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Parent- and Student-Reported Parental Learning Support as Predictors of Biology Learning Outcomes among Junior High School Students

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A B S T R A C T

Parental learning support may be perceived differently by parents and students, and the predictive value of each report for biology achievement may vary across contexts. This exploratory secondary analysis examined whether parent- and student-reported parental learning support were associated with Grade VIII biology outcomes in one public junior high school in Sigi, Indonesia. The matched sample comprised the entire available cohort of 30 student-parent pairs, while biology outcomes were obtained from school records. The multiple-regression model was not statistically significant, $F(2, 27) = 0.977$, $p = .389$, $R^2 = .068$, adjusted $R^2 = -.002$. The parent-report estimate was positive but imprecise ($B = 1.358$, 95% CI [-0.844, 3.560], $\beta = .255$, partial $R^2 = .056$, $p = .217$), whereas the student-report estimate was near zero ($B = 0.082$, 95% CI [-2.567, 2.731], $\beta = .013$, partial $R^2 < .001$, $p = .950$). Thus, these data did not provide evidence that either report independently predicted biology achievement. The wide confidence intervals, small single-school sample, dichotomous response format, and unavailable psychometric evidence require cautious interpretation. The findings are exploratory and do not demonstrate that parental support is unimportant. Larger multisite studies using validated multidimensional measures are needed.

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INTRODUCTION

Biology learning requires students to connect observable phenomena with less directly observable structures and processes, sustain attention across conceptual explanations, and apply evidence when solving problems. Achievement in this subject therefore reflects not only conceptual understanding and scientific reasoning but also the conditions that support continued engagement with learning tasks. Local biology and science-education studies likewise show that motivational and instructional conditions are relevant to learning, although they do not operate in isolation (Jamhari et al., 2025; Jumaliani et al., 2026; Kusumawati, 2024).

The family is a continuing learning environment during early adolescence. Parental learning support refers here to observable behaviors such as reminding students to study, discussing school experiences, helping when difficulties arise, recognizing effort, and providing learning needs. These behaviors are conceptually closer to parental support or involvement than to

parents' internal motivation. Parental involvement is multidimensional, and its association with achievement may differ according to whether support occurs at home or at school and whether it is experienced as guidance, autonomy support, or control (Eden et al., 2024; Higgins & Katsipataki, 2015; Hill, 2022; Shumow et al., 2011; Zahedani et al., 2016)

Reports from parents and students need not represent the same experience of support. Parent reports reflect behaviors that adults believe they provide, whereas student reports reflect how those behaviors are perceived by the learner. Examining matched reports can therefore reveal whether either perspective has an independent predictive association with biology achievement. This distinction is especially relevant because broad measures of involvement can obscure differences in the form, timing, and perceived quality of support (Hill, 2022; Shumow et al., 2011).

Previous studies have often reported positive average associations between parental involvement and academic outcomes, including science-related outcomes, but the size and direction of associations vary across dimensions and contexts (Chohan & Khan, 2010; Higgins & Katsipataki, 2015; Shumow et al., 2011). The source study was conducted in a single Grade VIII cohort in Sigi and used matched parent and student questionnaires. Informal contextual observations suggested variation in home-study support, but because no systematic observation protocol was documented, those observations are treated only as background rather than as empirical evidence.

This exploratory analysis therefore examined the simultaneous and individual predictive associations of parent-reported and student-reported parental learning support with Grade VIII biology outcomes in one public junior high school in Sigi, Indonesia. Its contribution is deliberately narrow: it evaluates two matched informant scores in a biology-education context without claiming causal effects or testing an intervention.

METHOD

Research Design

This exploratory secondary analysis used a cross-sectional correlational (ex post facto) design. The two predictor scores represented parental learning support reported by a parent (X_1) and parental learning support reported by the corresponding student (X_2); the outcome was the student's documented biology score (Y). No treatment was administered. The study was conducted at one public junior high school in Sigi, Central Sulawesi, Indonesia. The available record did not specify the questionnaire date or the assessment period from which biology scores were drawn. Directionality and temporal precedence therefore cannot be established.

