying such learning models, it is hoped that pupils' active participation in teaching and learning activities can be encouraged. One creative and relevant learning model that teachers can apply to increase pupil engagement in the learning process is the Inquiry-based learning model.

The Inquiry-based learning model is a model that emphasises the process of seeking and discovering answers to a problem through critical and analytical thinking. With this model, students are expected to be more active, creative, and able to understand concepts in greater depth. Through the application of the Inquiry-Based Learning model, pupils are not merely the objects of learning but also active participants in the learning process. It is hoped that this will enhance pupils' interest in learning, their engagement, and their learning outcomes in science.

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RESEARCH METHOD

This study utilised the Classroom Action Research (CAR) method. According to Darinda (2024), CAR originates from the concept of action research, which aims to improve understanding of social practices through evaluation and collaboration. In an educational context, CAR is carried out by teachers to identify problems in the classroom, plan corrective actions, implement them, observe the results, and reflect on the process.

According to Hamzah et al. (2011), Classroom Action Research is a study carried out by teachers in their own classrooms through introspection, with the aim of improving their performance as educators, so that the teaching and learning process is effective and learning outcomes improve. CAR is a research activity carried out directly by teachers in their own classrooms by reflecting on or evaluating their teaching practices. The aim is to improve and enhance the quality of teachers' performance, so that teaching becomes more effective and has a positive impact on pupils' learning outcomes.

The research design is based on the Kemmis and McTaggart cycle model, which consists of four main, recurring stages: **Planning, Acting, Observing, and Reflecting**. The research was conducted over two cycles, with improvements made in each cycle based on an evaluation of the previous cycle.

According to Hamzah et al. (2011), **the characteristics of action research** include:

1. The problem arises from the teacher's awareness of the shortcomings of the methods used.
2. It is reflective or involves self-introspection.
3. It is carried out in the classroom in a real-life context.
4. Aims to improve the learning process gradually and sustainably.
5. It involves a cycle of planning, implementation, observation and reflection.

Furthermore, according to Prihantoro and Hidayat (2019), the characteristics of PTK include: the researcher is the actor, it focuses on real problems in the classroom, the generalisation of results is limited, it is based on self-evaluation, and it is carried out in a repetitive cycle.

Principles of PTK according to Norlaila & Hermina (2025):

1. It is carried out in the authentic environment without external interference.
2. Based on self-awareness to improve performance.
3. Uses SWOT analysis to evaluate potential and risks.
4. It is empirical, structured and planned.
5. Follows the SMART principles (Specific, Measurable, Achievable, Relevant, Time-bound).

The stages of PTK according to Rahayu & Saskia (2025):

1. Initial Observation: Gathering information and identifying real problems in the classroom.
2. Planning: Drawing up an action plan, objectives, strategies, methods and indicators of success.
3. Implementation: Carrying out the actions in accordance with the plan that has been drawn up.
4. Observation: Observing the progress of the activities and their impact on pupils whilst collecting data.
5. Reflection: Analysing the data to assess success and determine next steps.
6. Iteration: Making improvements if the results are not yet satisfactory.
7. Reporting: Compiling a report on the research findings.

The research was conducted at State Primary School 067245 Medan Selayang, Medan Selayang Sub-district, Medan City, during the second semester of the 2025/2026 academic year. The research subjects were 25 Year 5 pupils, comprising 12 boys and 13 girls. This location was selected due to the issue of low learning outcomes and pupil engagement in the Science subject, specifically the Natural Resources module.

Research Procedure

Pre-cycle

This stage was carried out to ascertain the initial learning conditions and pupils' abilities prior to the intervention. Activities included classroom observation, interviews with the teacher, and the administration of a pre-test to measure pupils' understanding of the Natural Resources topic. This data was used as the basis for planning the intervention.

