Jurnal Pendidikan Progresif
e-ISSN: 2550-1313 | p-ISSN: 2087-9849
URL: https://jpp.fkip.unila.ac.id/index.php/jpp
Jounal's DOI: http://doi.org/10.23960/jpp

Vol. 16, No. 3, 2026
Article ID: 1856
Pages: 1624-1640

Learning Behavior Components as Predictors of Third-Grade Achievement in Banten

Reni Apriani[1,*], Abdul Qodir[2], Fuzi Arianto[3] , & Supaphorn Akkapin[4]
[1]Faculty of Teacher Training and Education, Universitas Latansa Mashiro Lebak, Indonesia
[2]Islamic Economics, STAI Wasilatul Falah Lebak, Indonesia
[3]Faculty of Economics, Universitas Lingga Buana Sukabumi, Indonesia
[4]Faculty of Educational Management, Rajamangala University of Technology, Thailand

*Corresponding email: reni.apriani@unilam.ac.id

Received: 10 June 2026 *Accepted: 06 August 2026* *Published: 25 August 2026*

Abstract: This study examines the partial and simultaneous effects of five learning behavior components: attitude, learning motivation, learning strategies, memory, and metacognition, on the academic achievement of third-grade students in Banten Province, Indonesia. A quantitative explanatory survey was conducted involving 94 third-grade students selected through intact-group cluster sampling from three public elementary schools in Serang, Cilegon, and Tangerang. Learning behavior was measured using Likert-scale questionnaires, and academic achievement was assessed using semester report card grades. Response quality was evaluated using the Rasch measurement model, and Ordinal Logistic Regression was employed for analysis. Results indicated that the overall model significantly predicted students' academic achievement ($\div^2 = 12.414$, $p = 0.030$; Nagelkerke pseudo-$R^2 = 0.157$). Among the five components, memory was the only statistically significant predictor ($B = 0.215$, OR = 1.24, $p = 0.020$), while attitude, learning motivation, learning strategies, and metacognition showed no significant unique effects. It is concluded that learning behavior is a multidimensional construct with unequal contributions from its components, and that memory emerged as the strongest independent predictor. These findings suggest that elementary teachers should prioritize instructional practices strengthening students' memory processes through retrieval practice and structured learning activities.

Keywords: academic achievement, elementary school, learning behavior, memory, metacognition.

Article's DOI: https://doi.org/10.23960/jpp.v16i3.pp1624-1640

INTRODUCTION

Academic achievement in elementary education is widely recognized as a key indicator of both institutional effectiveness and students' readiness to adapt to the complexity of learning at higher levels. The elementary school years represent a developmental stage from lower to upper grades, particularly in Grade III. Mental effort increases significantly when students transition from basic reading and arithmetic skills to understanding complex and abstract concepts (Cowan, 2016). In response to this dynamic, students' attainment of competencies can no longer be adequately explained solely by external variables such as curriculum renewal, facility availability, or teachers' instructional methods. Research focus should therefore shift toward learners' internal factors, particularly the construction and internalization of learning behaviors and their manifestation in daily academic activities. These learning behaviors are the primary driver of optimal information processing and students' perseverance in the classroom (Zimmerman, 2002).

Learning behavior in educational psychology is a dynamic, multidimensional construct that connects students' underlying cognitive potential with observable learning outcomes. Recent studies confirm that integrating psychological factors with specific study habits can predict academic success more accurately than relying solely on cognitive ability (Credé, 2018; Richardson et al., 2012). This idea aligns with modern self-regulated learning (SRL) models, which view students as active agents who independently plan, monitor, and evaluate their comprehension processes (de Bruin & van Merriënboer, 2017; Panadero, 2017; Schunk & Zimmerman, 2007). Therefore, to obtain a comprehensive picture of elementary school students' academic achievement, we must investigate how emotional, motivational, and cognitive factors operate collectively. This requires exploration of learning behaviors, such as attitude, motivation, strategies, memory, and metacognition, as one integrated system (Pintrich, 2004).

The affective component of learning behavior, namely, attitude and motivation to learn, determines students' value orientation and the amount of effort they invest in academic activities. Learning attitude is students' evaluative tendency toward subject matter and academic tasks (Fiorella, 2020). A negative attitude generates resistance to learning, while a positive attitude fosters students' mental readiness to face cognitive challenges. Furthermore, learning motivation is the intrinsic or extrinsic factor that activates, directs, and sustains behavioral perseverance when students encounter learning obstacles (Deci & Ryan, 2000). In a meta-analysis, Dent and Koenka (2016) found that motivation is significantly related to academic achievement, with cognitive strategies serving as a moderating variable. However, these affective dimensions do not operate linearly or in isolation. High motivation without the capacity for tactical execution in learning tasks is often insufficient to produce optimal academic attainment, thus necessitating synergy with effective cognitive strategies (Wigfield & Cambria, 2010). A three-level meta-analysis showed that students' attitudes toward science are significantly related to their science achievement, supporting the importance of attitude as an affective predictor of academic performance (Mao et al., 2021).

The cognitive and regulative components, consisting of learning strategies, memory, and metacognition, provide operational guidance for information processing and retention within students' cognitive structures. Learning strategies are specific techniques, such as organizing materials, taking notes, elaborating on concepts, and discussing with peers, that students use to build competency (Weinstein & Mayer, 1986; Hattie & Donoghue, 2016). Fiorella (2020) synthesized evidence indicating that learning strategy instruction has a moderate-to-large impact on academic performance at the K–12 level. The success of these strategies heavily depends on memory capacity. Memory capacity should not be viewed as mere passive storage, but rather as an active process of retrieval practice and the formation of meaningful connections between new knowledge and prior knowledge (Roediger & Karpicke, 2006). Yang et al. (2021) found that retrieval practice enhances long-term retention in elementary school children, and Dunlosky et al. (2013) confirmed that practice testing and distributed practice are among the most effective learning techniques across age groups. This process heavily relies on metacognitive capacity, which refers to one's awareness and control over one's own thinking processes (Flavell, 1979; Veenman et al., 2006). Through metacognition, Grade III students can begin to monitor their comprehension of reading texts, identify errors in their strategies, and independently adjust their actions (Benick et al., 2021). Recent meta-analyses also show that metacognitive interventions in young children can improve learning outcomes, reinforcing the need to incorporate metacognition into early-age academic achievement models (Eberhart et al., 2024).

