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HIGHER-ORDER SEM-PLS MODELING OF SCHOOL READINESS AMONG INDONESIAN SENIOR HIGH SCHOOL STUDENTS

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ABSTRACT

Improving the quality of secondary education is a strategic priority in Indonesia due to its impact on human wellbeing. Secondary education faces challenges in improving the quality of learning and students' psychological readiness. School preparation is widely acknowledged as a multifaceted concept that highlights the significance of social-emotional engagement, self-regulation, and cognitive-motivational engagement. Thus, this study is intended to examine the construct of school readiness in Indonesia senior high school students using higher-order SEM-PLS. Results indicate that behavioral regulation is the most influential predictor of academic achievement (0.385) and functions as the central mechanism transmitting social-emotional engagement into academic outcomes. However, cognitive-motivational factors exert a competitive mediating effect, indicating that academic grades do not always improve among students who show strong cognitive-motivational engagement (-0.130). The findings reveal the important role of behavioral regulation in academic achievement and indicate that social-emotional engagement exerts the strongest overall influence on cognitive-motivational engagement, thereby supporting a multidimensional integrated model of school readiness.

Keywords : School Readiness, SEM-PLS, Education

I. INTRODUCTION

Education is the cornerstone for building competitive and sustainable human resources, and government efforts to improve social welfare depend heavily on the effectiveness of the education system. This aligns with Sustainable Development Goal (SDG) 4, which prioritizes inclusive and high-quality education as a pillar of sustainable human development. However, secondary education in Indonesia continues to struggle to improve learning quality and student academic achievement, particularly at the senior high school level where students must simultaneously master more complex subject matter, regulate learning pressure, build healthy peer relationships, and develop independent learning strategies (Suyanto, 2017).

In response to these demands, current literature no longer defines school readiness as a set of basic academic abilities, but rather as a multidimensional construct that includes social-emotional engagement, behavioral regulation, and cognitive-motivational (Janus, Gaskin & Reid-Westoby, 2023). Social-emotional shapes students' learning experiences through emotional regulation, a sense of school belonging, and peer-related behavior, which in turn influence classroom climate and adaptive learning behavior (Miller-Slough, Zhu & Dunsmore, 2025). Behavioral regulation comprising persistence and effort, time management and planning, and attention and participation enables students to observe, assess, and modify their learning activities to attain self-set academic goals (Aydan & Capa-Aydin, 2025). Cognitive-motivational, operationalized through academic self-efficacy, task value, and growth mindset, sustains intrinsic motivation and the use of deep cognitive learning strategies (Bai & Wang, 2023).

Prior empirical investigations have established relationships among these constructs using multiple regression (Galizty & Sutarni, 2021), correlation and path analysis (Wirajaya, Suganda & Zuraida, 2019), and latent class analysis (Christensen *et al.*, 2022). Although these methods have advanced significantly, most research still uses profile-based approaches or direct factors without including social-emotional, self-regulation, and cognitive motivation into a hierarchical model. While these studies have advanced the field, two critical gaps remain unaddressed. First, most studies treat social-emotional, self-regulation, and cognitive-motivational as parallel predictors rather than as interconnected dimensions within a unified hierarchical construct, thereby overlooking the mediating mechanisms that link them. Second, the role of behavioral regulation as a mediating mechanism between socio-emotional foundations and academic outcomes has rarely been empirically tested using higher-order modeling approaches that can accommodate both hierarchical structure and non-normal data.

To address these gaps, the present study employs a partial least squares approach in higher-order Structural Equation Modeling (SEM) to model school readiness among Indonesian senior high school students as a multidimensional hierarchical construct and to examine how behavioral regulation and cognitive-motivational mediate social-emotional engagement and academic grade. The findings

are expected to inform data-driven interventions aimed at strengthening both the structural and behavioral foundations of academic achievement in Indonesian senior high schools.

II. METHODS

2.1. Data Sources

This study is based on a publicly available dataset about school readiness in Indonesian (Hermita & Wijaya, 2025). The original data comprised 1182 junior and senior high school students, but this study focused on the school readiness of senior high school students, so the filtered results were 633 students. After handling missing values and data consistency, a clean sample of 572 students was retained.

