



The Influence of growth mindset and multiple intelligences on elementary students' self-regulation

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Abstract

This study examines the association between growth mindset, multiple intelligences, and elementary school students' self-regulation. Self-regulation is a key competency in elementary education, yet it is often treated as a technical learning skill rather than an integrated cognitive and behavioral capacity. Using a quantitative explanatory design, the study involved 239 fifth-grade students from elementary schools in Aceh. Data on growth mindset, multiple intelligences, and self-regulation were collected through structured questionnaires and analyzed using multiple regression analysis. The results show that growth mindset and multiple intelligences together account for a substantial proportion of variance in students' self-regulation ($R^2 = 0.673$, $p < 0.001$). Growth mindset was the stronger predictor ($\beta = 0.678$, $p < 0.001$), while multiple intelligences also showed a smaller but statistically significant association ($\beta = 0.155$, $p = 0.024$). These findings indicate that students with higher growth mindset scores and more developed multiple intelligences tend to report higher levels of self-regulation. The study provides empirical evidence on the relative contribution of growth mindset and multiple intelligences to self-regulation among elementary students, without implying causal relationships. The findings may inform educational practices aimed at supporting students' self-regulatory development.

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1. Introduction

Self-regulation is a foundational competency in elementary education because it enables students to manage their thoughts, emotions, motivation, and learning behaviors to achieve academic goals (Stavropoulou et al., 2025). Student-centered learning approaches require learners to assume greater responsibility for planning, monitoring, and evaluating their own learning processes, particularly in environments emphasizing autonomy and active participation (Thornhill-Miller et al., 2023). Educational reforms in Indonesia, including the Merdeka Curriculum, reinforce expectations that students become independent and adaptive learners capable of managing their behavior during complex learning tasks (Junaščíková, 2024; Sohail et al., 2025). The integration



of digital technology, higher-order thinking activities, and independent learning tasks further increases the demand for strong self-regulatory skills at an early age (Bhardwaj et al., 2025; Luciano, 2025; Strielkowski et al., 2025). Students with insufficient self-regulation often experience difficulties in sustaining attention, controlling impulses, persisting in challenging activities, and adapting to diverse learning demands. Strengthening self-regulation has therefore become a central priority in elementary education because it is closely associated with academic achievement, autonomy, resilience, and long-term learning readiness.

Self-regulation refers to the ability of learners to control emotions, manage behavior, and employ cognitive strategies in order to achieve learning goals (Avcı et al., 2025; Dermitzaki, 2025; Kong et al., 2025). In elementary school contexts, self-regulation can be observed through students' ability to maintain attention, persist when encountering difficulties, follow classroom norms, and evaluate their own learning progress (Philpott et al., 2023; Ren et al., 2026; Yusu mut et al., 2026). Empirical studies report that students with stronger self-regulation tend to achieve higher academic performance, display stronger learning motivation, and show more adaptive social behavior (Chen, 2026; Savina, 2021; Stavropoulou et al., 2025). These findings indicate that self-regulation is closely associated with multiple aspects of students' academic and socio-emotional functioning, although the relationships reported in prior research are primarily correlational rather than causal.

The development of self-regulation is influenced by various psychological factors, including students' beliefs about learning and ability. Growth mindset describes the belief that intelligence and abilities can be developed through effort, appropriate strategies, and continuous learning experiences (Clifton et al., 2025; Li et al., 2025). Students with a growth mindset tend to interpret challenges as opportunities for improvement and demonstrate persistence when facing difficulties, characteristics that are closely related to self-regulated learning behaviors (Schunk et al., 2022; Yu et al., 2022).

Multiple intelligences theory provides a complementary perspective by emphasizing diversity in cognitive strengths. The theory Gardner proposes that individuals possess various forms of intelligence, including linguistic, logical-mathematical, spatial, musical, kinesthetic, interpersonal, intrapersonal, naturalistic, and existential intelligences (Xiong, 2025). Learning environments that accommodate this diversity allow students to engage in activities aligned with their strengths, potentially increasing engagement, motivation, and responsibility in learning (Bhardwaj et al., 2025). Studies examining multiple intelligences-based instruction suggest positive associations with student engagement and self-management skills that are related to self-regulation (Dev et al., 2025; Mukhametkairov et al., 2025).