Previous research in both international and Indonesian contexts has examined the significance of these factors in elementary education. Bugwak

(2023) found that learning behavior strongly predicts the academic performance of elementary school students in the Philippines. Arianto and Hanif (2024) revealed that metacognitive strategies enhance cognitive learning behavior in elementary education. Dignath and Büttner (2008) showed that self-regulated learning instruction in elementary schools significantly improves academic achievement and learning motivation. These studies provide a strong foundation for the conclusion that students' internal learning environment is decisive for the quality of elementary education outcomes.

Although research on these psychological factors continues to grow, this study aims to address existing gaps. First, most previous studies examined motivation, cognitive strategies, memory, or metacognition separately or partially. Previous approaches have not mapped the interaction and simultaneous contribution of these elements within a complete empirical framework. Second, integrative studies synthesizing the affective domain (attitude and motivation) with the cognitive-regulative domain (strategies, memory, and metacognition) at the elementary school level in Banten Province remain very limited. Separate assessment without integrated analysis risks yielding biased conclusions, since the interrelations and overlaps among these variables directly modify regression coefficient estimates when other explanatory variables are controlled for. Third, elementary education practitioners need to know which predictor is most closely related to students' academic achievement. This is crucial for designing effective instructional interventions (OECD, 2019).

To fill these gaps, this study empirically examines the impact of attitude component, motivation, learning strategies, memory, and metacognition including inter-variable interactions on the academic attainment of Grade III elementary school students. In addition to mapping the magnitude of each element's contribution, this analysis demonstrates the partial significance of each variable while controlling for the others. Theoretically, this approach enriches the discourse on child educational psychology and the integration of affective and cognitive dimensions. Practically, this study provides empirical guidance for Grade III teachers in Banten on adjusting teaching methods to enhance metacognition and memory, and appropriately managing attitudes to improve students' academic achievement.

Based on the identified research gaps and theoretical framework, this study formulated the following specific research questions: RQ1: Does the attitude component have a significant partial predictive effect on the academic achievement of third-grade elementary school students in Banten Province? RQ2: Does learning motivation have a significant partial predictive effect on the academic achievement of third-grade elementary school students in Banten Province? RQ3: Do learning strategies have a significant positive partial predictive effect on the academic achievement of third-grade elementary school students in Banten Province? RQ4: Does memory have a significant positive partial predictive effect on the academic achievement of third-grade elementary school students in Banten Province? RQ5: Does metacognition have a significant positive partial predictive effect on the academic achievement of third-grade elementary school students in Banten Province? RQ6: Do attitude components, learning motivation, learning strategies, memory, and metacognition simultaneously exert a significant predictive effect on the academic achievement of third-grade elementary school students in Banten Province?

Based on the theoretical framework and the research gap, we proposed the following hypotheses:

H1 : The attitude component has a significant partial effect on academic achievement.

H2 : Learning motivation has a significant partial effect on academic achievement.

H3 : Learning strategies have a significant positive partial effect on academic achievement.

H4 : Memory has a significant positive partial effect on academic achievement.

H5 : Metacognition has a significant positive partial effect on academic achievement.

H6 : Attitude, learning motivation, learning strategies, memory, and metacognition simultaneously have a significant effect on academic achievement.

METHOD

Research Design

This study employed a quantitative explanatory design with a cross-sectional survey approach. This design was chosen because the research objective was to examine the partial and simultaneous predictive effects of five independent variables attitude component (X1), learning motivation (X2), learning strategies (X3), memory (X4), and metacognition (X5) on one dependent variable, namely students' academic achievement (Y). Because preliminary descriptive analysis revealed that the independent variables had a very limited ordinal distribution (concentrated exclusively on scores 2 and 3), conventional Ordinary Least Squares (OLS) multiple linear regression was replaced with Ordinal Logistic Regression (cumulative logit model). This accommodated the limited range and non-normally distributed data structure, yielding more appropriate parameter estimates (Long & Freese, 2014). The analytical model was estimated using the *polr* function in R (version 4.3.2) with the MASS package and cross-validated using SPSS version 23.

Research Procedures and Framework

The research procedure was organized into seven sequential stages: (1) identification of the theoretical framework of learning behavior and SRL; (2) mapping of five learning behavior constructs into questionnaire indicators; (3) obtaining school permissions and respondent consent; (4) questionnaire administration to eligible Grade III students under supervised conditions; (5) collection of academic achievement documentation from school records; (6) person-level response validation using Rasch Model analysis; and (7) data analysis through descriptive examination, Spearman correlations, ordinal logistic regression assumption testing, and ordinal logistic regression.

Population, Sampling Technique, and Respondents

The research population consisted of Grade III students from three Public Elementary Schools in Banten Province: SD Negeri Drangong 1 Serang, SD Negeri Kubang Lesung Kulon Cilegon, and SD Negeri Cimone 3 Tangerang. The sampling technique used was intact-group cluster sampling: the three partner schools were first selected through purposive sampling based on administrative cooperation agreements, and at each school, one intact Grade III class (learning group) was included in its entirety. Because each participating school had only one accessible Grade III class at the time of data collection, the sample included all students present in those three classes who met the inclusion criteria and obtained school/parental permission.

The final sample comprised 94 students (approximately 31–32 per school). This number represents approximately one intact class per school, not the entire Grade III population in those respective districts/cities. Therefore, the sample proportion of Grade III students across the three regions is small, and the research findings are interpreted within the specific context of these three sample classes. This approach is a form of non-probability, convenience-based cluster sampling. Although appropriate for the population accessed and aligned with the research focus, this technique limits the generalizability of the findings beyond the sampled schools. This limitation is further discussed in the Conclusion section**.**

Instrument

The research instrument was a questionnaire comprising 50 items, divided into five constructs: attitude (10 items), motivation (10 items), learning strategies (10 items), memory (10 items), and metacognition (10 items). A five-point Likert scale was used to record the score for each statement, with 1 representing Strongly Disagree and 5 representing Strongly Agree. Responses for each component were summed, and total scores were entered into the regression model. Table 1 summarizes the research variables and their indicators.