Table 1: Senior High School Student Demographics

Characteristics		Male (n = 210)	Female (n = 362)	Total (n = 572)
School location	Remote area	8	19	27
	Rural area	95	163	258
	Urban area	107	180	287
Grade	10	88	154	242
	11	64	98	162
	12	58	110	168
Mode of transportation to school	Walking	9	26	35
	Bicycle	2	1	3
	Motorcycle	187	305	492
	Car	9	21	30
	Public transportation	3	9	12

Table 1 describes respondent characteristics based on demographic factors such as gender, school location, grade, and mode of transportation to school. Among the 572 respondents, 63.3% were female. Respondents were distributed across grade 10 (42.3%), grade 11 (28.3%), and grade 12 (29.4%). The majority attended schools in urban and rural areas, with a smaller proportion from remote regions. Motorcycles were the dominant mode of transportation (86.0%), followed by cars (5.2%).

Figure 1: Province Distribution

The sample includes 572 Indonesian students from 10 provinces. Most respondents (383; 67%) are from Riau; West Kalimantan (122; 21%) is the second largest, while respondents from other provinces contribute much less. Moderate representation comes from South Maluku (5%) and Jakarta (4%). Banten, West Java, East Java, Central Kalimantan, and Bangka Belitung make up less than 3% of the sample.

2.2. Conceptual Framework and Hypotheses Development

Drawing on multidimensional school readiness literature, this study conceptualizes school readiness as a higher-order construct consisted of three interrelated aspects: social-emotional engagement, behavioral regulation, and cognitive-motivational engagement (Wang & Wang, 2025). These three dimensions are hypothesized to jointly influence academic achievement, with behavioral regulation and cognitive-motivational serving as mediating mechanisms that transmit the effect of social-emotional foundations into learning outcomes. Each higher-order construct is operationalized through three lower-order construct. Social-emotional comprises sense of school belonging, emotional regulation, and peer-related behavior (Miller-Slough, Zhu & Dunsmore, 2025). Behavioral regulation comprises academic persistence, time management and planning, attention and participation (Aydan & Capa-Aydin, 2025). Cognitive-motivational comprises academic self-efficacy, task value, and growth mindset (Bai & Wang, 2023). In total, twelve lower-order constructs were assessed, each operationalized through four items rated from 1 to 5 (strongly disagree to strongly agree). Academic achievement is measured through students' self-perceived performance across ten subjects, rated from 1 to 5 (Very Poor to Very Excellent) (Hermita & Wijaya, 2025).

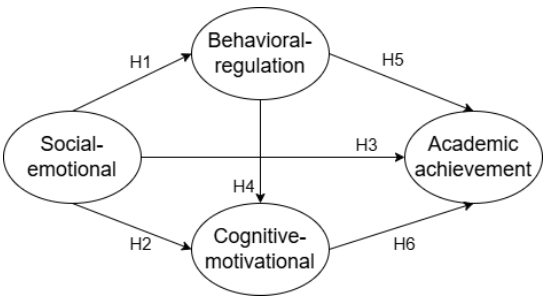

Figure 2: Conceptual Framework of School Readiness

Social-emotional engagement is theorized to form the affective foundation upon which self-regulated learning develops. Students who feel accepted at school, regulate their emotions effectively (Dan & Bai, 2025), and maintain positive peer relationships are better positioned to sustain persistence, manage time, and maintain attention in academic tasks (Miller-Slough, Zhu & Dunsmore, 2025). Emotional stability also frees cognitive resources that can be allocated to motivational appraisals such as self-efficacy and task value, and may contribute directly to achievement through improved classroom participation and reduced learning anxiety (Wirajaya, Suganda & Zuraida, 2019; Sari, Oktriyanti & Laniar, 2024).

H1. Social-emotional has a positive and significant effect on behavioral regulation.
H2. Social-emotional has a positive and significant effect on cognitive-motivational.
H3. Social-emotional has a positive and significant effect on academic achievement.