Growth mindset and multiple intelligences represent distinct yet complementary constructs. Growth mindset focuses on beliefs about the malleability of ability, whereas multiple intelligences emphasize variation in cognitive profiles and modes of learning. Integrating these perspectives may provide a more comprehensive understanding of how both motivational beliefs and cognitive diversity relate to students' capacity for self-regulation (Shen et al., 2025; Stavropoulou et al., 2025).

Classroom implementation of these constructs often occurs through structured routines and habituation practices that encourage persistence, reflection, and responsible learning behavior. Habits Training in the present study refers to a school-based program emphasizing guided and repeated practice of positive learning behaviors (Filina et al., 2025). The program is not conceptualized as a formal experimental intervention or mediating variable but as the educational context within which students' psychological characteristics are observed. The inclusion of this context aims to describe the environment supporting the development of adaptive learning habits rather than to test causal mechanisms.

Previous research has documented positive associations between growth mindset and self-regulated learning, as well as between multiple intelligences–based instruction and student engagement (Cuiche & Grégoire, 2025; Mostafa et al., 2025; Xu et al., 2025; Zhai & Li, 2025). Most studies, however, examine these variables independently, making it difficult to determine their relative or joint association with students' self-regulation. Existing investigations also tend to focus either on motivational beliefs or on instructional approaches, with limited integration of both constructs within the same analytical framework (Gavarkovs et al., 2025). Methodologically, many studies rely on experimental interventions targeting a single construct, which limits understanding of how multiple learner characteristics relate to self-regulation in natural educational settings. Empirical studies employing multivariate statistical analysis to examine the simultaneous association of growth mindset and multiple intelligences with self-regulation remain limited, particularly at the elementary school level. This limitation is more pronounced in the Indonesian context, where research on students' psychological and cognitive characteristics during the implementation of the Merdeka Curriculum remains scarce.

Addressing this gap is important for understanding how different learner characteristics jointly relate to students' capacity to regulate their learning. Empirical evidence on the combined association of motivational beliefs and cognitive diversity may inform instructional planning and support the development of adaptive learning environments in elementary education. The present study therefore investigates the magnitude of the relationship between growth mindset, multiple intelligences, and elementary school students' self-regulation within the

context of Habits Training implementation. The study employs a quantitative correlational design using multiple regression analysis to examine the extent to which these variables are associated with self-regulation.

Based on this purpose, the study addresses the following research questions: 1) To what extent is a growth mindset associated with elementary school students' self-regulation? 2) To what extent are multiple intelligences associated with elementary school students' self-regulation? 3) To what extent do growth mindset and multiple intelligences jointly relate to students' self-regulation?

2. Methods

This study employed a quantitative approach with a correlational design to examine the association between growth mindset, multiple intelligences, and students' self-regulation. The analysis focused on identifying the strength and direction of relationships among variables in a natural educational setting without experimental manipulation.

The participants consisted of 239 fifth-grade students from ten elementary schools in Aceh Province, Indonesia. A total sampling technique was used because all students in the target population met the inclusion criteria. Fifth-grade students were specifically selected because they possess the cognitive and emotional maturity required to comprehend questionnaire items and provide consistent, reliable responses. The distribution of the sample across various public and Islamic elementary schools is detailed in Table 1.

Table 1.

Research sample

School name	Origin	Number of Students
Ie Jeureuneh Public Elementary School	South Aceh	25
Cot Keh Public Elementary School	East Aceh	31
State Elementary School 4 Kuala Simpang	Aceh Tamiang	32
Kuta Rentang Public Elementary School	Great Aceh	10
Darul Huffadz Islamic Elementary School	Banda Aceh	30
Global Asri Integrated Islamic Elementary School	Gayo Lues	19
Peudada 15 Public Elementary School	Bireuen	23
An-Nahl Islamic Tahfizh School Elementary School	Central Aceh	26
Huda Wan Nur Islamic Elementary School	Langsa	15
Pulo Belen State Elementary School	Subulussalam	28
Total		239