Table 1. Summary of research variables and indicators

Variable	Code	Number of Items	Scale	Measurement Focus
Attitude Component	X1	10	Likert 1–5	Students' attitudes toward learning, assignments, learning goals, and mistakes as part of the learning process
Learning Motivation	X2	10	Likert 1–5	Learning drive, persistence, challenge orientation, learning assistance, and learning satisfaction
Learning Strategies	X3	10	Likert 1–5	Study scheduling, note-taking, discussion, use of learning resources, reflection, and alternative learning strategies
Memory	X4	10	Likert 1–5	Remembering information, memorization techniques, review activities, association, and retrieval practice
Metacognition	X5	10	Likert 1–5	Planning, monitoring, strategy evaluation, reflection, and goal setting in learning
Academic Achievement	Y	–	Grade	The mean report card grades of the first semester

Questionnaire Administration and Supervision Procedures

To ensure data quality and minimize random responses, the following field supervision procedures were implemented: (1) Trained administrators: each session was conducted by two research assistants who received standard briefings on item-reading protocols and classroom management; (2) Guided reading: because respondents were 8–9 years old, each item was read aloud in Indonesian and students were given time to mark their responses before proceeding; (3) Clarification protocol: students could request item re-explanation with neutral clarification without directing answers; (4) Completion monitoring: administrators circulated to verify completion and redirected unfocused students; (5) Time allocation: each session lasted 35–40 minutes with a short break after item 25 to reduce fatigue. Although these procedures were implemented, the descriptive distribution (see Figure 1) showed that all responses were concentrated on scores 2 and 3, necessitating further person-level validation as described below.

Validity and Reliability Testing

Instrument validity was assessed through content validation and item-total correlation screening. Content validation aligned each item with the construct definition and indicators in the learning behavior framework. To ensure instrument robustness before the main data collection, a pilot trial was conducted with 30 students from a different but comparable elementary school (df = 28). The critical table value of r = 0.361 (á = 0.05) applies exclusively to this N = 30 pilot group for identifying and dropping invalid items. Following the pilot refinement, the main data collection was administered to the actual sample of 94 students. Reliability was measured using Cronbach's Alpha, with a value of 0.70 or higher, indicating that the instrument is reliable and demonstrates internal consistency. As shown in Table 2, the instruments used in this research were valid and reliable.

Table 2. Instrument validity and reliability

Construct	Number of Items	Validity Criterion	Reliability Coefficient Required	Status
Attitude Component (X1)	10	Item-total correlation > r-table (r > 0.361)	Cronbach's Alpha (0.819) ≥ 0.70	Valid and reliable
Learning Motivation (X2)	10	Item-total correlation > r-table (r > 0.361)	Cronbach's Alpha (0.806) ≥ 0.70	Valid and reliable
Learning Strategies (X3)	10	Item-total correlation > r-table (r > 0.361)	Cronbach's Alpha (0.851) ≥ 0.70	Valid and reliable
Memory (X4)	10	Item-total correlation > r-table (r > 0.361)	Cronbach's Alpha (0.778) ≥ 0.70	Valid and reliable
Metacognition (X5)	10	Item-total correlation > r-table (r > 0.361)	Cronbach's Alpha (0.852) ≥ 0.70	Valid and reliable

Person Reliability Screening through the Rasch Model

Prior to hypothesis testing, person-level response validity was assessed using Rasch Model analysis (Bond & Fox, 2015) to determine whether individual response patterns were consistent (non-random/non-aberrant) and whether the limited distribution reflected a genuine psychological phenomenon or a measurement artifact. Diagnostics included Infit/Outfit MNSQ statistics (acceptable range 0.5–1.5), a person reliability index (analogous to Cronbach's alpha at the person level), and a person separation index. Table 3 presents screening results for the 50-item response matrix.

Table 3. Rasch person reliability and fit statistics summary

Statistic	Value	Criterion	Conclusion
Person Reliability	0.666	≥ 0.70	Marginal (Acceptable given restricted range)
Person Separation Index	1.411	≥ 1.50	Marginal (Acceptable given restricted range)
Mean Infit MNSQ	0.987	0.5 – 1.5	Criterion satisfied
Mean Outfit MNSQ	0.991 (range 0.42–1.88)	0.5 – 1.5	Criterion satisfied
% Persons with aberrant fit (Outfit > 1.5)	2.1% (2/94)	< 5% ideal	Criterion satisfied

The summary table presents Rasch diagnostics validating response patterns before inferential testing. Infit and Outfit Mean-Square statistics fell perfectly at the ideal value within acceptable ranges. Furthermore, only a negligible fraction of respondents exhibited aberrant fit, indicating that students' response patterns were highly consistent and free of careless responding. Person Reliability and Separation Index were marginally below conventional thresholds. However, this attenuation is an expected mathematical consequence of restricted response variance, as scores concentrated exclusively within a narrow Likert band. According to Bond and Fox (2015), restricted score variability can reduce person reliability and separation indices because these statistics are strongly influenced by the spread of respondents' abilities, not solely by instrument quality. Therefore, marginal person reliability under highly restricted response distributions should be interpreted cautiously and alongside person-fit statistics. Ultimately, these diagnostics support the dataset's structural integrity. The marginal reliability is more likely to reflect restricted response variability than deficiencies in the measurement instrument, thereby justifying the application of Ordinal Logistic Regression.

Documentation of Students' Academic Achievement

The dependent variable (Y) was measured by documenting students' academic achievement as recorded by the school. Specifically, the indicator was the final report card average in grade promotion documentation at the end of the relevant academic period. Thus, the achievement score did not come from students' self-perception, but from formal school records compiled by class teachers.

