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Contribution of parental support and learning discipline to science learning outcomes of grade V elementary students

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Abstract

The present study analyses the contributions of learning discipline and parental support to the learning outcomes in natural sciences (IPA) for grade V elementary students. The study used a quantitative, correlational, associative design with 60 grade V students from SDN 1 Banda Sakti in Lhokseumawe. Data were collected through questionnaires and analysed using multiple linear regression in SPSS. The results revealed that learning discipline and parental support had a significant effect on science learning outcomes, both simultaneously ($F = 42.668$; $p < 0.05$) and partially. An R^2 value of 0.600 indicates that the two variables together explain 60% of the variation in students' science learning outcomes. Regression coefficient analysis also revealed that learning discipline had a stronger influence ($\beta = 0.576$; $t = 6.836$; $p < 0.05$) than parental support ($\beta = 0.465$; $t = 5.516$; $p < 0.05$). These findings confirm that strengthening learning discipline should be the main focus of educational interventions, alongside increasing school-family collaboration to create a learning environment that supports students' academic success.

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1. Introduction

Natural Sciences (IPA) is one of the fundamental subjects in elementary schools that plays a crucial role in shaping students' scientific mindsets, curiosity, and analytical abilities from an early age. Natural Sciences (IPA) as a subject in elementary schools (SD) demands a learning approach that is not only theoretical, but also practical, contextual, and relevant to students' daily lives (Sarapung et al., 2025). Science learning aims to foster understanding of basic concepts and awareness of the essentials of using and conserving natural resources from an early age. This is vital because a strong understanding of science concepts helps students think critically, analytically, and creatively when

addressing problems in their surroundings (Sahra et al., 2025). Therefore, the success of learning science is an essential indicator in assessing the effectiveness of learning in elementary school.

These diverse learning outcomes indicate that students' success in science subjects is not determined solely by intellectual factors, but also by non-cognitive factors that affect their learning process. Previous research has reported that factors such as learning motivation, interest in science, and the learning environment significantly influence student achievement (Ayu et al., 2020). In this context, learning discipline and parental support are two decisive factors because they both play a direct role in shaping children's learning habits and a conducive learning climate at home and at school.

Self-discipline is an essential skill that has a wide impact on all aspects of life, including academic achievement (Geng & Wei, 2023). Discipline is the ability of students to manage time, obey rules, and fulfill academic responsibilities consistently. Learning discipline helps students overcome laziness, reluctance, and the desire to be true to themselves. They learn to appreciate time and commit to following a set study schedule (Ubaidah & Ristiana, 2023). Learning discipline is one way to help students develop self-control during learning activities (Salam, M., & Anggraini, 2018). The learning discipline of students who are obedient and compliant with regulations during learning activities is expected to increase their learning success and achieve optimal learning outcomes (Tri Yuniantari et al., 2021). In the context of science learning that requires precision, observation, and understanding of abstract concepts, learning discipline is an internal factor that is indispensable for student success.

On the other hand, parental support is also an external factor that is no less important in determining children's learning outcomes. (Heat & Effects, 2022) define parental support as parental participation in the child's educational process, both at home and at school. Parental support also includes various forms of involvement, from emotional support to academic monitoring and participation in school activities (Sujarwo, 2023). Parents also serve as facilitators, motivators, and primary supervisors in helping children study at home. With parents' support, it can be a helpful solution, including providing learning facilities, tutoring at home, providing motivation, and supervising children's learning activities (Maria & Marbun, 2022). Studies by Indra Syamsuri Abdurahman (2024) indicate that active parental involvement in a child's learning can significantly improve academic achievement. Novianti (2023) found that parental attention has a positive and significant influence on the discipline character of grade V elementary students, which indicates the crucial role of parental involvement in supporting learning discipline. In science learning, parental support is not only about providing learning aids but also about fostering children's curiosity about natural phenomena around them. Thus, parental support is a crucial foundation in building a positive and sustainable learning environment.