Behavioral regulation, as the self-regulatory behavioral core of learning, is expected to influence both motivational cognition and academic outcomes. Students who persist through difficulty, organize their study time systematically, and maintain attention during instruction are more likely to experience mastery, which in turn reinforces their self-efficacy, perceived task value, and growth mindset (Shamla & Jayan, 2025). Behavioral regulation also translates directly into measurable performance by ensuring that effort is consistently directed toward academic goals (Galizty & Sutarni, 2021; Dewi, Mertasari & Ratnaya, 2024).

H4. Behavioral regulation has a positive and significant effect on cognitive-motivational.
H5. Behavioral regulation has a positive and significant effect on academic achievement.

Cognitive-motivational, which captures students' beliefs about their capabilities, the value of academic tasks, and the malleability of intelligence, is theorized in classical expectancy-value and self-determination frameworks to enhance academic performance by sustaining intrinsic motivation and promoting deeper cognitive engagement (Steinmayr *et al.*, 2019).

H6. Cognitive-motivational has a positive and significant effect on academic achievement.

This study proposes that the influence of social-emotional on academic grade is not purely direct but operates largely through intermediate regulatory (Morosanova, Bondarenko & Fomina, 2022; Armiati et al., 2026) and motivational mechanisms (Pekrun *et al.*, 2017). Similarly, the link between behavioral regulation and academic achievement is hypothesized to be partially channeled through cognitive-motivational (Supervía & Robres, 2021). Support for these mediation hypotheses would strengthen the theoretical claim that behavioral regulation functions as the behavioral bridge linking socio-emotional foundations to academic outcomes, while also clarifying the boundary conditions under which cognitive-motivational beliefs translate into measurable achievement.

H7a. Behavioral regulation mediates the relationship between social-emotional engagement and academic achievement.
H7b. Behavioral regulation mediates the relationship between social-emotional engagement and cognitive-motivational engagement.
H7c. Cognitive-motivational engagement mediates the relationship between social-emotional engagement and academic achievement.
H7d. Cognitive-motivational engagement mediates the relationship between behavioral regulation and academic achievement.

2.3. Structural Equation Modeling – Partial Least Squares

Structural Equation Modeling (SEM) is a multivariate dependence method that simultaneously estimates the relationships among latent variables. This study adopts the Partial Least Squares (PLS), which is robust to non-normal data, small-to-moderate sample sizes, and complex hierarchical models (Hair *et al.*, 2019). The analysis was conducted using the repeated-indicators approach for the higher-order component model. The measurement model links observed indicators to their latent constructs via a reflective confirmatory factor structure. Equations (1) are measurement models for the dependent and independent variables, respectively. In this model, y represents the indicator of endogenous constructs (η), while x denotes the indicator of exogenous constructs (ξ).

$$y_{(px1)} = \lambda_{(pxm)}\eta_{(mx1)} + \varepsilon_{(px1)} \quad (1)$$

$$x_{(q\,x1)} = \lambda_{(pxn)}\xi_{(n\,x1)} + \delta_{(q\,x1)} \quad (2)$$

The symbol λ refers to the factor loadings, which describes the relationships between indicators and their respective latent constructs. The term ε indicates the measurement error associated with the y indicators and δ represents the measurement error linked to x indicators. Measurement model evaluation included convergent validity (factor loadings ≥ 0.60 and Average Variance Extracted, AVE ≥ 0.50), construct reliability using Cronbach's alpha ≥ 0.70 and Composite Reliability ≥ 0.70, and discriminant validity using the Heterotrait-Monotrait (HTMT) ratio at a threshold of 0.85. The structural model specifies the simultaneous relationships among endogenous and exogenous constructs through the following equations.

$$\eta_{(mx1)} = \beta_{(mxm)}\eta_{(mx1)} + \gamma_{(mxn)}\xi_{(nx1)} + \zeta_{(mx1)} \quad (3)$$

The symbol β represents the path coefficients describing the relationships among endogenous constructs while γ denotes the path coefficients that capture the effects of exogenous constructs on endogenous constructs. The term ζ refers to the structural error term associated with the endogenous constructs. Furthermore, m and n denote the model's endogenous and exogenous constructs, respectively. The structural model was assesed using path coefficients, coefficient of determination (R^2), and effect size (f^2). Bootstrap resampling was employed to evaluate the significance of path coefficients and indirect effects. This research uses the seminr package in RStudio 2026.01.2+418 version for SEM-PLS analysis.