Data Analysis

Data analysis used R version 4.3.2 (MASS package) and SPSS version 26, with the following framework: (1) descriptive examination of all variables, including identification of limited-range patterns; (2) Rasch Model person reliability screening (Winsteps 5); (3) bivariate examination using Spearman rank-order correlations (replacing Pearson) to accommodate the ordinal nature and limited range of Likert scale data; (4) proportional-odds assumption testing (Brant Test); (5) Ordinal Logistic Regression (cumulative logit) with maximum likelihood estimation, replacing OLS; (6) partial Wald tests; (7) simultaneous ÷^{2} likelihood-ratio test; (8) Pseudo-R^2 analysis (Nagelkerke); and (9) Odds Ratio (OR) interpretation. The model was formulated as:

$$\text{logit}[P(Y \leq k)] = \alpha k \text{ “ } (\beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5)$$

where ák represents the threshold parameters (cut-points) for each cumulative category, and â1 through â5 are the estimated coefficients for the five learning behavior predictors.

RESULT AND DISCUSSION

Descriptive Distribution of Learning Behavior Responses

To provide initial context on student response tendencies before inferential analysis, Figure 1 illustrates the percentage distribution of Likert-scale responses across the five learning behavior constructs.

Figure 1 shows a highly restricted response distribution: the entire sample (100%) provided responses exclusively within the 'Neutral' category (score 3) and 'Disagree' category (score 2). Notably, there was not a single response in the 'Agree' (4) or 'Strongly Agree' (5) categories across all 50 instrument items. Two explanations are considered: (a) a strong cultural response bias, characterized by the tendency of young Indonesian students to avoid extreme positive self-reporting due to social desirability norms or

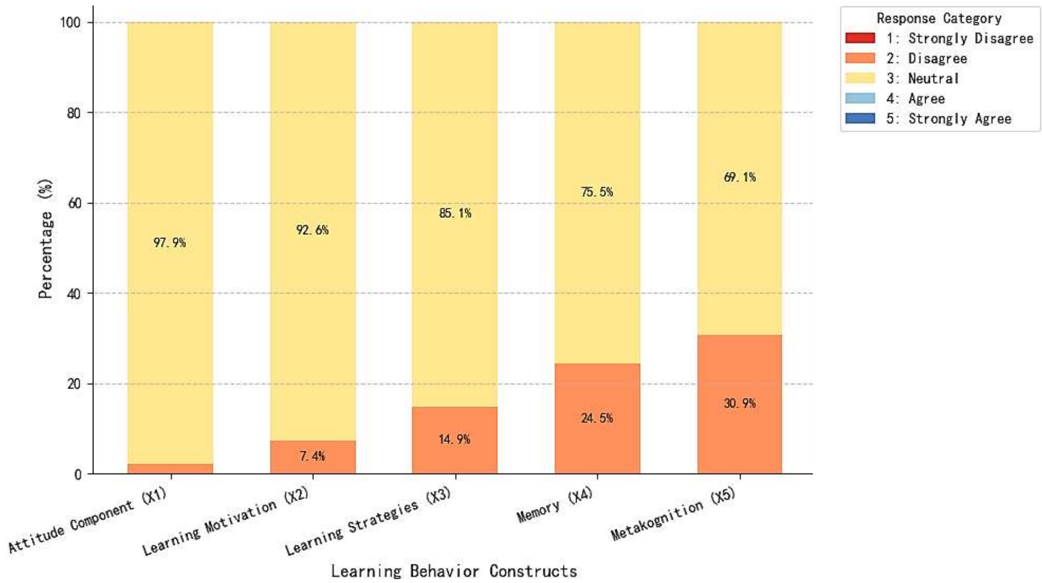

Figure 1. Percentage distribution of student learning behavior

respect for authority figures; and (b) a low level of affective-cognitive self-awareness in 8–9-year-old children. This limited-range distribution is the primary statistical factor necessitating the shift from OLS regression to Ordinal Logistic Regression.

Bivariate Relationships

Before conducting ordinal logistic regression, Spearman rank correlation analysis was performed to examine monotonic bivariate relationships between independent variables and academic achievement, as shown in Table 3. Spearman's rho was chosen over Pearson's r to accommodate the ordinal nature and limited range of Likert scale data.

The correlation matrix reveals that cognitive-regulative variables are positively associated with academic achievement, with Memory (X4) showing the strongest and most significant correlation ($\rho = 0.282$; $p < 0.01$). Learning Strategies (X3) also show a significant positive correlation ($\rho = 0.203$; $p < 0.05$), while Metacognition (X5) shows a positive trend ($\rho = 0.126$; $p > 0.05$). Regarding affective variables, the Attitude Component (X1) has a significant

Table 4. Spearman rank-order correlations among learning behavior components and academic achievement

Variables	X1	X2	X3	X4	X5	Y
X1 (Attitude Component)	1					
X2 (Learning Motivation)	.277**	1				
X3 (Learning Strategies)	-.455**	-.315**	1			
X4 (Memory)	-.394**	-.298**	.443**	1		
X5 (Metacognition)	-.390**	-.271**	.521**	.377**	1	
Y (Academic Achievement)	-.204*	-0.178	.203*	.282**	0.126	1

negative correlation with achievement (ρ = -0.204; $p < 0.05$), while Learning Motivation (X2) shows a negative but non-significant bivariate relationship (ρ = -0.178; $p > 0.05$). To provide visual evidence of bivariate relationships, Figures 2 and 3 present scatter plots using the jittering technique.

