



The Relationship Between Parental Attention and Learning Environment on Students' Science Achievement

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Abstract. This study investigates the relationship between parental attention and the learning environment on students' science achievement. Using a quantitative approach with a cross-sectional design, data were collected from 200 junior high school students in Sukabumi. The results indicate that parental attention and the learning environment significantly influence science achievement, both individually and simultaneously, with a combined contribution of 70.8%. Parental attention, including emotional and behavioral involvement, and a conducive learning environment, characterized by access to resources and positive social interactions, were found to be critical factors. The findings underscore the importance of collaboration between parents, educators, and policymakers in fostering academic success. This study contributes to the literature by exploring the interaction between these factors and provides practical recommendations for enhancing science education.

Keywords: Academic Success, Education Policy, Learning Environment, Parental Attention, Science Achievement.

1 Introduction

Academic achievement of students, particularly in the field of science, is one of the key indicators of educational success [1]. In efforts to improve student performance, parental involvement has been identified as one of the critical factors that significantly contribute to children's learning success [2]. Previous studies have shown that parental engagement in their children's education can enhance motivation, foster a positive attitude toward learning, and improve academic outcomes [3]. In the context of science education, parental involvement can be manifested through emotional support Lyons et al. [4], supervision of learning activities Carroll [5], and assistance with school assignments [6]. However, despite numerous studies highlighting the importance of parental involvement, there remains a gap in understanding how this involvement interacts with other factors, such as the learning environment, in influencing students' science achievement.

The learning environment, both at home and at school, also plays a crucial role in supporting students' academic success [7]. A positive learning environment encompasses various aspects, such as physical facilities, a conducive learning atmosphere,

support from teachers, and peer interactions [8]. Research by [9] indicates that a supportive learning environment can enhance student engagement in learning, which ultimately impacts their academic performance. Data from the Program for International Student Assessment [10] also revealed that countries with favorable learning environments, such as Finland, tend to have higher science achievement levels compared to countries with less supportive learning environments [11]. This underscores that a conducive learning environment is a critical prerequisite for student success, particularly in understanding complex scientific concepts.

Although parental involvement and the learning environment have been extensively studied separately, the relationship between these two factors in influencing students' science achievement remains poorly understood. Parental involvement can help create a positive learning environment at home, such as providing a comfortable study space, access to educational resources, and sufficient time for learning [12]. Conversely, a supportive learning environment at school can amplify the positive effects of parental involvement, as students who feel supported both at home and at school tend to have higher motivation and better abilities to tackle academic challenges. The complexity of the interaction between parental involvement and the learning environment highlights the need for further research to understand how these two factors influence and contribute to students' science achievement.

The urgency of this research lies in the need to identify effective strategies to improve students' science performance, especially amidst global challenges in education. In an era that increasingly emphasizes scientific literacy as one of the core competencies of the 21st century, understanding the factors that influence students' science achievement becomes even more critical [13]. This study offers novelty by exploring the relationship between parental involvement and the learning environment simultaneously, as well as how their interaction affects students' science achievement. Thus, this research not only contributes to academic literature but also provides practical insights for parents, teachers, and policymakers in designing more effective interventions to improve the quality of education.

This study aims to explore the relationship between parental involvement and the learning environment in relation to students' science achievement. Specifically, this research seeks to answer three main questions: (1) Is there a significant relationship between parental involvement and students' science achievement? (2) Does the learning environment influence students' science achievement? and (3) How does the interaction between parental involvement and the learning environment affect students' science achievement? By addressing these questions, this study is expected to provide in-depth empirical evidence on the factors influencing students' science performance and offer relevant recommendations for improving the quality of education.

2 Literature Review

2.1 Parental Attention

Parental attention is defined as the level of involvement and support provided by parents to their children in various aspects of life, including education [14]. According to [15], parental attention consists of two main components: emotional involvement and behavioral involvement. Emotional involvement includes affection and moral support, while behavioral involvement encompasses concrete activities such as helping children with homework or attending school meetings. Research indicates that consistent parental attention can influence children's cognitive and social development, which ultimately impacts their academic achievement [16].