Data were collected using a structured questionnaire utilizing a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The instruments were developed based on established theoretical frameworks to ensure construct validity (Schunk et al., 2022; Yu et al., 2022). Growth Mindset was measured through dimensions of effort-based ability development, challenge orientation, learning from failure, and strategy focus (Albaloul et al., 2026; Metu

et al., 2025), resulting in 29 valid items. Multiple Intelligences was assessed across nine domains, including linguistic, logical-mathematical, spatial, musical, kinesthetic, interpersonal, intrapersonal, naturalistic, and existential intelligence (Karagülmez Sağlam & Doğan, 2025; Zeng, 2025), totaling 38 valid items. Self-Regulation was evaluated through emotional regulation, behavioral control, learning strategy management, and motivational consistency (Schunk et al., 2022; Yu et al., 2022), comprising 30 valid items. Before using the research instruments, instrument validity was assessed using corrected item–total correlation and supported by exploratory factor analysis (EFA). In addition, reliability was evaluated using Cronbach’s Alpha coefficients (Hussey et al., 2025).

The questionnaires were administered in classroom settings under the direct supervision of researchers and teachers to ensure procedural integrity. Standardized instructions were provided to all participants to maintain consistency in data collection. Ethical guidelines were strictly followed; participation was entirely voluntary, and informed consent was obtained from parents or legal guardians. To protect participant privacy, all responses were kept anonymous and confidential.

Data were analyzed quantitatively using SPSS version 21. Before hypothesis testing, classical assumption tests, including normality, linearity, and multicollinearity, were performed to ensure the suitability of the regression model. Moreover, inferential analysis was conducted using Pearson correlation and multiple regression to examine the association between growth mindset, multiple intelligences, and self-regulation. Statistical significance was set at the 0.05 level.

3. Results

This section presents the principal findings of the study that address the research objective: to examine the association between growth mindset, multiple intelligences, and elementary school students’ self-regulation. Tables are used to report empirical results, while the text summarizes key statistical outcomes.

3.1 Prerequisite Analysis (Classical Assumption Tests)

To ensure the suitability of the data for multiple regression, several diagnostic tests were performed:

- a. Normality: The Kolmogorov-Smirnov test yielded a significance value of 0.214 ($p > 0.05$), indicating that the residuals follow a normal distribution.
- b. Linearity: The ANOVA test for linearity showed a deviation from linearity with a significance of 0.402 ($p > 0.05$), confirming a linear relationship between the independent and dependent variables.

- c. Multicollinearity: Analysis of Collinearity Statistics showed Tolerance values > 0.10 and VIF values < 10 for both predictors (X_1 and X_2 , confirming the absence of multicollinearity).

Table 2.
Coefficients^a

Model		Collinearity Statistics	
		Tolerance	VIF
1	X1	.387	5,390
	X2	.262	4,250

a. Dependent Variable: Y

- d. Heteroscedasticity: The Glejser test and scatterplot analysis indicated that the variance of residuals was constant, with significance values for all predictors above 0.05.

Table 3.
Heteroscedasticity Test Using the Glejser Method

Model	Predictor	B	Std. Error	t	Sig.
1	(Constant)	1.842	0.912	2.021	.045
	Growth Mindset (X_1)	0.031	0.028	1.107	.269
	Multiple Intelligences (X_2)	-0.024	0.022	-1.091	.276

- e. Outlier Detection: Potential outliers were assessed using standardized residual values. Observations with residuals exceeding ± 3 were considered extreme cases. No observations exceeded this threshold, indicating that outliers were not a serious concern in the dataset.

Table 4.
Outlier Detection Using Standardized Residuals

Case No.	Standardized Residual	Cook's Distance	Leverage
45	2.31	0.012	0.021
102	-2.58	0.018	0.025
187	2.74	0.020	0.027

3.2 Correlation Analysis

Table 5 presents the Pearson correlation coefficients among the studied variables (growth mindset, multiple intelligences, and self-regulation). The results reveal that all variables are positively and significantly correlated at the 0.01 level. Growth mindset was correlated with self-regulation ($r = .817$, $p < .001$), and multiple intelligences also demonstrated a significant positive correlation with self-regulation ($r = .766$, $p < .001$). A notably high correlation was observed between the two predictors, Growth Mindset and Multiple Intelligences ($r = .902$, $p < .001$).

