# Unraveling the Decline of Science Interest Among Middle School Students: A Case Study

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**Abstract.** This case study explores factors influencing students' interest in Science Subject at Al-Muayyad Surakarta Middle School. Recordings of lessons with 1 teacher and 25 students were analyzed qualitatively, focusing on classroom interactions. Results reveal challenges like low interactivity, monotonous delivery, material difficulty, and lack of relevance hindering student interest. External factors, such as low confidence and busy schedules, impact learning concentration. Teachers play a vital role, and interactive teaching practices, incorporating discussions, experiments, and relatable content, enhance student engagement. Strategies involving stimulating questions and reducing formula use boost participation. This research contributes valuable insights for developing effective teaching practices to enhance student interest in junior high school science subjects.

**Keywords:** Science Education, Classroom Interactions, Teacher-Student Engagement,

## 1 Introduction

The declining interest in science among students globally has raised significant concerns for science educators [1], [2]. A lack of enthusiasm for learning science could lead to reduced engagement in science and technology fields, potentially impacting students' pursuit of careers in STEM [2]–[4]. This decline in interest typically occurs during the transition from primary to secondary education [5]. The core issue contributing to students' waning interest or motivation in secondary science education can often be traced back to the teaching methods used by educators in the classroom [6]–[8]. Both cognitive and emotional student engagement in learning activities play a crucial role in their academic success [9], [10]. Furthermore, the way teachers approach and deliver lessons has a significant impact on fostering students' interest[11], [12]. Key aspects in the science learning process include the extent to which science learning is linked to personal goals, belief in one's ability to understand science, and interest in a scientific career [13], [14]. Apart from that, emotional aspects such as the level of boredom or enjoyment

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in the science classroom environment also have an important role [15]. Interest factors, including enthusiasm and dedication in understanding science material, also contribute to increasing learning effectiveness [8], [16]. Science learning is an important aspect in developing students' cognitive abilities and skills [14]. Student involvement and interest in the learning process is a critical factor that influences the success of science education [13], [17]. The teacher's role and student responses emerge as key elements that require in-depth understanding [18]. Students' interest in learning is reflected through several indicators, namely feelings of enjoyment, attention and involvement [10], [19]. Feelings of enjoyment towards a subject show that students will be more enthusiastic and willing to study that field of study [20]. Student attention shows important mental concentration in the learning process, especially when students focus on certain objects or areas of study [21]. Student engagement reflects the extent to which students are actively involved in activities related to that object or field of study, and can be a motivation for more active participation in the teaching and learning process [22]. All these indicators provide a comprehensive view of student interests, which can help design more appropriate learning strategies and motivate students to be more actively involved in the educational process [20]. In an effort to identify factors that influence student interaction in the classroom, the main challenge is to map and understand the elements that can influence the level of participation [23], [24], interest [1], [25], and student understanding [26]. These factors involve teacher teaching style variables [11], the level of difficulty of the material [27], and student characteristics that may require a differentiation approach in interactions in science classes [28]. This research aims to conduct an in-depth exploration of the interactions between teacher teaching and student responses in science classes, with the hope of comprehensively identifying factors that influence student engagement. It is hoped that the results of this research can make a positive contribution to the development of more effective teaching strategies and improve the quality of science learning at the school level. Global concerns regarding the decline in students' interest in science, especially at the secondary school level have given rise to research questions seeking to explore the factors that influence students' interest in learning in Natural Sciences subjects, highlighting the role of teachers' teaching, student engagement, and the emotional aspects involved. might contribute to the dynamics of learning in science classes.

## 2 Method

Exploratory case study research design is an in-depth research approach to a particular phenomenon or case, with the aim of understanding, explaining or describing the situation comprehensively [29], [30]. Fig. 1 shows that qualitative methodology is used as a research step that produces descriptive data, either in the form of written or spoken words, which includes interactions between teachers and students as well as observable behavior [31]. Fig. 1 illustrates a two-cycle exploratory qualitative design used for data collection. In the first cycle, both teacher and student observations are conducted to gather initial insights. Following this, the second cycle involves teacher and student interviews, allowing for a deeper understanding of the observed behaviors and interactions. The process moves sequentially from observations in the first cycle to interviews in the second, suggesting an iterative approach that builds upon the initial findings to refine or expand the data gathered through qualitative methods. This research will focus on a qualitative descriptive type to explore and describe how interactions between teachers and students are related to teaching and engagement in the learning context in science classes.