Cycle I

1. **Planning:** Drawing up a Lesson Plan (RPP) using the inquiry model syntax: problem orientation, problem formulation, hypothesis formulation, data collection, data analysis, and conclusion. Preparing teaching materials, observation sheets for teacher and student activities, and learning outcome assessment instruments.
2. **Implementation:** The lesson takes place in accordance with the Lesson Plan. The teacher presents problems relating to the types and utilisation of Natural Resources. Pupils are encouraged to discuss, observe their surroundings, and seek answers both independently and in groups. The teacher acts as a facilitator and motivator.
3. **Observation:** Carried out concurrently with the lesson. The observer assesses the teacher's activities in applying the model and the pupils' activities (eagerness to ask questions, cooperation, readiness and participation).
4. **Reflection:** Analysing the results of the tests and observations. Identifying challenges such as time management, pupils' confidence, and understanding of the material to be addressed in the next cycle.

Cycle II

The stages are the same as in Cycle I, but with improvements based on previous reflections. Improvements include simplifying problems to make them more contextual, adding visual aids and real objects, boosting the motivation of passive pupils, and managing time more effectively so that all stages of the inquiry process run smoothly and in depth.

Data Collection Techniques

1. **Learning Outcome Test:** Consisting of 25 multiple-choice questions whose validity and reliability have been tested (reliability score of 0.934 – very high). The test is administered at the end of each cycle to assess cognitive aspects.
2. **Observation:** A 1–5 scale assessment sheet is used to measure the teacher's delivery of the lesson and student engagement during the learning process. Indicators include readiness, attention, participation and cooperation.
3. **Documentation:** Consists of photographs of activities and field notes to support qualitative data regarding the learning atmosphere and process.

Data Analysis Techniques

Data were analysed using both quantitative and qualitative descriptive methods:

1. **Quantitative:** Calculating the class average, individual achievement (marks ≥ 70), and class achievement (≥ 75% of pupils achieving the required standard).
2. **Qualitative:** Describing the results of observations of teacher and pupil activities, as well as any behavioural changes that emerged.

The research is deemed successful if:

1. There is an increase in the average learning achievement score from one cycle to the next.
2. The percentage of class-level achievement reaches at least 75 per cent.
3. Teacher and pupil activities improve to at least the 'Good' category.

RESULTS AND DISCUSSION

Prior to the implementation of the Inquiry model, teaching was teacher-centred, using lectures and the setting of assignments. The results of the pre-test indicated a very low standard. Of the 25 pupils, only 3 achieved the minimum passing mark (≥70), resulting in a class-based achievement rate of just 12 per cent, with an average class score of 45.44. Pupil engagement was low, as evidenced by the large number of pupils who were passive, did not dare to ask questions, and paid little attention to the teacher. Pupils' understanding of natural resources was still based on rote learning and had not yet been linked to real life. Pupils found the material difficult and boring because they were only listening to the teacher's explanations.

In Cycle I, the teaching had incorporated inquiry-based learning steps, but these were still simple and limited. Pupils were encouraged to observe pictures and engage in simple discussions about the types of natural resources. The results obtained were:

- **Learning Outcomes:** The number of students achieving the learning objectives increased to 10, the class pass rate was 40 per cent, and the average class mark was 66.40.
- **Observations:** Teacher activity reached 68 per cent (Good category), but was still not optimal in terms of guiding discussions and time management. Pupil activity reached 60 per cent (Fairly Good category). Pupils began to show enthusiasm, but some were still shy and passively waited for the teacher's instructions.

Reflection on Cycle I: Improvements have been made, but the targets have not yet been met. The main challenges are that pupils are not yet accustomed to independent learning methods, the problem scenarios are not sufficiently contextualised or realistic, and the time allocated for discussion is inadequate. Improvements to teaching materials and a more motivating approach are required in Cycle II.

Based on the improvements from Cycle I, Cycle II was implemented with more realistic problem-based scenarios, the use of concrete objects and the surrounding environment, more structured group division, and the teacher taking on a greater role as a motivating facilitator. The results obtained were:

- **Learning Outcomes:** The number of pupils achieving the learning outcomes increased to 22, the percentage of pupils achieving the learning outcomes reached 88 per cent, and the average class mark was 82.72.
- **Observation:** Teacher activity increased to 90 per cent ('Very Good' category); the teacher was able to manage the class and guide the inquiry process effectively. Pupil

activity increased to 84 per cent ('Good' category). Almost all pupils were confident in asking questions, working together, and enthusiastically participating in the inquiry.