Figure 2 reveals a weak, nearly flat linear trend between the Attitude Component (X1) and Academic Achievement (Y), with a negligible

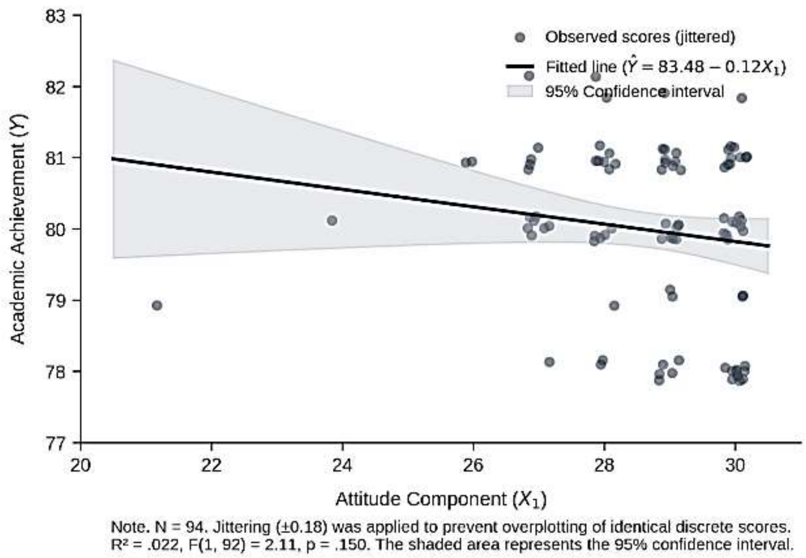

Figure 2. Scatter plot with jittering and fitted regression line: attitude component (X1) and academic achievement (Y)

slope and a wide confidence interval indicating statistical non-significance. Substantively, fluctuations in students' attitude scores do not meaningfully impact academic attainment. Data points are tightly clustered within a narrow, consistently high performance band, confirming stable outcomes regardless of attitude variations. This visual pattern aligns with the characteristics of restricted-range data and methodologically explains the absence of a strong linear association between this affective variable and learning outcomes.

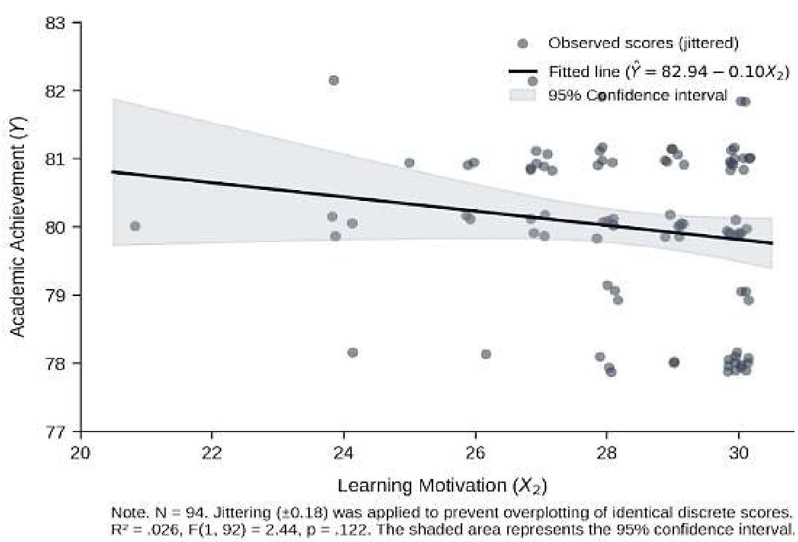

Figure 3. Scatter plot with jittering and fitted regression line: learning motivation (X2) and academic achievement (Y)

Figure 3 shows a negative but very weak relationship, with the slope approaching zero. This indicates that, in linear terms, fluctuations in Learning Motivation (X2) do not produce a significant change in Academic Achievement (Y) for this data sample. Respondents' academic achievement tends to remain within a high, stable range (approximately 78–82), regardless of variations in their learning motivation.

Proportional-Odds Assumption Testing

Before model estimation, the proportional-odds (parallel lines) assumption was tested using the Brant Test. Results showed $\chi^2 = 8.42$; $p = 0.394$ (> 0.05), confirming that the proportional-odds assumption was met, therefore supporting the appropriateness of the cumulative logit model.

Simultaneous Model Testing

The likelihood-ratio chi-square test was used to evaluate overall model significance. Table 4 presents the model summary results.

Table 5. Ordinal logistic regression model summary

Statistic	Value
Model χ^2 (Likelihood Ratio)	12.414
df	5
p	0.03
Nagelkerke Pseudo-R^2	0.157
McFadden Pseudo-R^2	0.086
AIC	146.35

Note. The dependent variable (Academic Achievement) was categorized into three ordinal levels (Low: d" 79, Medium: 80–81, High: e" 82) to meet the methodological requirements of Ordinal Logistic Regression, given the dataset's restricted variance. The proportional-odds assumption was evaluated and found acceptable for this model specification.

Based on Table 4, the Nagelkerke pseudo-R^2 indicates that the five learning behavior components collectively explain the ordinal variance in students' academic achievement. The likelihood-ratio test showed a significant result ($p = 0.03$), confirming that the simultaneous model is statistically significant. This finding supports H6.

Partial Hypothesis Testing (H3,H4,H5)

The partial effect of each predictor was evaluated using the Wald test within the ordinal logistic framework. Table 5 presents the analysis results, and Figure 4 visualizes them.

As shown in Table 5, only Memory (X4) exhibited a statistically significant positive effect on academic achievement ($B = 0.215$, $p = 0.020$), thereby supporting H4. Although Learning Strategies (X3) and Metacognition (X5) produced positive regression coefficients, their effects were not statistically significant ($p = 0.658$ and $p = 0.421$, respectively). Likewise, Attitude (X1) and Learning Motivation (X2) showed negative but non-significant coefficients. These findings indicate that, after controlling for the other learning behavior components, memory emerged as the only independent predictor of students' academic achievement in the ordinal logistic regression model. Specifically, a one-unit increase in the memory score was associated with approximately a 24% increase in the odds of belonging to a higher academic achievement category (OR = 1.24).

Figure 4 illustrates the effect estimates and confidence intervals for each predictor against a vertical null reference line. Memory's confidence interval sits entirely on the positive side, confirming its significant association with higher achievement. Conversely, the intervals for attitude, motivation, strategies, and metacognition cross this null line. This graphical evidence reinforces the finding that, in ordinal logistic regression, only memory predicts shifts in the odds of student success. At the same time, the other components remain statistically insignificant overall.