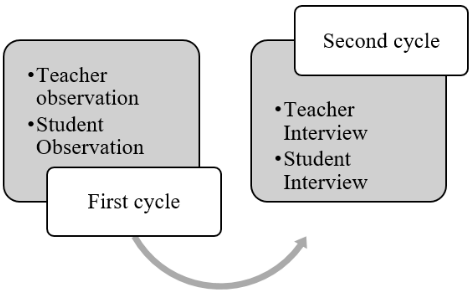


**Fig. 1.** Exploratory qualitative design illustrating the process across two cycles of data collection

This research focused on collecting information related to classroom interactions between 1 science teacher and 25 students at SMP Almuayyad Surakarta, especially related to questions asked by the teacher. This is done with the aim of understanding in depth how questions from teachers influence student participation in the learning process. Apart from that, this research will also explore the extent to which this interaction can shape students' conceptual understanding and knowledge related to the lesson material presented by the teacher. In carrying out Qualitative Data Analysis, there are four basic stages that need to be followed (Saldaña, 2013 and Tracy, 2013) [31], [32].

1. Raw Data Management : The first stage involves managing raw data to clean and ensure the accuracy and completeness of the data that has been collected.
2. Data Reduction: This stage involves a coding process, where the data is labeled or coded to identify certain patterns or findings.
3. Interpretation: This stage includes further interpretation through coding and grouping data into certain categories or clusters. This helps in understanding the meaning behind the data collected.
4. Data Representation: The final stage focuses on how to tell a story from the data and create meaning that can be understood by others. This involves the process of presenting the results of the analysis narratively to provide a comprehensive picture.

## 3 Results and Discussion

The position of students in the classroom when learning science has significance in creating an effective learning environment and supporting the development of understanding of scientific concepts. Factors such as teachers' teaching methods, classroom layout, and interactions between students can influence students' physical position and participation in the learning process [33], [34]. The teacher's role in facilitating students' positions is also significant. Organizing learning activities that involve students and can motivate them to participate actively. The teacher's physical positioning during the presentation also plays an important role in creating student involvement and focus [35].

Observations in cycle 1 were carried out by making direct observations and recording in video form during the teaching process. The resulting data is in the form of lesson transcripts which are then analyzed qualitatively. Observations of teachers include how to deliver material, teaching style, and interactions with students. In addition, special attention is paid to the way teachers ask students questions and how students respond to them. Observations of students include the level of engagement, responses to questions, and the extent to which students are involved in the learning process.

Cycle 2 continued with interviews with teachers and students. These interviews aimed to gain a deeper understanding of the factors that influence classroom interactions and the extent to which these interactions stimulate student engagement. There were several students who were not active in class and 4 students were selected to be interviewed to get their perceptions.

### 3.1. Analysis of the results of observations of science teaching between teachers and students

In order to observe the dynamics of learning, especially regarding student interests and teacher teaching strategies in the context of dinamic electricity lessons, observations were carried out in a class where the teacher used a direct learning approach. Teachers with good opening skills start lessons by greeting students, creating a friendly atmosphere, and students actively respond to greetings. When introducing the material, the teacher plans well and provides information about collecting notebooks and tests, providing a clear picture of the direction of learning.

However, there are obstacles when the teacher explains the difference between static electricity. Even though the teacher asks questions, some students seem to be more dominant in listening ability than speaking ability. At several moments, it was seen that some students were not active, such as Student S24 who did not pay attention to the teacher's explanation. Student inactivity in learning needs to be researched in more depth to find out the causes.

When the teacher gives example questions, the interaction between the teacher and students is less visible, especially in answering questions. S21 Students even expressed their inability to answer, and S22 Students who raised their hands were not given any attention. This shows weaknesses in managing student responses.

The teacher recreates student activity by providing example questions and giving students the opportunity to record the material. However, there are still some students who are inactive or sleep during learning, indicating a low level of activity.

The classroom observations aimed to capture the dynamics of teaching and learning, particularly focusing on student interest and teacher strategies in teaching dynamic electricity. The teacher employed a direct learning approach, initiating the lesson with effective classroom management skills by greeting students and creating a welcoming environment. The positive interaction during the lesson's introduction set a good tone for engagement, with students actively responding. Furthermore, the teacher displayed strong planning skills by clearly outlining the objectives of the lesson, including guidelines for collecting notebooks and upcoming assessments. This provided students with a clear learning path and helped establish a structured learning environment.