The implementation of the inquiry-based learning model has proven to have a significant positive impact on improving learning outcomes and student engagement in Year 5 at SDN 067245 Medan Selayang. The consistent improvement from the initial stage, through Cycle I, to Cycle II demonstrates the effectiveness of this method in addressing the learning challenges encountered.

The increase in the average mark from 45.44 to 82.72, as well as the rise in the class pass rate from 12 per cent to 88 per cent, indicates that this method is capable of clarifying abstract material, making it concrete and easy to understand. This is in line with constructivist learning theory and the views of Trianto (2009), who states that knowledge discovered by students themselves is more meaningful and lasts longer in their memory than simply listening to the teacher's explanation.

According to Tohir & Mashari (2020), the Inquiry Model focuses on the process of seeking truth through critical thinking. Natural resource material—which includes definitions, types and uses—is often considered tedious if merely memorised. Through inquiry, pupils no longer simply memorise definitions of renewable or non-renewable natural resources; instead, they are encouraged to observe, categorise and analyse real-world examples in their school or home environments.

The steps of inquiry—formulating a problem, developing a hypothesis, collecting data, analysing, and drawing conclusions—train pupils to process information in depth. When pupils formulate problems and seek answers, they unconsciously process information and relate it to real-life experiences. This aligns with Ahmad Susanto's (2013) view that learning involving direct experience enhances conceptual understanding.

These results are also consistent with relevant research by Ruslan Pasaribu et al. (2024), which found an increase in learning attainment from 25 per cent to 85 per cent, as well as research by Harni (2021), which concluded that the Inquiry model effectively improves learning achievement in the ' ' (Science) subject. As understanding improves, cognitive learning outcomes automatically improve, as evidenced by the rise in evaluation test scores in each cycle.

The increase in the percentage of student engagement from 60 per cent to 84 per cent indicates a significant shift from passive to active learning. The Inquiry model is well-suited to the characteristics of primary school pupils, who are becoming increasingly curious and eager to interact. This method transforms a rigid classroom atmosphere into a dynamic and enjoyable one.

In this model, the teacher's role shifts to that of a motivator, facilitator, questioner and guide. Pupils are given controlled freedom to explore knowledge. Through the stages of inquiry, pupils are no longer passive listeners but become young researchers. They engage in group discussions, exchange views, present their findings and draw conclusions. This fosters courage, cooperation and self-confidence.

According to Shoimin (2014), the main advantage of the inquiry-based approach is that it develops pupils' critical thinking skills and independence, whilst fostering a balanced development of cognitive, affective and psychomotor aspects. Although it has drawbacks, such as requiring a significant amount of time and thorough preparation, if managed effectively, the impact is highly positive.

In addition to the cognitive and psychomotor aspects, the affective aspect also develops rapidly. Pupils learn to respect their peers' opinions, work together, and take responsibility for group tasks. The values of environmental care, which form the core of the Natural Resources curriculum, are no longer merely theory but become an awareness arising from the process of inquiry itself.

The improvement in teacher performance from 68 per cent to 90 per cent indicates that the implementation of this model encourages teachers to innovate and develop their pedagogical competences. From Cycle I to Cycle II, teachers learnt to simplify problems, manage their time more effectively, and create a safe environment for pupils to express their views. This aligns with the objectives of Action Research, namely to improve the quality of learning and teacher professionalism.

It can therefore be concluded that the more effectively the Inquiry model is implemented—from the formulation of contextual problems, through guidance, to the conclusion session—the greater the students' understanding of the subject matter, their engagement, and their learning outcomes . This method has proven effective in bridging the gap between theory and practice, as well as making science learning come alive and meaningful.