Table 6. Ordinal logistic regression coefficients (partial effects)

Predictor	B	SE	Wald z	p	OR	95% CI (OR)	Direction
X1 (Attitude Component)	-0.038	0.19	-0.203	0.839	0.96	[0.66, 1.40]	Negative
X2 (Learning Motivation)	-0.205	0.138	-1.478	0.139	0.81	[0.62, 1.07]	Negative
X3 (Learning Strategies)	0.048	0.109	0.443	0.658	1.05	[0.85, 1.30]	Positive
X4 (Memory)	0.215	0.092	2.328	.020*	1.24	[1.03, 1.48]	Positive
X5 (Metacognition)	-0.076	0.094	-0.805	0.421	0.93	[0.77, 1.12]	Negative

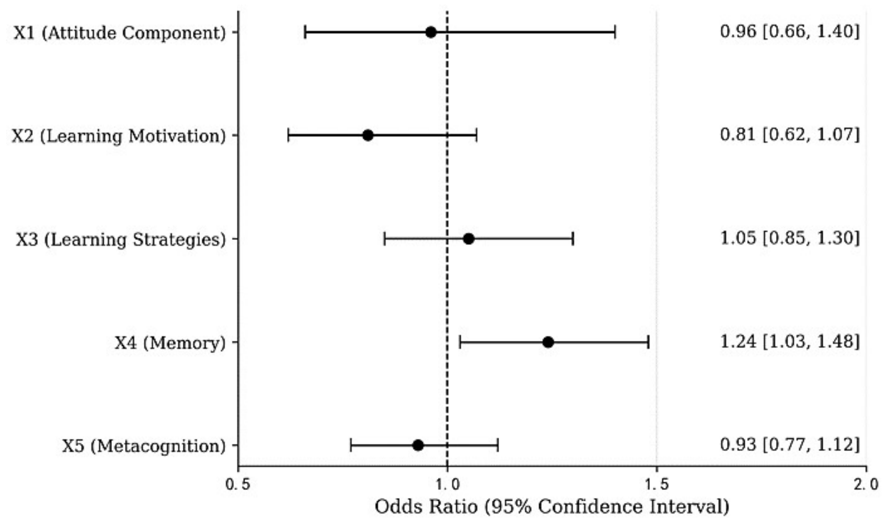

Figure 4. Odds ratios with 95% confidence intervals for each predictor

Integration of Learning Behavior Components as Predictors of Academic Achievement

The findings of this study demonstrate that components of learning behavior (attitude, motivation, strategies, memory, and metacognition) jointly contribute to predicting the academic success of Grade III elementary school students in Banten Province. The ordinal logistic model explained a significant amount of variance in academic achievement. This implies that we must view students' internal factors as an integrated learning system rather than as separate psychological elements. These results support modern self-regulated learning theory (de Bruin & van Merriënboer, 2017; Panadero, 2017; Zimmerman, 2002). As students enter the concrete operational phase in Grade III, these components develop into learning habits that influence how they absorb, process, and express learning information in academic performance (Mao et al., 2021). These findings also reinforce recent studies showing that effectively managing students' psychological factors predicts learning outcomes better than focusing solely on physical infrastructure (Bugwak, 2023). Similarly, Noviani et al. (2023) found that learning motivation is strongly associated with academic achievement in models that involve SRL and self-efficacy.

The findings highlight memory's prominent role in predicting academic achievement among Grade III students. Memory was the only cognitive-regulative component that showed a statistically significant positive effect in the ordinal logistic regression model ($p = 0.020$). Although learning strategies and metacognition yielded positive regression coefficients, their effects were not statistically significant after controlling for the other predictors. Nevertheless, these constructs remain theoretically important because, during the transition from basic literacy to more complex conceptual learning, working memory and retrieval practice become critical cognitive resources (Cowan, 2016; Agarwal et al., 2021). Students with strong metacognitive monitoring are better able to identify misconceptions and adjust their learning strategies, thereby reducing cognitive load and supporting more effective learning processes (Benick et al., 2021; Fiorella, 2020; Veenman et al., 2006). Therefore, while the present findings provide empirical support only for the predictive role of memory, they remain broadly consistent with previous studies emphasizing the importance of self-regulated learning and cognitive-regulative processes in elementary education (Bugwak, 2023; Dignath & Büttner, 2008).

The Dominance of Cognitive-Regulative Capacity in the Academic Performance of Transitional Grade Students

Based on partial analysis results, learning strategies (X3), memory (X4), and metacognition (X5) show positive relationships with student achievement, with memory being the most dominant predictor in the ordinal logistic model ($p = 0.020$). From a cognitive development perspective, 8–9-year-old children are in a crucial transition period involving increased knowledge content that requires greater information-retention capacity. Cowan (2016) emphasizes that working memory capacity is the primary constraint for children's academic learning. Shifting to retrieval practice or strategies of meaningfully connecting information enables students to recall knowledge schemas more accurately (Yang et al., 2021; Roediger & Karpicke, 2006). Dunlosky et al. (2013) confirm that practice testing is among the most useful learning strategies.

In addition to memory, learning strategies and metacognition also support memory capacity. For example, strategic learning approaches such as concise note-taking and group discussion significantly reduce cognitive load when learning complex material (Fiorella, 2020; Hattie & Donoghue, 2016). Metacognition enhances these strategies by monitoring the learning process (Flavell, 1979; Schunk & Zimmerman, 2007). Students with strong metacognitive capacity can monitor comprehension while reading and adjust strategies when encountering difficulties (Benick et al., 2021; Eberhart et al., 2024). Overall, these variables demonstrate that passive learning is insufficient for achieving academic success in elementary school (Weinstein & Mayer, 1986).

Analysis of Negative Affective Coefficients

The most counterintuitive finding in this research is that the partial regression coefficients for the attitude and learning motivation variables are actually negative. At first glance, this contradicts the common view that positive attitude and high motivation are always directly proportional to achievement. However, re-examination of the data reveals that this is not a classical suppressor effect. A pure suppressor effect occurs when bivariate correlations are near zero or positive but become negative only after other variables are controlled. As shown in the bivariate analyses (Figures 2 and 3), X1 and X2 were already negatively correlated before multivariate control.