III. RESULTS AND DISSCUSSION

3.1. Lower-Order Measurement Model

Based on Shapiro-Wilk test with the P-value of 2.2×10^{-16}, the data did not satisfy the normal assumption, so further analysis used the SEM-PLS approach. Measurement model evaluation in lower-order SEM PLS is used to test the validity and reliability of item constructs. Measurement model initial analysis identified five indicators with factor loadings below the 0.60 threshold: A3.1 - A3.2 within peer-related behavior, C3.3 within growth mindset, and D1 - D2 within academic achievement. These indicators were removed sequentially, from the lowest loading. Table 2-5 shows CR values ranged

from 0.818 to 0.919 and AVE values above 0.5, confirming acceptable convergent validity and construct reliability for all lower-order constructs.

Table 2: Social Emotional Lower-Order Construct Factor Loading and Reliability after Modification

Construct	Item	Est.	T Stat.	2.5% CI	97.5 % CI	Cronbach's Alpha	CR	AVE	rhoA
Sense of School Belonging	A1.1	0.802	45.942	0.766	0.836	0.793	0.865	0.617	0.795
	A1.2	0.826	38.115	0.778	0.863				
	A1.3	0.780	31.269	0.727	0.821				
	A1.4	0.734	23.258	0.670	0.787				
Emotion Regulation	A2.1	0.722	21.882	0.655	0.781	0.723	0.828	0.547	0.735
	A2.2	0.653	17.129	0.570	0.722				
	A2.3	0.790	37.622	0.746	0.827				
	A2.4	0.785	33.577	0.735	0.826				
Peer-Related Behavior	A3.3	0.773	20.599	0.687	0.834	0.566	0.818	0.693	0.605
	A3.4	0.888	62.382	0.861	0.915				

Following the addition of modifications, all social-emotional maintained indicators had loadings in Table 2 ranging from 0.653 to 0.888, and their t-statistics were greater than 1.96, indicating that they made statistically significant contributions to their respective constructs.

Table 3: Behavioral Regulation Lower-Order Construct Factor Loading and Reliability after Modification

Construct	Item	Est.	T Stat.	2.5% CI	97.5% CI	Cronbach's Alpha	CR	AVE	rhoA
Academic Persistence	B1.1	0.841	40.798	0.796	0.876	0.850	0.899	0.689	0.852
	B1.2	0.790	33.347	0.742	0.833				
	B1.3	0.851	47.232	0.814	0.884				
	B1.4	0.837	39.955	0.792	0.873				
Time Management	B2.1	0.808	38.610	0.764	0.849	0.796	0.867	0.62	0.801
	B2.2	0.751	28.575	0.694	0.798				
	B2.3	0.824	51.317	0.790	0.854				
	B2.4	0.764	32.733	0.718	0.810				
Attention and Participation	B3.1	0.785	38.966	0.742	0.819	0.769	0.852	0.59	0.775
	B3.2	0.748	29.750	0.694	0.794				
	B3.3	0.734	26.237	0.675	0.785				
	B3.4	0.802	43.225	0.763	0.836				

Those remaining indicators of cognitive-motivational engagement, behavioral regulation, and academic achievement with loading values greater than 0.6 are presented and explained in Table 3-4. T-stat values exceeding 1.96 for all items, indicating that all loadings are significant and valid in forming the constructs.