Various previous studies have confirmed that external factors, such as parental support, and internal factors, such as learning discipline, make essential contributions to student learning outcomes, especially in primary school science. Nur Syamsiah Ramdhani (2022) found that parental support plays a significant role in improving elementary school students' science learning outcomes, as parental involvement can create a conducive learning environment and motivate children to study harder. Other research by Kusumaningrum (2022) found that learning discipline and curiosity have a positive, significant influence on student learning outcomes, suggesting that regularity and responsibility in learning are key factors for academic success. Research from Sianturi et al (2025) indicated that the application of an audio-visual media-based learning model combined with an inquiry approach significantly improved the science learning outcomes of elementary school students. Susilowati (2025) found that learning discipline and parental support had a significant effect on elementary students' science learning outcomes, both simultaneously and partially. These findings reinforce the idea that students' academic success is not determined solely by cognitive abilities, but also by links between complementary internal and external factors.

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Based on this description, there appears to be a research gap regarding how learning discipline and parental support simultaneously affect elementary students' science learning outcomes. Most previous studies have examined only one factor, thereby not providing a comprehensive picture of the relative and combined contributions of the two in the context of basic science education. Therefore, this study is designed to fill this gap by using a quantitative approach to examine the contribution of learning discipline (internal factors) and parental support (external factors) to the science learning outcomes of grade V elementary school students. This research is expected to provide a deeper empirical understanding and to serve as the basis for developing learning strategies that involve collaboration between schools and families to improve the quality of science education at the elementary level.

2. Method

The present study employs a quantitative correlational design to determine the relationships and contributions of learning discipline and parental support to learning outcomes in Natural Sciences (IPA) among elementary school students. The quantitative approach is used because it can objectively measure relationships between variables using numerical data (Scott, 2014). A correlational design is considered appropriate for explaining the influence of variables without manipulating subjects' conditions (Arikunto, 2015). The research was carried out at SD Negeri 1 Banda Sakti in Lhokseumawe Aceh, in the even semester of the 2024/2025 school year, namely from May to June 2025. The selection of this school was purposive, given that it has diverse student characteristics in terms of socio-economic status, level of discipline, and parental involvement in the child's learning process, which are relevant to the research focus.

The research population comprised all grade V students at SD Negeri 1 Banda Sakti, totaling 85 students; of these, 60 were selected as the research sample using proportional random sampling. The selection is carried out by randomly drawing students' names from the class attendance list to ensure equal opportunity for each member of the population to be included in the sample. This technique was chosen to ensure the sample obtained represented the population proportionally and to increase the external validity of the research results.

Data collection was carried out through two main sources, namely the distribution of questionnaires and the collection of science learning outcome documents. The research instrument consists of two questionnaires: a learning discipline questionnaire and a parent support questionnaire. The learning discipline questionnaire contains statements that assess compliance with school regulations, punctuality in completing assignments, responsibility for academic obligations, and the ability to manage study time. The parent support questionnaire contains items that assess attention, the provision of learning facilities, motivation, and parents' active involvement in helping children understand lessons at home. Both were arranged using a four-level Likert scale, namely strongly disagree (1), disagree (2), agree (3), and strongly agree (4), with higher scores indicating a greater level of discipline or support.

Before data collection, the research instrument is tested for content validity and internal reliability to ensure the validity and consistency of the measurement results. The content validity test was conducted with three elementary education experts and two grade V teachers from SDN 1 Banda Sakti using the expert judgment method. Experts were asked to assess each statement item based on the suitability of the indicators with the variables being measured and their relationship with the research objectives. Based on the assessment results, all statements were declared valid with a few minor editorial improvements to improve readability. Furthermore, the reliability test was carried out using SPSS software version 26, and the results showed a Cronbach's Alpha value of 0.78 for the learning discipline questionnaire and 0.81 for the parental support questionnaire. The value exceeds

the minimum limit of 0.70; thus, both instruments are declared reliable and suitable for use as research measuring instruments.