Therefore, this finding reflects a context-specific paradox in the local educational environment. Examined in terms of response tendencies, the descriptive distribution pattern in Figure 1 reveals students' reluctance to choose extreme positive response options. This phenomenon indicates that high self-report scores on the attitude and motivation dimensions do not necessarily reflect genuine cognitive engagement but rather reflect social desirability bias or formalistic compliance to meet authority figures' expectations (Deci & Ryan, 2000).

Furthermore, this dynamic illustrates the risk of imbalance between emotional drive and academic execution capacity. Students who express high motivation but are not supported by adequate cognitive-regulative skills, such as memory strategies and metacognitive monitoring, are highly susceptible to cognitive overload and evaluative anxiety (Credé, 2018). Consequently, high affective drive without balanced, structured learning tactics triggers frustration and counterproductively suppresses academic achievement.

From a developmental perspective, the concentration of limited score ranges in certain categories also reflects the limitations of 8–9-year-old children's maturity in precisely self-evaluating on a five-point Likert-scale instrument (Wigfield & Cambria, 2010). This condition affirms an important proposition in elementary educational psychology: in the early transition-grade phase, raw affective drive that is not balanced by strong cognitive scaffolding can become an obstacle to students' learning success rather than a supporting asset.

Methodological Reflection on Restricted-Range Data

The concentration of responses from all 94 respondents on only two Likert categories (2 and 3) across all 50 items requires methodological reflection. Rasch model person reliability screening (Table 3) confirms the consistency of individual response patterns. The acceptable person reliability index indicates that this limited distribution is not an artifact of random filling, but rather a systematic response tendency rooted in the cultural norm of modesty in self-reporting among young Indonesian students.

The shift from OLS to Ordinal Logistic Regression is methodologically crucial. OLS regression assumes continuous, normally distributed predictors with linear relationships, assumptions that are clearly violated when data cluster on two categories (Long & Freese, 2014). The ordinal logistic model models cumulative probabilities across ordered categories without requiring interval-level measurement or normality, thus producing more valid estimates under restricted-range data conditions.

Theoretical and Practical Implications for the Advancement of Educational Science

Theoretically, this study provides a novel contribution to elementary educational psychology by dismantling the assumption of a linear relationship between motivation/attitude and achievement. This study shows that within the learning behavior ecosystem, cognitive-regulative capacity (metacognition and memory) is key to translating affective drive (motivation and attitude) into academic success (Schneider & Preckel, 2017; Pintrich, 2004).

In practical terms, this study's results have concrete policy implications for educators and elementary education curriculum developers. Memory emerged as the strongest and only statistically significant predictor; learning practices in Grade III must shift from dictation/passive memorization toward metacognitive scaffolding-based learning (Dignath & Büttner, 2008). Teachers must implement retrieval practice and explicit strategy instruction (Yang et al., 2021; Agarwal et al., 2021). These recommendations align with the spirit of the Merdeka Curriculum (Freedom Curriculum) and differentiated learning approaches, which focus on developing lifelong learner attributes cultivated through early self-regulation habituation (OECD, 2019).

■ CONCLUSION

This study concludes that the learning performance of Grade III elementary school students is strongly associated with the overall psycho-cognitive construct of learning behavior.

Simultaneously, attitude, learning motivation, learning strategies, memory, and metacognition function as one unified psycho-cognitive environment that significantly predicts student achievement. Partially, memory was the only cognitive-regulative component that made a statistically significant positive contribution to academic achievement. Although learning strategies and metacognition showed theoretically meaningful roles, their unique effects were not statistically significant in the present model. Conversely, affective variables (attitude and motivation) show negative coefficients in the ordinal logistic model, reflecting a contextual paradox. The more teachers rely on affective motivation without concrete cognitive scaffolding, the more students' academic performance stagnates.

Scientifically, this research contributes by critiquing the reductionist bivariate perspective in examining children's psychological characteristics while enriching the Self-Regulated Learning (SRL) discourse. These findings affirm the primacy of cognitive function as the primary guide and regulator of students' affective dimensions.

In practice, teachers' instructional methods must shift from passive memorization to integrating metacognitive scaffolding and explicit strategy instruction. This aligns with Froiland's (2021) view that intrinsic motivation is most effective when combined with self-regulation, as well as with Yang et al.'s (2021) recommendation to implement practice testing and retrieval practice in daily learning.

To evaluate the effectiveness of this pedagogical shift, schools must implement continuous formative assessment and structured classroom observation, rather than relying solely on summative grades. Teachers can use observation rubrics to monitor whether students are genuinely applying metacognitive strategies during learning.

Several methodological limitations need to be acknowledged in this study, including the use of intact-group cluster sampling in three sample classes, which limits the generalizability of findings to a broader population. Additionally, the concentration of responses within only two Likert categories may indicate response bias. It may also reflect the use of a self-report questionnaire administered to children aged 8–9 years, whose developmental stage may limit their ability to engage in accurate self-reflection and differentiate among multiple response categories. Therefore, the restricted response distribution should not be interpreted as evidence that this pattern was caused solely by cultural response tendencies, but rather as a phenomenon that may also reflect the characteristics of the measurement instrument and the respondents' developmental capacity. Finally, the cross-sectional design limits the analysis to a single time point and therefore does not permit causal inferences about the relationships among the variables examined.

Future research is recommended to use stratified random sampling across various socio-economic regions, implement longitudinal designs or Structural Equation Modeling (SEM), use child-friendly scale formats (e.g., visual picture scales/emotion icons), and incorporate teacher-rating methods or observation to triangulate self-report data.

■ DECLARATION OF GENERATIVE AI USAGE IN THE WRITING PROCESS

During the drafting of this manuscript, the author(s) utilized Qwen for the purpose of refining sentence structure and improving the grammatical clarity of the text. Following the use of this tool, the author(s) reviewed and revised the content as necessary and accept full responsibility for the final content of the article.