In the context of science learning, parental attention plays a crucial role in supporting students' academic success [17]. URT [18] found that parents who are actively attentive to their children's education tend to have children who perform better academically. This attention can take the form of discussing school subjects, assisting with assignments, or encouraging children to engage in science-related activities at home, such as simple experiments. Gwija [19] also emphasized that parental attention not only improves academic performance but also fosters children's motivation and positive attitudes toward learning. These findings suggest that parental attention has both direct and indirect impacts on children's academic success, particularly in the field of science.

2.2 Learning Environment

The learning environment refers to the physical and social conditions in which the learning process takes place [20]. This environment includes various factors, such as educational facilities Bosch [21], interactions between students and teachers Grant & Kelly [22], and peer support [23]. Durlak & Weissberg [24] argue that a positive learning environment can create an atmosphere that supports effective learning. A conducive environment encourages students to actively participate in the learning process, ultimately improving their academic outcomes [25].

Several factors influence the quality of the learning environment, including the quality of teaching, school facilities, and social support [26]. The quality of teaching significantly affects students' motivation and engagement. Competent and inspiring teachers can make learning materials more engaging and easier to understand [27]. Additionally, adequate facilities, such as well-equipped science laboratories and good libraries, also contribute to the quality of the learning environment [28]. Social support from peers and parents is equally important, as it fosters a collaborative and supportive atmosphere during the learning process.

The relationship between the learning environment and students' academic achievement has been widely demonstrated in research. Wang & Eccles [29] found that students who learn in a positive and supportive environment tend to achieve better academic outcomes compared to those in less supportive environments. For example, a study in Indonesia revealed that students with access to good learning facilities and strong social support from parents and peers performed better in science exams than

those without such access [30]. These findings highlight that a good learning environment can enhance students' motivation and academic achievement, particularly in science education.

2.3 Science Learning Achievement

Science learning achievement refers to students' ability to understand and apply scientific concepts [31], as well as the outcomes they achieve in evaluations or exams related to science subjects. According to the National Research Council, science achievement is not only measured by test scores but also by students' ability to think critically and solve problems in scientific contexts. Therefore, science achievement is considered an important indicator of students' understanding and skills in science [32].

Several factors influence science learning achievement, including the quality of teaching, student motivation, and parental attention [33]. High-quality teaching, which involves effective teaching methods and the use of appropriate resources, can enhance students' understanding of science material [34]. Additionally, students' intrinsic motivation to learn science plays a crucial role in determining their achievement [35]. Research shows that students with high motivation are more active in learning and more successful in achieving their academic goals [36]. Parental attention, such as providing support and assistance in learning, can also improve students' performance in science subjects [17].

3 Research Methodology

This study employs a quantitative approach with a cross-sectional design to analyze the relationship between parental attention, the learning environment, and students' science learning achievement. The quantitative approach was chosen because it allows for the collection of numerical data that can be statistically analyzed to test hypotheses [23]. The cross-sectional design enables data collection at a single point in time, making it efficient for identifying patterns of relationships between variables [37]. The study aims to analyze the effects of each independent variable, as well as their interaction, on students' science learning achievement.

Table 1. Research Variables

Model	Variables Entered	Variables Removed	Method
1	Learning_Environment, Parental Attention ^b		Enter

a. Dependent Variable: Science_Achievement_Scores

b. All requested variables entered.

3.1 Population and Sample

The population of this study consists of 8th-grade students from several junior high schools in Sukabumi. The sample was selected using a stratified random sampling technique to ensure representation from various socioeconomic backgrounds, genders, and academic achievements. The population was divided into strata based on specific criteria, namely gender and parental educational background, and students were randomly selected from each stratum.

3.2 Research Instruments

1. Parental Attention Questionnaire: Measures parental involvement in children's learning activities, communication, and emotional support. The questionnaire uses a 5-point Likert scale and has been validated [38].
2. Learning Environment Questionnaire: Assesses the availability of learning resources, the physical atmosphere of the learning space, and support from teachers and peers [39].
3. Science Achievement Test: A standardized test based on the 8th-grade curriculum to measure students' understanding of scientific concepts, critical thinking, and problem-solving skills.