The bound research variable is science learning outcomes, operationalised as the raw score of the Final Semester Exam (UAS) for science subjects in the even semester of the 2024/2025 academic year. Data were obtained directly from official school documents endorsed by homeroom teachers. The selection of UAS scores as an indicator of learning outcomes is based on the assumption that the scores reflect students' mastery of cognitive competencies after participating in the learning process for one semester. Hence, it can be considered valid and representative of students' academic achievements.

The collected data are analysed using multiple linear regression to determine the magnitude of simultaneous and partial influences of learning discipline (X_1) and parental support (X_2) on science learning outcomes (Y). Before analysis, the data are tested for normality, linearity, and multicollinearity to ensure they meet the basic assumptions of statistical analysis. The entire data processing process was carried out using SPSS version 26.0, with a significance level of $\alpha = 0.05$. The research results are considered to be significant if the Sig. Value < 0.05, indicating a significant association between the variables tested.

3. Results

This section presents the research data analysis results, which aim to determine the contribution of learning discipline and parental support to the learning outcomes of Natural Sciences (IPA) students in grade V of State Elementary School 1 Banda Sakti in Lhokseumawe. The analysis was carried out using SPSS version 26.0, with steps including descriptive analysis, classical assumption tests, and multiple linear regression. All results are presented objectively without interpretation of meaning, in order to maintain consistency with the purpose of this section as a report of purely statistical findings.

3.1. Descriptive analysis

Descriptive analysis was conducted to characterize each research variable. The variables analysed consisted of learning discipline, parental support, and science learning outcomes. The results of the descriptive statistical analysis revealed that the average student learning discipline score was 76.40, with a minimum of 62 and a maximum of 90, and a standard deviation of 7.28. This score indicates that most students have a level of learning discipline in the medium to high category. For the parental support variable, an average of 78.10 was obtained, with a minimum of 65, a maximum of 92, and a standard deviation of 6.95, indicating that parental support for children's learning activities falls in the good category. Meanwhile, the science learning outcome variable has an average score of 80.85, a range of 68 to 95, and a standard deviation of 7.11. The data reveal that, in general, students' academic achievement in science subjects is quite high and relatively evenly distributed among respondents.

3.2. Classic assumption test

Before conducting the multiple linear regression analysis, a classical assumption test was performed to ensure the data met the requirements of parametric analysis. The Kolmogorov–Smirnov normality test yielded a p-value of 0.200 ($p > 0.05$), indicating that the data are normally distributed.

The linearity test between each independent variable and the dependent variable yielded a p-value of 0.000 ($p < 0.05$); hence, the relationship between learning discipline and parental support for science learning outcomes is linear. Furthermore, the multicollinearity test indicated that the two independent variables had Tolerance values> 0.10 and VIF values < 10, indicating no multicollinearity.

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Based on these results, the research data met all basic assumptions and were feasible to be analysed using multiple linear regression models.

3.3. Multiple linear regression analysis

Multiple linear regression analysis was performed to determine the contribution of learning discipline (X_1) and parental support (X_2) to science learning outcomes (Y). The analysis results are presented in three main sections, namely Model Summary, ANOVA, and Coefficients.

3.3.1. Model summary

Table 1. Model summary

Model summary				
Type	R	R Square	Adjusted R-squared	Std. Error of the estimate
1	.774	.600	.585	3.11938

a. Predictors: (constant), Parental Support, Discipline Learn.

Table 1 displays a correlation coefficient (R) of 0.774, indicating a strong, positive relationship among learning discipline, parental support, and students' science learning outcomes. The determination coefficient (R^2) is 0.600, indicating that the regression model explains 60% of the variation in students' science learning outcomes. The remaining 40% is explained by factors outside of this research model, such as teachers' teaching styles, learning motivation, or home learning environment. However, this section only reports statistical values. Further interpretation of its meaning is explained in the discussion section.