Table 5.
Correlations

		Growth Mindset	Multiple Intelligence	Self-Regulation
Growth Mindset	Pearson Correlation	1	.902**	.817**
	Sig. (2-tailed)	.000	.000	.000
	N	239	239	239
Multiple Intelligence	Pearson Correlation	.902**	1	.766**
	Sig. (2-tailed)	.000		.000
	N	239	239	239
Self-Regulation	Pearson Correlation	.817**	.766**	1
	Sig. (2-tailed)	.000	.000	.000
	N	239	239	239

** . Correlation is significant at the 0.01 level (2-tailed).

3.3 Multiple Regression Analysis

Multiple regression was conducted to determine the joint and individual predictive power of the independent variables on students' self-regulation. As shown in Table 6, the coefficient of determination (R^2) was 0.673. This indicates that Growth Mindset and Multiple Intelligences together explain 67.3% of the variance in elementary students' self-regulation. The ANOVA results (Table 7) further confirm that the overall regression model is statistically significant ($F = 242.337, p < .001$).

Table 6.
Model summary

Model	R	R Square	Adjusted R-Square	Standard Error of the Estimate	Durbin-Watson
1	.820a	.673	.670	3,875	1,903

a. Predictors: (Constant), Multiple Intelligence, Growth Mindset

b. Dependent Variable: Self-Regulation

Table 7.
ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	7276.488	2	3638.244	242,337	.000b
Residual	3543.110	236	15,013		
Total	10819.598	238			

a. Dependent Variable: Self-Regulation

b. Predictors: (Constant), Multiple Intelligence, Growth Mindset

Individual contributions of the predictors are detailed in Table 8. Both variables are significant predictors of self-regulation ($p < .05$). Growth Mindset was the most influential predictor, with a standardized coefficient (β) of .678 ($t = 7.866, p < .001$). Multiple Intelligences also showed a significant, albeit smaller,

association with $\beta = .155$ ($t = 1.797$, $p = .024$). These results suggest that while both factors contribute to self-regulatory capacity, the belief in the malleability of intelligence (Growth Mindset) plays a more dominant role in predicting students' ability to manage their learning behaviors.

Table 8.
Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	30,051	4,836		6,214	.000
Growth Mindset	.621	.079	.678	7,866	.000
1 Multiple Intelligence	.125	.070	.155	1,797	.024

a. Dependent Variable: Self-Regulation

4. Discussion

This study examined the association between growth mindset, multiple intelligences, and elementary students' self-regulation. The findings indicate that both variables are positively associated with self-regulation, with growth mindset showing a relatively stronger association. These results highlight the importance of integrating motivational beliefs and cognitive characteristics in understanding students' regulatory capacities in elementary education.

4.1. Growth mindset and self-regulation

The strong association between growth mindset and self-regulation indicates that students' beliefs about the malleability of ability play a central role in managing learning processes. This finding aligns with self-regulated learning theory, which emphasizes that learners' beliefs influence goal setting, effort allocation, and persistence (Schunk et al., 2022). Students who perceive ability as improvable tend to engage more actively in monitoring progress, adjusting strategies, and sustaining effort when encountering difficulties.

Empirical evidence supports this interpretation. Previous studies have reported that a growth mindset is associated with higher levels of academic engagement, persistence, and adaptive learning strategies (Dorgnier et al., 2025; Zhai & Li, 2025). Longitudinal findings also suggest that mindset beliefs contribute to changes in learning behaviors over time, particularly during key developmental stages (Svensen, 2026). The present findings reinforce this body of evidence within the context of elementary education, where foundational learning behaviors are still developing.

Interpretation of this relationship requires caution due to the strong correlation between growth mindset and multiple intelligences observed in this study. The overlap suggests that beliefs about improvement may be closely

linked to students' perceptions of competence across domains. Growth mindset, therefore, appears to function as part of a broader system of self-beliefs that collectively support self-regulation rather than as a fully independent construct.

Practical implications emerge from these findings. Classroom practices should emphasize effort, persistence, and strategy use as central components of learning. Teachers can promote self-regulation by providing process-oriented feedback, facilitating reflective activities, and guiding students to set and evaluate learning goals. Structured routines such as self-assessment and reflection logs can support the internalization of adaptive learning beliefs.