However, challenges arose when the teacher began explaining the concepts of dynamic electricity. Despite the teacher's attempts to engage students through questioning, it became evident that many students, particularly those like Student S24, were passive listeners rather than active participants. This discrepancy between listening and speaking abilities in the classroom highlighted the need for more interactive teaching strategies that promote verbal participation and critical thinking. The lack of response from students during the questioning phase suggests that the teacher's questioning techniques may not have effectively encouraged student engagement. For instance, while Student S21 expressed difficulty in answering the teacher's question, Student S22, who showed willingness by raising their hand, did not receive adequate attention. This lack of recognition and interaction points to weaknesses in the teacher's ability to manage and encourage student participation.

Moreover, the teacher attempted to reinvigorate student involvement by providing example questions and encouraging students to take notes. While this effort led to some improvement in engagement, a portion of the class, such as students who appeared to be disengaged or even sleeping, remained inactive. The persistence of low participation from certain students indicates that the direct learning approach may not be sufficient to foster a high level of cognitive and emotional engagement.

The observed lack of student activity suggests underlying issues that go beyond simple classroom management. Potential factors such as the teaching style, the appropriateness of the content to the students' level of understanding, or even external factors related to the students' motivation and interest in science should be explored further. An in-depth study into these causes could help inform future pedagogical approaches to enhance student participation, ensuring that all students, regardless of their natural tendencies towards listening or speaking, are equally engaged in the learning process. Additionally, a more diversified approach, such as incorporating active learning strategies like group discussions, hands-on activities, or problem-based learning, could potentially address the current gaps in student engagement.

**Table 1.** Coding Results for Cycle 2 of Teacher Interviews

| Codes | Category | Theme |
|---|---|---|
| The reason behind the teacher's tendency to explain more concepts. | Direct Explanation Approach | Teaching Approach |
| Belief that hands-on explanations provide a solid foundation before engaging in interactive activities. | | |
| The ease and clarity that this approach provides in teaching. | | |
| Belief that students can be more successful in mastering concepts through detailed explanations | | |
| Concerns about classroom management and barriers to using contextual questions. | Considerations and Constraints | |
| Factors such as time constraints, resource availability, and uncertainty in student responses. | | |

| Codes | Category | Theme |
|---|---|---|
| Teachers' experiences in attending workshops on implementing independent curriculum and differentiated learning. | Experience and Training | |
| Real challenges in changing teaching methods despite training. | | |
| Knowing the effectiveness of teaching methods through evaluating student understanding and active participation. | Evaluation and Development | |
| Plan to integrate questioning strategies in future learning. | | |

Table 1 describe that even though teachers have the ability to open and explain material, student activity appears to be lacking, and several obstacles arise, especially in maintaining student involvement. There needs to be reflection and adjustments in teaching strategies in order to increase student interest and participation in learning about dinamic electricity.

In the process of observing teachers, it can be seen that teachers tend to ask questions at the level of basic understanding (C1) and application of concepts (C2). The questions mainly focus on understanding facts, definitions, and application of formulas without expanding the scope to higher levels of understanding [36]. C1 level questions often relate to basic concepts, such as the difference between static and dynamic electricity. Meanwhile, questions at level C2 are more in-depth, inviting students to calculate current strength or solve simple problems involving basic formulas for electric current [37].

However, in these observations, teachers were rarely seen asking questions at the analysis (C4) or evaluation (C5) level. Questions at this level involve deeper understanding, such as constructing an argument or evaluating information. Lack of use of questions at the analysis or evaluation level can limit students' opportunities to develop critical thinking skills and the ability to apply concepts in different contexts [38], [39].

To increase teaching effectiveness, it is recommended that teachers vary the difficulty level of questions, including questions that encourage students to think analytically or evaluate concepts in a broader context. In this way, students can develop deeper understanding and better critical thinking skills [40]. It is important to note that excessive use of C1 level questions may limit the potential for student engagement in higher order thinking. In improving the quality of learning, it may be necessary to integrate more questions that stimulate analysis, synthesis and evaluation, so that students can better develop their critical thinking skills [41], [42].