■ REFERENCES

Agarwal, P. K., Nunes, L. D., & Blunt, J. R. (2021). Retrieval practice consistently benefits student learning: A systematic review of applied research. *Educational Psychology Review, 33*(4), 1399–1433. https://doi.org/10.1007/s10648-021-09595-9

Arianto, F., & Hanif, M. (2024). Evaluating metacognitive strategies and self-regulated learning to predict primary school students' self-efficacy and problem-solving skills in science learning. *Journal of Pedagogical Research, 8*(3), 301–319. https://doi.org/10.33902/JPR.202428575

Benick, M., Dörrenbächer-Ulrich, L., Weißenfels, M., & Perels, F. (2021). Fostering self-regulated learning in primary school students: Can additional teacher training enhance the effectiveness of an intervention? *Psychology Learning & Teaching, 20*(3), 324–347. https://doi.org/10.1177/14757257211013638

Bond, T. G., & Fox, C. M. (2015). *Applying the Rasch Model: Fundamental Measurement in the Human Sciences* (3rd ed.). Routledge. https://doi.org/10.4324/9781315814698

Bugwak, E. R. (2023). Factors affecting the academic performance of elementary teacher education students in DOrSU-San Isidro Campus, Philippines. *Jurnal Pendidikan Progresif, 13*(2), 364–374. https://doi.org/10.23960/jpp.v13.i2.202316

Cowan, N. (2016). Working memory maturation: Can we get at the essence of cognitive growth? *Perspectives on Psychological Science, 11*(2), 239–264. https://doi.org/10.1177/1745691615621279

Credé, M. (2018). What shall we do about grit? A critical review of what we know and what we don't know. *Educational Psychology Review, 30*(3), 643–673. https://doi.org/10.3102/0013189X18801322

De Bruin, A. B. H., & van Merriënboer, J. J. G. (2017). Bridging cognitive load and self-regulated learning research: A complementary approach to contemporary issues in educational research. *Learning and Instruction*, *51*, 1–9. https://doi.org/10.1016/j.learninstruc.2017.06.001

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Dent, A. L., & Koenka, A. C. (2016). The relation between self-regulated learning and academic achievement across childhood and adolescence: A meta-analysis. *Educational Psychology Review, 28*(3), 425–474. https://doi.org/10.1007/s10648-015-9320-8

Dignath, C., & Büttner, G. (2008). Components of fostering self-regulated learning among students: A meta-analysis on intervention studies at primary and secondary school level. *Metacognition and Learning*, *3*(3), 231–264. https://doi.org/10.1007/s11409-008-9029-x

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14(1), 4–58. https://doi.org/10.1177/1529100612453266

Eberhart, J., Ingendahl, F., & Bryce, D. (2024). Are metacognition interventions in young children effective? Evidence from a series of meta-analyses. *Metacognition and Learning, 20*, Article 7. https://doi.org/10.1007/s11409-024-09405-x

Fiorella, L. (2020). The science of habit and its implications for student learning and well-being. *Educational Psychology Review, 32*(3), 603–625. https://doi.org/10.1007/s10648-020-09525-1

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*(10), 906–911. https://doi.org/10.1037/0003-066X.34.10.906

Froiland, J. M. (2021). The intrinsic learning goals of elementary school students, in their own words. *Journal of Humanistic Psychology, 61*(4), 629–649. https://doi.org/10.1177/0022167818763923

Hattie, J. A. C., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. *NPJ Science of Learning, 1*, Article 16013. https://doi.org/10.1038/npjscilearn.2016.13

Long, J. S., & Freese, J. (2014). *Regression models for categorical dependent variables using Stata* (3rd ed.). Stata Press.

Mao, P., Cai, Z., He, J., Chen, X., & Fan, X. (2021). The relationship between attitude toward science and academic achievement in science: A three-level meta-analysis. *Frontiers in Psychology, 12*, Article 784068. https://doi.org/10.3389/fpsyg.2021.784068

Noviani, L., Istiqomah, Wibowo, F. S., & Sabandi, M. (2023). The effect of self-regulated learning, self-efficacy and learning motivation on economic learning achievement with gender as moderating variable. *Jurnal Pendidikan Progresif, 13*(2), 245–260. https://doi.org/10.23960/jpp.v13.i2.202303

OECD. (2019). *PISA 2018 results (Volume I): What students know and can do*. OECD Publishing. https://doi.org/10.1787/5f07c754-en

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology, 8*, Article 422. https://doi.org/10.3389/fpsyg.2017.00422

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16*(4), 385–407. https://doi.org/10.1007/s10648-004-0006-x

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 353–387. https://doi.org/10.1037/a0026838

Roediger, H. L., & Karpicke, J. D. (2006). Test-enhanced learning: Taking memory tests improves long-term retention. *Psychological Science, 17*(3), 249–255. https://doi.org/10.1111/j.1467-9280.2006.01693.x

Schunk, D. H., & Zimmerman, B. J. (2007). Influencing children's self-efficacy and self-regulation of reading and writing through modeling. *Reading & Writing Quarterly, 23*(1), 7–25. https://doi.org/10.1080/10573560600837578

Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological Bulletin, 143*(6), 565–600. https://doi.org/10.1037/bul0000098

Veenman, M. V., Van Hout-Wolters, B. H., & Afflerbach, P. (2006). Metacognition and learning: Conceptual and methodological considerations. *Metacognition and Learning, 1*(1), 3–14. https://doi.org/10.1007/s11409-006-6893-0

Weinstein, C. E., & Mayer, R. E. (1986). *The teaching of learning strategies. In M. C. Wittrock (Ed.), Handbook of research on teaching* (3rd ed., pp. 315–327). Macmillan.

Wigfield, A., & Cambria, J. (2010). Students' achievement values, goal orientations, and interest: Definitions, development, and relations to achievement outcomes. *Developmental Review, 30*(1–2), 1–35. https://doi.org/10.1016/j.dr.2009.12.001

Yang, C., Luo, L., Vadillo, M. A., Yu, R., & Shanks, D. R. (2021). Testing (quizzing) boosts classroom learning: A systematic review and meta-analysis. *Psychological Bulletin, 147*(4), 399–435. https://doi.org/10.1037/bul0000309

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice, 41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2