Population and Samples

The accessible population and analytic target were the complete Grade VIII cohort at the participating school: 30 students and one participating parent for each student. Total sampling yielded 30 matched student-parent pairs, and the available analysis reported no incomplete paired records. Each biology score was linked to the corresponding parent and student questionnaire scores through a de-identified code. Age, gender, class composition, family characteristics, explicit inclusion or exclusion criteria, and the process used to resolve any initially incomplete responses were not reported in the available study record. Generalization is therefore restricted to this cohort and closely similar contexts.

Instrument

Two separate questionnaires were administered to parents and students. The available item description covered study reminders, attention to school experiences, assistance with difficulties, educational communication, advice, recognition, and provision of learning needs. Because these indicators describe supportive behaviors rather than parents' internal motivation

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or students' own learning motivation, both summed scores are interpreted here as reports of parental learning support from different informants. Items used a dichotomous format (Yes = 1; No = 0), with higher summed scores indicating more reported support. The available record did not provide the questionnaire developer, number of items, subscales, sample items, adaptation procedure, possible score range, handling of negatively worded items, or evidence of content validity, construct validity, and reliability. Item-level data were also unavailable for estimating KR-20 or an alternative coefficient. Accordingly, these scores cannot be treated as validated measures, and the regression is framed as exploratory. Biology outcomes were obtained from school documentation, but the assessment type, score scale, and assessment period were not preserved in the available report.

Procedure

After obtaining school permission, the researcher identified the Grade VIII cohort, distributed the two questionnaires, checked returned responses, and documented biology scores. Responses were coded numerically and linked to the outcome through study codes; names were not included in the analytical file. The available record did not state whether research-ethics committee approval or exemption was obtained, how parental informed consent and student assent were documented, whether withdrawal procedures were explained, or how voluntariness was protected. These details must be confirmed from the original study records before publication.

Data Analysis Techniques

The available SPSS version 25 output was summarized using multiple linear regression with two predictors (Agni & Zainal, 2023). The overall model was evaluated with the F test and individual coefficients with t tests at $\alpha = .05$. Unstandardized coefficients are reported with 95% confidence intervals calculated using $t(27) = 2.052$. Partial R^2 for each predictor was calculated as $t^2/(t^2 + df)$, and Cohen's f^2 for the model as $R^2/(1 - R^2)$. Available diagnostics included a one-sample Kolmogorov-Smirnov test of residuals, deviation-from-linearity tests, tolerance/VIF values, and a Glejser test. Because $n = 30$ gives diagnostic tests limited power, $p > .05$ was not interpreted as proof that assumptions were satisfied. Q-Q plots, residual plots, leverage, studentized residuals, and Cook's distances were not available in the archived output.

RESULT AND DISCUSSION

Descriptive Information

Means, standard deviations, observed minima and maxima, skewness values, possible questionnaire score ranges, and zero-order correlations were not included in the available analytical record and could not be reconstructed from the regression summary. Consequently, range restriction and floor or ceiling effects cannot be evaluated. This reporting gap is a material limitation and should be resolved from the original data before confirmatory interpretation.

Assumption Diagnostics

The available tests showed a residual Kolmogorov-Smirnov p value of .200, a deviation-from-linearity p value of .760, and tolerance/VIF values of .876/1.141 for both predictors. Glejser p values were reported only as greater than .05. These diagnostics did not provide evidence of a major violation, but they are insufficient to establish normality, linearity, or homoscedasticity in a sample of 30. Exact Glejser values and graphical and influence diagnostics were unavailable.

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Table 1. Summary of Available Regression Assumption Diagnostics

Assumption	Available indicator	Result	Cautious interpretation
Residual normality	Kolmogorov-Smirnov p	.200	No evidence of marked deviation in this test
Linearity	Deviation p	.760	No evidence of nonlinearity in this test
Multicollinearity	Tolerance / VIF	.876 / 1.141	No problematic collinearity indicated
Homoscedasticity	Glejser p	> .05 (exact values unavailable)	No evidence in the reported test

Regression Results

The two-predictor model was not statistically significant, $F(2, 27) = 0.977$, $p = .389$, $R^2 = .068$, adjusted $R^2 = -.002$, Cohen's $f^2 = .073$. Thus, 6.8% of the observed variance was accounted for in this sample and 93.2% was not explained by the model. The negative adjusted R^2 indicates that, after accounting for the number of predictors, the model offered essentially no improvement over an intercept-only model. The estimated equation was $\hat{Y} = 59.169 + 1.358X_1 + 0.082X_2$, where X_1 is the parent-report support score and X_2 is the student-report support score.