CONCLUSION

Based on the research findings and the discussion outlined in full, the following conclusions can be drawn:

1. The implementation of the inquiry-based learning model in science lessons on the topic of Natural Resources in Year 5 at SDN 067245 Medan Selayang was carried out through the following stages: problem orientation, formulating hypotheses, collecting and analysing data, and drawing conclusions. The implementation showed significant improvement from Cycle I to Cycle II, where the presentation of more realistic problems and a more intensive approach led to increased student engagement.
2. The Inquiry-based learning model proved effective in increasing student engagement. This was evidenced by an increase in the percentage of student activity from 60 per cent in Cycle I to 84 per cent in Cycle II, with the assessment category rising from 'Fair' to 'Good'. Students became more confident in asking questions, collaborating in groups, paying attention to the material, and participating actively in discussions.
3. The inquiry-based learning model has also been shown to significantly improve pupils' learning outcomes. The average class mark rose from 45.44 (pre-cycle) to 66.40 (Cycle I) and to 82.72 (Cycle II). The percentage of pupils achieving the learning standards also increased from 12 per cent to 88 per cent, which means it has exceeded the minimum success indicator of 75 per cent.

It is recommended that science teachers implement the inquiry-based learning model on a regular basis and combine it with engaging learning materials to optimise conceptual understanding whilst fostering scientific attitudes among pupils. For schools, the results of this study can serve as a reference in the development of student-centred programmes to improve the quality of learning.

REFERENCES

Arikunto, Suharsimi. (2017). *Classroom Action Research*. Jakarta: Bumi Aksara.

Budiana, et al. (2020). *Assessment of Learning Outcomes*. Bandung: Pustaka Setia.

Djamarah, Syaiful Bahri. (2010). *Teaching and Learning Strategies*. Jakarta: Rineka Cipta.

Fitria, & Indra. (2020). *Basic Concepts of Science*. Bandung: Pustaka Setia.

Hamzah et al. (2011). *Research Methods in Learning*. Jakarta: Bumi Aksara.

Harni. (2021). The Application of the Inquiry-Based Learning Model to Improve Pupils' Motivation and Learning Outcomes. *Journal of Primary Education*, 5(2), 45–58.

Janna, M., & Herianto, A. (2021). *Techniques for Analysing Educational Research Data*. Jakarta: Bumi Aksara.

Juniati, Ni Wayan & Widiana, I Wayan. (2017). The Application of the Inquiry-Based Learning Model to Improve Science Learning Outcomes. *Scientific Journal of Primary School Teacher Education*, 3(1), 22–30.

Kemmis, S., & McTaggart, R. (1988). *The Action Research Planner*. Geelong: Deakin University Press.

Lestari & Yudhanegara. (2017). *Educational Research Methodology*. Bandung: Refika Aditama.

Nurdin, H. Syafruddin. (2016). *Teacher Professionalism and Classroom Action Research*. Jakarta: Raja Grafindo Persada.

Pasaribu, Ruslan et al. (2024). The Application of the Inquiry-Based Learning Model to Improve Learners' Learning Outcomes. *Journal of Education and Learning*, 7(1), 12–24.

Shoimin, Aris. (2014). *68 Innovative Learning Models in the 2013 Curriculum*. Yogyakarta: Ar-Ruzz Media.

Sugiyono. (2019). *Educational Research Methods: Quantitative, Qualitative and R&D Approaches*. Bandung: Alfabeta.

Susanto, Ahmad. (2013). *Learning and Teaching Theories in Primary Schools*. Jakarta: Kencana Prenada Media Group.

Tanjung, Darinda Sofia. (2024). *Classroom Action Research*. Jambi: PT. Sonpedia Publishing Indonesia.

Tohir, & Mashari. (2020). *Innovative Learning Models*. Jakarta: Pustaka Pelajar.

Trianto. (2009). *Designing Innovative-Progressive Learning Models*. Jakarta: Kencana Prenada Media Group.

Law of the Republic of Indonesia No. 20 of 2003 on the National Education System. Jakarta: Ministry of National Education.