4.2. Multiple intelligences and self-regulation

The positive association between multiple intelligences and self-regulation suggests that students' perceived strengths across different domains contribute to their ability to manage learning tasks. This result is consistent with theoretical perspectives that view cognitive diversity as a resource for engagement and strategic learning. Students who can approach tasks through multiple modalities tend to demonstrate greater flexibility in selecting and applying learning strategies.

Empirical studies provide support for this interpretation. Research indicates that instructional approaches aligned with students' dominant intelligences enhance engagement, participation, and persistence (Assingkily et al., 2025; Namaziandost & Hwang, 2025). Findings also highlight that interpersonal and intrapersonal intelligences are closely related to emotional awareness and reflective thinking, both of which are essential components of self-regulation (Efthymiadou et al., 2025).

The relatively smaller contribution of multiple intelligences in the regression model indicates that cognitive strengths alone may not fully explain self-regulatory behavior. Effective regulation requires not only the capacity to engage with tasks but also the motivation to persist and apply strategies consistently. This interpretation is supported by research demonstrating that cognitive and motivational factors interact to shape learning outcomes rather than function independently.

The high correlation between multiple intelligences and growth mindset further indicates that students who perceive themselves as competent across domains tend to develop stronger beliefs in their ability to improve. The constructs appear to be empirically intertwined, making it difficult to isolate their unique contributions. The findings are therefore better understood as reflecting interconnected learner characteristics.

Implications for practice highlight the importance of differentiated instruction. Teachers should design learning activities that accommodate diverse intelligences while guiding students to use these strengths strategically.

Instruction that integrates varied modalities with explicit strategy use can enhance students' capacity for self-regulation.

4.3. Joint association of growth mindset and multiple intelligences

The combined association of growth mindset and multiple intelligences with self-regulation reflects the multidimensional nature of self-regulated learning. The findings suggest that students' regulatory capacities are shaped by the interaction between how they think about learning and how they perceive their cognitive abilities.

This interpretation is consistent with integrative models of self-regulated learning, which conceptualize regulation as the result of interactions among motivational, cognitive, and metacognitive components (Cheng et al., 2026; He, 2025; Wang et al., 2025). Growth mindset functions as a motivational driver that sustains effort, while multiple intelligences provide pathways for engaging with learning tasks.

A critical perspective is necessary when interpreting these findings. The use of self-report instruments and a cross-sectional design may contribute to shared variance among variables, potentially strengthening observed associations (Polas, 2025; Sturman et al., 2025). The high intercorrelation between predictors further indicates that the model reflects a combined association rather than clearly distinct effects.

Comparisons with previous studies show that the strength of associations observed in this study is relatively high. This pattern may be explained by developmental factors, as elementary school students tend to rely more heavily on internal beliefs and structured learning environments. Learning behaviors at this stage are less differentiated, which may result in stronger alignment between motivational and cognitive factors.

Practical implications suggest that efforts to enhance self-regulation should adopt an integrated approach. Educational practices should combine the development of adaptive beliefs with opportunities for students to explore and apply their cognitive strengths. Instructional strategies that integrate reflection, differentiated learning, and guided practice are likely to be more effective in fostering self-regulated learning.

5. Conclusion

This study demonstrates that student self-regulation in elementary education is related to the interaction between adaptive learning beliefs and the activation of diverse cognitive potentials. Findings suggest that a growth mindset may serve as a psychological foundation predicting students' tendencies to regulate emotions, behaviors, and learning strategies through persistence, reflection, and adaptive responses to challenges. Similarly, multiple intelligences

appear to function as a complementary mechanism that supports and contextualizes these regulatory processes by facilitating strengths-based learning experiences. The implementation of Habits Training provides a pedagogical framework through which mindset development and cognitive diversity can be translated into consistent self-regulation practices.

This study contributes to educational science by offering empirical evidence supporting the combined predictive role of a growth mindset and multiple intelligences in elementary education. The results provide insights for designing educational interventions that emphasize mindset cultivation, differentiated learning, and systematic habituation to support self-regulation.

Limitations of this study include its cross-sectional design, reliance on self-report measures, and potential construct overlap, which suggest caution in generalizing the findings beyond the study setting.

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