3.3 Data Collection Procedure

1. Preparation: Obtain permission from schools and parents.
2. Questionnaire Distribution: Questionnaires were distributed both in person at schools and through online platforms.
3. Science Test Administration: The test was conducted at schools under direct supervision.
4. Data Processing: Data were checked for validity and then analyzed using statistical software. The data collection process was designed to take place over two months.

3.4 Data Analysis

1. Descriptive Statistics: Describe respondent characteristics (age, gender, parental educational background).
2. Inferential Statistics (Multiple Linear Regression): Analyze the effects of parental attention and the learning environment on students' science achievement Dini et al.[41].
3. Correlation Analysis: Evaluate the relationships between variables in greater depth.

Table 2. Description of Research Hypotheses

Null Hypotheses (H ₀)	Alternative Hypotheses (H ₁)
1. There is no significant relationship between parental attention and students' science learning achievement.	1. There is a significant relationship between parental attention and students' science learning achievement.
2. There is no significant relationship between the learning environment and students' science learning achievement.	2. The learning environment has a significant effect on students' science learning achievement.
3. There is no interaction between parental attention and the learning environment in influencing students' science learning achievement.	3. The interaction between parental attention and the learning environment affects students' science learning achievement.

4 Results

In this study, the respondents consisted of 200 students currently enrolled in junior high schools (SMP) in Sukabumi.

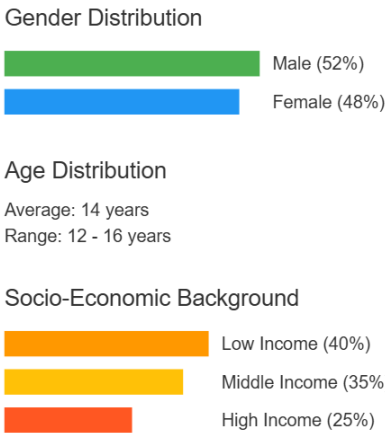


Fig 1. Demographic and Socio-Economic Profile of Junior High School Students

Out of the total 200 students, 52% were male, and 48% were female. The average age of the respondents was 14 years, with an age range between 12 and 16 years. Additionally, the socioeconomic backgrounds of the respondents varied, with 40% coming from low-income families, 35% from middle-income families, and 25% from high-income families. This variation is important for understanding how demographic factors may influence parental attention and students' learning environments [42].

Parental attention was measured using a questionnaire consisting of 20 items that assessed aspects such as parental involvement in home learning activities, communication between parents and children, and emotional support provided. The analysis results showed that 65% of parents provided high levels of attention to their children's education, 25% demonstrated moderate levels of attention, and 10% showed low levels of attention.

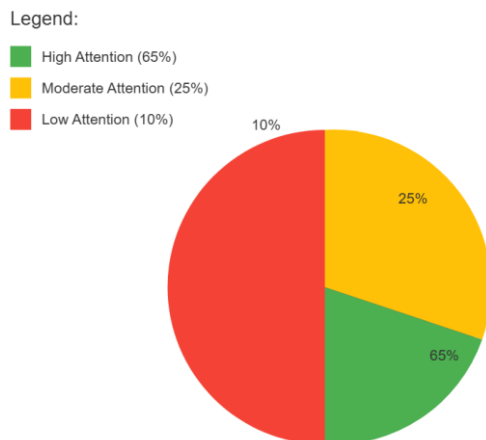


Fig 2. Parental Attention to Children's Education

The learning environment was measured using an instrument that included factors such as the physical comfort of the study space, the availability of learning resources, and social interactions within the learning environment. The results indicated that 70% of students reported having a conducive learning environment, 20% rated their learning environment as moderate, and 10% considered their learning environment to be unsupportive.