### 3.2. Analysis of science teaching interviews with students

Students were interviewed to obtain their views on the learning process, the extent to which they felt involved, and what factors influenced their interest in science subjects. Table 2 shows students' desires for more interaction, connections to everyday life, and variety in the delivery of material.

**Table 2.** Coding Results for Cycle 2 of Student Interviews

| Codes | Category | Theme |
|---|---|---|
| Teachers rarely provide opportunities for students to talk or ask questions.<br><br>Creates a feeling of lack of involvement and lack of interactivity in learning. | Opportunity to Speak or Ask Questions | Factors that Influence Interest in Learning Science |
| A monotonous or too fast delivery style can make students feel bored or have difficulty following.<br><br>Too much non-stop talking and not enough variety can distract students' attention. | Teacher Delivery Style | |
| Material that is considered too difficult or unclear can make students lose interest.<br><br>A lack of connection to everyday life or personal interests can also influence attraction. | Material Difficulty Level | |
| Students feel more focused if the teacher asks interesting questions or relates the material to personal experiences.<br><br>Relate the material to students' interests or hobbies to increase engagement. | Interesting and Relevant Questions | |
| Factors such as lack of self-confidence, busy activity schedules, lots of memorization, and activities at the cottage being a priority can affect study concentration. | External Factors | |
| Students have varying assessments of teachers' teaching styles, from good to boring or too theoretical. | Assessment of Teachers' Teaching Styles | |

| Codes | Category | Theme |
|---|---|---|
| Students feel they will participate more if the teacher uses fun questions or conducts experiments. More discussion and reduced use of formulas were also considered positive factors. | Appreciation of Fun and Experimenting Questions | |
| Relating material to everyday life is considered important. Reduce the use of formulas and present material in a way that is easier to understand. | Relationships with Everyday Life and Minimizing Formulas | |

This research explores the factors that influence students' interest in science learning, with a focus on teachers' teaching practices. Teachers who rarely provide opportunities for students to talk or ask questions can create a feeling of less involvement and reduce interactivity in learning. A teacher's delivery style that is monotonous or too fast can also contribute to students' boredom and difficulty in following the lesson. The irrelevance of the material to students' daily life or personal interests is also a determining factor in learning interest. Students feel more focused when the teacher asks interesting questions or relates the material to their personal experiences, indicating that using these strategies can increase student engagement.

External factors, such as lack of self-confidence, busy activity schedules, lots of memorization, and prioritization of activities at the boarding school, can also affect students' learning concentration. Teachers need to pay attention to these factors to create a supportive learning environment. Ratings of teachers' teaching styles varied, and students responded positively to the use of fun questions, experiments, and greater discussion. Relating the material to everyday life was considered important, while reducing the use of formulas and presenting the material in a way that was easier to understand was also seen as a positive factor.

Thus, teachers can increase student interest by providing opportunities to speak, using varied delivery styles, relating material to students' personal experiences, and paying attention to external factors that can influence learning concentration. More use of interesting questions, experiments and discussions can also increase student participation in learning.

Teachers can consider strategies such as interesting questions, experiments, and reducing the use of formulas. It is also important for teachers to understand students' needs and concerns and provide a supportive learning environment. A number of studies have been conducted to identify factors that can increase interest in science in the school environment. These findings show that one of the main determinants of interest in science is making science learning more relevant to students' real lives [43], [44].

## 4 Conclusion

Science learning at Al-Muayyad Middle School shows that there are various factors that influence students' interest in learning. Teachers have a central role in shaping students' interests through their teaching practices. Factors such as lack of interactivity, less interesting delivery style, difficulty of the material, and irrelevance to everyday life can harm students' interest in learning. External factors, such as lack of self-confidence, busy schedules, lots of memorization, and prioritization of activities at the boarding school, also influence students' learning concentration. Students' assessments of teachers' teaching styles vary, and it is important for teachers to respond positively to student feedback.

Strategies that can increase student interest include providing opportunities to speak, using varied delivery styles, relating material to students' personal experiences, and paying attention to external factors that can influence learning concentration. The use of interesting questions, experiments, and discussions was also found to increase student participation. Thus, an approach that pays attention to these aspects can make a positive contribution to students' interest in learning in science subjects at Al-Muayyad Middle School, Surakarta. Implementation of these strategies can provide a foundation for the development of teaching practices that are more effective and engaging for students.

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