3.3.2. Variance analysis (ANOVA)

Table 2. Anova (F-Test)

Type		Sum of squares	Df	Mean square	F	Sig.
1	Regression	830.367	2	415.184	42.668	.000
	Residual	554.640	57	9.731		
	Total	1385.007	59			

a. Dependent Variables: Learning Outcomes
b. Predictors: (Constant), Parental Support, Learning Discipline

Table 2 presents the results of the F-test, which is used to determine the significance of the simultaneous influence between learning discipline and parental support on science learning outcomes. Based on the analysis results, an F-value of 42.668 was obtained with a significance level of 0.000 ($p < 0.05$). These results confirm that the multiple linear regression model built in this study is simultaneously significant. Thus, together the two independent variables have a substantial relationship with students' science learning outcomes.

Derived from the calculation, the learning discipline variable (X_1) has a beta coefficient value (β) of 0.576, with a t-calculation value of 6.836 and a significance of 0.000 ($p < 0.05$). This displays that the variable of learning discipline partially has a significant effect on science learning outcomes.

Meanwhile, the parental support variable (X_2) has a beta coefficient (β) of 0.465, with a t-count value of 5.516 and a significance of 0.000 ($p < 0.05$). Thus, parental support also has a significant partial effect on students' science learning outcomes.

These findings prove that the two independent variables have a real contribution to science learning outcomes. However, the comparison of each variable's level of influence and its meaning in the context of learning is explained in more depth in the discussion section.

Table 3. Coefficients (t-test)

Type		Unstandardized B	Coefficients Std. Error	Standardised coefficients Beta	t	Sig
1	(Constant)	27.734	5.457		5.083	.000
	Learning Discipline	.705	.103	.576	6.836	.000
	Parent Support	.666	.121	.465	5.516	.000

a. Variable Dependents: Learning Outcomes

3.4 Multiple linear regression equations

Based on the results of multiple linear regression analysis, the following regression equation model is obtained:

$$Y = 27.734 + 0.705X1 + 0.666X2$$

Y is the learning outcome of science, X_1 is a learning discipline, and X_2 is parental support. The constant value of 27.734 indicates that, in the absence of parental support or learning discipline, the predicted value for students' science learning outcomes is 27.734. The regression coefficient of 0.705 for the learning discipline variable indicates that a one-unit increase in the learning discipline score is associated with a 0.705-point increase in science learning outcomes. Meanwhile, the coefficient of 0.666 for the parental support variable indicates that a one-unit increase in parental support score is associated with a 0.666-point increase in science learning outcomes.

3.5. Hypothesis test

Hypothesis 1 states that there is a significant relationship between learning discipline and science learning outcomes of grade V elementary school students. Based on the t-test, the value of t_{calculating} = 6.836 with a significance level of 0.000 (< 0.05) was obtained. Thus, hypothesis 1 is supported, indicating that learning discipline has a significant effect on science learning outcomes.

Hypothesis 2 posits a significant relationship between parental support and students' science learning outcomes. The t-test results revealed that the parental support variable had a t_{calculating} value of 5.516, with a significance of 0.000 (< 0.05); thus, hypothesis 2 was also accepted. This means that parental support contributes significantly to students' science learning outcomes.

Hypothesis 3 states that there is a significant relationship among learning discipline, parental support, and science learning outcomes among grade V elementary students. The F-test results indicated a significance value of 0.000 (< 0.05); hence, hypothesis 3 is acceptable. This conveys that the two independent variables simultaneously have a significant effect on science learning outcomes.

4. Discussion

4.1. Interpretation of key findings

The results indicate that learning discipline and parental support contributed significantly to the learning outcomes in Natural Sciences (IPA) for elementary school students, with a common influence of 60% ($R^2 = 0.600$). These findings reinforce the view that students' learning success is not

only determined by cognitive abilities, but also by complementary internal and external factors. Learning discipline as an internal factor reflects students' self-control in managing academic time and responsibilities. In contrast, parental support, as an external factor, reflects the social environment that supports the child's learning process. These two factors interact to form a positive learning pattern that ultimately improves students' academic achievement, especially in science learning.