Table 2. Multiple Regression Predicting Biology Learning Outcomes

Predictor	B	SE	95% CI for B	β	t	p	Partial R^2
Constant	59.169	17.228	[23.820, 94.518]	-	3.435	.002	-
Parent-report support	1.358	1.073	[-0.844, 3.560]	.255	1.265	.217	.056
Student-report support	.082	1.291	[-2.567, 2.731]	.013	.064	.950	< .001

The parent-report coefficient was positive, but the 95% confidence interval ranged from -0.844 to 3.560 and included zero. The estimate is therefore compatible with both a modest negative association and a positive association in the population represented by this cohort. The partial R^2 of .056 describes the unique sample association after adjustment for the student-report score, but the p value of .217 and wide interval indicate substantial uncertainty. These data do not establish an independent predictive association, and the cross-sectional design cannot support causal wording such as influence or effect.

Measurement quality is the primary alternative explanation. The listed items capture several supportive behaviors, but a dichotomous total score compresses variation and may combine practices that differ in form and educational meaning. Without item-level data, dimensionality, validity evidence, or reliability estimates, it is impossible to determine whether the coefficient is small because the underlying association is weak or because the measure is imprecise. Differences between parent and student perceptions may also be obscured when both are reduced to short summed scores.

The student-report support coefficient was close to zero ($\beta = .013$; partial $R^2 < .001$), but its 95% confidence interval for B was wide, from -2.567 to 2.731. The result should therefore be

described as an imprecise near-zero sample estimate, not as proof that students' perceptions of parental support are unrelated to biology achievement. The available instrument information is too limited to support a stronger substantive interpretation.

The present result differs from studies reporting positive associations between parental support or involvement and academic or science-related outcomes (Chohan & Khan, 2010; Higgins & Katsipataki, 2015; Hornby & Blackwell, 2018; Shumow et al., 2011) and from a review linking learning motivation with achievement (Eden et al., 2024; Utami et al., 2022). This difference does not demonstrate that the earlier evidence is inapplicable. Those studies used different populations, constructs, measurement formats, dimensions of involvement, and outcomes. In particular, science-focused research indicates that at-home and at-school involvement can relate differently to motivation and performance (Shumow et al., 2011), distinctions that the present dichotomous scores could not test.

The low R^2 and adjusted R^2 near zero describe a weak predictive model; they do not identify why most variance remained unexplained. Unexplained variance may reflect omitted variables, measurement error, restricted score ranges, random variation, or model misspecification. Because these possibilities were not directly measured, no one explanation from the present data (Angelia et al., 2023).

Practically, the findings support caution against assuming that general support scores will independently predict biology achievement in every cohort. They do not test whether a particular parent-engagement strategy is effective. Recommendations such as clear family-school communication, process-focused feedback, and structured home-study routines arise from the broader literature rather than from an intervention evaluated here (Higgins & Katsipataki, 2015; Hill, 2022). Biology teachers and schools may consider such practices, but their local effectiveness requires direct evaluation.

The study is limited by the small census of one school cohort, low statistical power and coefficient stability, unavailable descriptive and zero-order statistics, incomplete information about participant characteristics and assessment timing, dichotomous questionnaires without reported psychometric evidence, unavailable graphical and influence diagnostics, and incomplete ethics reporting. These limitations substantially restrict generalization and prevent causal inference. Future research should use validated multidimensional measures, larger multisite samples, prespecified models, prior-achievement and relevant contextual controls, complete diagnostic reporting, and documented consent and assent procedures.

CONCLUSION

In this sample of 30 matched student-parent pairs and with the measures used, the study did not find evidence that either parent-reported or student-reported parental learning support independently predicted Grade VIII biology outcomes. The overall model was not significant, $F(2, 27) = 0.977$, $p = .389$, $R^2 = .068$, adjusted $R^2 = -.002$. The parent-report estimate was $B = 1.358$, 95% CI [-0.844, 3.560], and the student-report estimate was $B = 0.082$, 95% CI [-2.567, 2.731]. These intervals make the uncertainty visible and do not justify a causal claim or the stronger conclusion that parental support is unrelated to achievement. The most defensible interpretation is that this exploratory analysis, using these instruments in this single cohort, did not establish independent prediction.

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