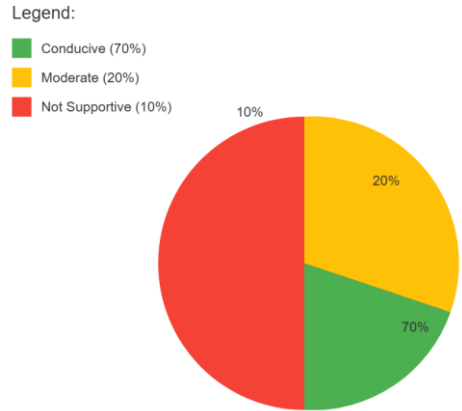


Fig 3. Learning Environment Conditions

Science learning achievement was assessed through a standardized test covering various basic concepts in science, including physics, biology, and chemistry. The average science achievement score among the students in this study was 76.65 on a scale of 100, with 32.5% of students scoring above 80 and 30.5% scoring at or below 70. These results indicate significant variation in science learning achievement among the students.

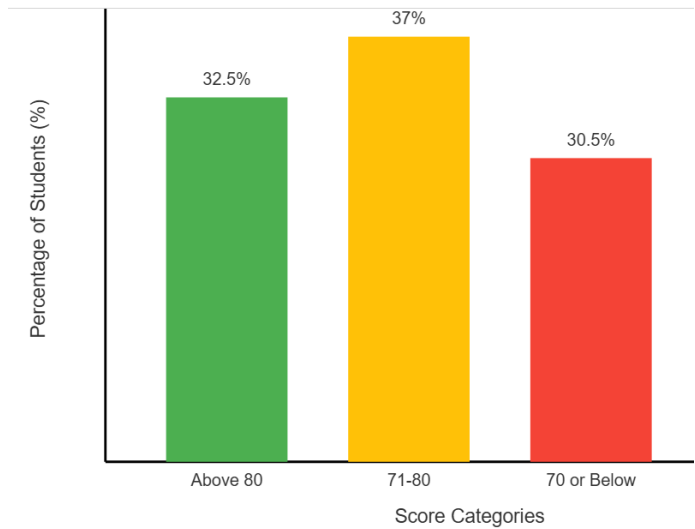


Fig 4. Science Achievement Scores Distribution

4.1 Multiple Linear Regression Assumption Testing

Before conducting hypothesis testing using multiple linear regression, all assumptions required for the analysis were tested to ensure the validity of the model. The results of

the assumption tests showed that the data met all the requirements for multiple linear regression, as follows:

1. Residual Normality: The residuals were normally distributed, with a significance value of 0.259 ($p > 0.05$), indicating that the normality assumption was satisfied.
2. Linearity of Relationships: The relationships between the independent variables (parental attention and learning environment) and the dependent variable (students' science learning achievement) were linear, allowing the regression model to be used for analysis.
3. No Multicollinearity: No strong correlations were found between the independent variables, as indicated by Variance Inflation Factor (VIF) values below the threshold of 10.
4. Homoscedasticity: The residual variance was constant, confirming that the homoscedasticity assumption was met.
5. No Autocorrelation: No correlation was found between residuals at different time points, as indicated by a Durbin-Watson value within the acceptable range.

With all assumptions satisfied, the multiple linear regression model was deemed appropriate for hypothesis testing.

4.2 Hypothesis Testing Results

Hypothesis testing was conducted using SPSS software to analyze the effects of parental attention and the learning environment on students' science learning achievement, both individually and simultaneously. The results showed that all null hypotheses (H_0) were rejected, indicating that the independent variables had significant effects on the dependent variable. The key findings of the study are as follows:

The Effect of Parental Attention on Students' Science Learning Achievement

The analysis revealed that parental attention had a significant effect on students' science learning achievement. This indicates that the higher the level of parental attention, the better the students' science learning outcomes. Parental attention, which includes emotional and behavioral involvement such as helping children study, providing moral support, and monitoring academic progress, was found to be a critical factor in improving students' academic performance.

The Effect of the Learning Environment on Students' Science Learning Achievement

The learning environment also had a significant effect on students' science learning achievement. A conducive learning environment, both at home and at school, such as the availability of learning resources, a supportive physical atmosphere, and encouragement from teachers and peers, positively contributed to students' academic success in science subjects.

The Simultaneous Effect of Parental Attention and the Learning Environment on Students' Science Learning Achievement

Simultaneously, parental attention and the learning environment had a significant effect on students' science learning achievement. The analysis showed that these two independent variables collectively contributed 70.8% to the dependent variable (students' science learning achievement), while the remaining 29.2% was influenced by

other factors not examined in this study. This finding highlights that parental attention and the learning environment are key factors influencing students' success in science learning.