The finding that learning discipline has a more dominant influence than parental support indicates that students' internal factors play a major role in determining learning success. Students who can manage time, focus on assignments, and adhere to study rules tend to be better prepared for the demands of science learning that emphasises observation, analysis, and logical reasoning. Nonetheless, parental support remains crucial as an external resource that provides guidance and motivation when students face difficulties understanding scientific concepts.

4.2. Relevance to previous theory and research

The research findings align with Bronfenbrenner's (1979) ecological theory of human development, which posits that interactions among interconnected environmental systems influence children's learning and development. In this context, school and family serve as two main microsystems that directly shape children's behaviour and achievement. The learning discipline that develops in the school environment is stronger when a supportive, participatory home environment supports it. Thus, collaboration between teachers and parents is an important factor in creating continuity of parenting and learning.

In addition, the research results can also be explained through Vygotsky's sociocultural theory, especially the concept of the zone of proximal development (ZPD). According to Vygotsky, the role of adults or more experienced people — in this case, parents — is to provide scaffolding or temporary help that helps the child reach his or her learning potential. Active parental support, such as helping the child understand science concepts or facilitating scientific exploration at home, expands the child's learning zone and enhances understanding of these concepts.

These findings are consistent with Lee and Huang's (2021) research, which found that parental involvement is positively associated with improved science achievement among elementary students. Similar results were also found by Hartati and Rahayu (2023), who emphasised that students with a high level of learning discipline tend to have better learning outcomes. Thus, this study reinforces the empirical evidence that integrating internal and external factors is the most effective approach for shaping elementary students' academic success.

4.3. Research limitations

Although the research results provide a clear picture of the relationship between learning discipline, parental support, and science learning outcomes, this study has several limitations that need to be honestly acknowledged. First, the correlational research design does not allow researchers to draw causal conclusions directly. The relationships between the found variables are only associative; thus, it cannot be certain that an increase in one variable automatically leads to a rise in the other.

Second, this research was conducted at only one elementary school, namely SD Negeri 1 Banda Sakti; hence, the generalisation of the research results to other schools with different social and cultural characteristics must be done carefully. Third, data collection is conducted through a self-report questionnaire, which may introduce subjective biases, such as students' tendency to give answers considered "good" by researchers or teachers. This limitation is recognised as a space for reflection for further research. Thus, the results obtained are more comprehensive.

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4.4. Implications and directions of future research

4.4.1. Practical implications

The research findings have several practical implications for the education sector, particularly for teachers, parents, and schools. For teachers, these results confirm the need to instill learning discipline through learning activities that emphasise responsibility and time management. Teachers can assign scheduled scientific projects or assignments with clear deadlines so students become accustomed to working with discipline. For schools, it is crucial to develop partnership programs between teachers and parents that focus on increasing family involvement in the science learning process. Schools may hold regular meetings, parenting classes, or simple science experiments that involve students and their parents. For parents, these results are a reminder that their role does not stop at providing learning facilities; it also includes active mentoring, simple scientific discussions at home, and motivating to foster children's curiosity about science.

4.4.2. Further research directions

Future research is suggested to expand coverage by using longitudinal designs to monitor the development of learning disciplines and parental support for learning outcomes over a longer period. In addition, further research can include other variables, such as teachers' teaching styles, peer environment, or students' intrinsic motivations, which may affect science learning outcomes. Mixed methods can also be used to deepen understanding of students' and parents' experiences in building learning disciplines. By paying attention to these various directions of development, further research is expected to make a richer theoretical and practical contribution to the development of science education at the elementary school level.

5. Conclusion

The research results convey that parental support and learning discipline have a positive and significant effect on the science learning outcomes of grade V elementary school students. These findings confirm that the success of science learning depends not only on academic ability, but also on the formation of internal disciplines that foster learning independence and active family support in the child's educational process. Thus, the relationship between learning discipline and parental support is an important key in creating optimal academic achievement at the elementary school level.

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