5 Discussion

The findings of this study emphasize the importance of parental attention and the learning environment in supporting students' science learning achievement. Parental attention not only provides emotional support and motivation but also creates a positive learning atmosphere at home. On the other hand, a conducive learning environment, both at home and at school, offers the facilities and social support necessary for students to understand complex scientific concepts.

The interaction between parental attention and the learning environment also showed a significant effect on students' science learning achievement. This indicates that parental attention can enhance the positive effects of a good learning environment, and conversely, a supportive learning environment can maximize the benefits of parental attention. Therefore, collaboration between parents, teachers, and schools is essential to create optimal conditions for student learning.

These findings align with previous research showing that parental involvement directly contributes to improving students' academic performance. Parental involvement, such as helping children complete school assignments, providing motivation, and monitoring academic progress, creates a supportive learning atmosphere at home. This not only enhances students' understanding of the material but also builds their confidence and intrinsic motivation to learn. Research by Fan and Chen Jungert & Koestner [43] also demonstrated that parental attention has a significant positive relationship with students' academic performance, particularly in subjects requiring deep understanding, such as science.

A good learning environment, with access to educational resources such as books, technology, and adequate learning facilities, has been shown to increase student engagement in the learning process [26]. A conducive learning environment includes not only physical aspects, such as a comfortable and distraction-free study space, but also social aspects, such as support from teachers and peers. Research by Bimaruci Hazrati Havidz & Mujakiah [44] found that students who learn in a supportive environment tend to be more motivated to study and achieve better academic outcomes. Additionally, a positive learning atmosphere helps students focus and reduces stress levels that may hinder the learning process.

Previous studies have shown that students who receive greater parental attention and are in a good learning environment are more likely to achieve high academic performance [45]. The combination of parental attention and a supportive learning environment creates a synergy that strengthens students' ability to understand the material, especially in science subjects, which are often considered challenging. For example, parental attention can help students overcome learning difficulties at home, while a good

learning environment at school, such as a well-equipped science laboratory and competent teachers, provides students with opportunities to practice and deepen their understanding of scientific concepts.

Furthermore, this study supports Bronfenbrenner's ecological systems theory Härkönen [46], which emphasizes that a child's development is influenced by interactions between various systems in their environment, including family and the learning environment. In this context, parental attention serves as support from the family system, while the learning environment encompasses the school and community systems. Positive interactions between these systems have a significant impact on students' cognitive development and academic performance. Thus, the findings of this study reinforce the view that students' academic success is not only determined by individual factors but also by the support from their social environment.

Additionally, these findings are consistent with research by N. E. Hill & Tyson [42], which found that parental involvement in children's education, such as attending school meetings, discussing lessons, and encouraging learning, has a significant impact on academic performance. This study also highlights the importance of a supportive learning environment, such as access to educational technology and a conducive learning atmosphere, in improving students' learning outcomes. Therefore, parental attention and a good learning environment not only contribute individually but also complement each other in creating optimal conditions for student learning.

5.1 Practical Implications

The findings of this study provide practical implications for parents, educators, and policymakers. Parents need to be more actively involved in their children's education, not only by providing emotional support but also by allocating time and resources to help their children learn. On the other hand, schools and policymakers must ensure that the school learning environment meets students' needs, such as providing adequate learning facilities, training for teachers, and programs that encourage parental involvement. With strong collaboration between families and schools, students can achieve their full academic potential.

6 Conclusion

This study highlights the significant influence of parental attention and learning environment on students' science achievement. The findings reveal that both factors, individually and collectively, contribute substantially to academic success, with a combined influence of 70.8%. Parental attention, encompassing emotional and behavioral involvement, plays a critical role in fostering a supportive home learning environment. Similarly, a conducive learning environment, characterized by access to educational resources, positive social interactions, and supportive school facilities, enhances students' engagement and academic performance. The interaction between these two factors underscores the importance of collaboration between parents, educators, and policymakers in creating optimal conditions for learning. These results provide practical

insights for improving science education and emphasize the need for integrated efforts to support students' academic development.

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