Table 4: Cognitive-Motivational Lower-Order Construct Factor Loading and Reliability after Modification

Construct	Item	Est.	T Stat.	2.5% CI	97.5 % CI	Cronbach's Alpha	CR	AVE	rhoA
Academic Self-Efficacy	C1.1	0.740	29.988	0.690	0.785	0.833	0.889	0.668	0.835
	C1.2	0.856	52.947	0.822	0.885				
	C1.3	0.826	35.747	0.777	0.866				
	C1.4	0.842	38.374	0.795	0.881				
Task Value	C2.1	0.862	42.675	0.821	0.899	0.882	0.919	0.739	0.884
	C2.2	0.869	45.107	0.825	0.903				
	C2.3	0.850	33.792	0.799	0.896				
	C2.4	0.857	32.004	0.797	0.901				
Growth Mindset	C3.1	0.872	51.049	0.836	0.904	0.797	0.881	0.712	0.799
	C3.2	0.835	41.926	0.792	0.870				
	C3.4	0.823	32.186	0.767	0.866				

Table 5: Academic Achievement Lower-Order Construct Factor Loading and Reliability after Modification

Construct	Item	Est.	T Stat.	2.5% CI	97.5 % CI	Cronbach's Alpha	CR	AVE	rhoA
Academic Achievement	D3	0.646	12.302	0.525	0.732	0.875	0.901	0.534	0.883
	D4	0.721	23.630	0.659	0.772				
	D5	0.776	26.507	0.711	0.824				
	D6	0.748	23.293	0.673	0.801				
	D7	0.782	29.628	0.720	0.825				
	D8	0.762	22.436	0.683	0.818				
	D9	0.690	14.800	0.584	0.766				
	D10	0.709	19.008	0.623	0.773				

3.2. Higher-Order Measurement Model

Next, validity and reliability testing were conducted for the higher-order SEM-PLS model. All all latent variables pertaining to social-emotional, behavioral regulation, and cognitive-motivational in Table 6 exhibited factor loadings above 0.60. The bootstrap process evaluates the estimated loading factors, demonstrating that all variables are statistically significant at the 95% confidence level. The cronbach's alpha coefficients varied between 0.737 and 0.882 and CR value from 0.851 to 0.927,

confirming reliability. The AVE values obtained were also greater than 0.5, ranging from 0.655 to 0.809 which confirms that the item converge on the same construct. The construct reliability test results indicate that the constructs in the higher-order model are reliable.

Table 6: Higher-Order Construct Factor Loading and Reliability

Construct	Est.	T Stat.	2.5% CI	97.5 % CI	Cronbach's alpha	CR	AVE	rhoA
Social-Emotional					0.737	0.851	0.655	0.739
Sense of School Belonging	0.799	36.528	0.754	0.839				
Emotion Regulation	0.827	48.082	0.794	0.861				
Peer-Related Behavior	0.803	33.082	0.752	0.845				
Behavioral Regulation					0.846	0.907	0.764	0.850
Academic Persistence	0.873	67.152	0.845	0.897				
Time Management	0.864	68.485	0.837	0.887				
Attention & Participation	0.886	76.816	0.864	0.908				
Cognitive-Motivational					0.882	0.927	0.809	0.888
Self-Efficacy	0.902	91.143	0.883	0.921				
Task Value	0.921	87.275	0.899	0.940				
Growth Mindset	0.874	37.812	0.823	0.913				

Table 7: Higher-Order Construct Discriminant validity using HTMT

Paths	Original Est.	T Stat.	2.5% CI	97.5% CI
Social-Emotional → Behavioral Regulation	0.813	15.533	0.705	0.906
Social-Emotional → Cognitive-Motivational	0.729	18.620	0.650	0.801
Social-Emotional → Academic Achievement	0.300	5.377	0.193	0.402
Behavioral Regulation → Cognitive-Motivational	0.883	39.498	0.842	0.927
Behavioral Regulation → Academic Achievement	0.349	6.699	0.243	0.446
Cognitive-Motivational → Academic Achievement	0.179	4.125	0.116	0.281

The HTMT in Table 7 was applied to evaluate discriminant validity, which indicate that all relationships between high-level constructs are valid because they are below 0.85. Although there is

one correlation slightly exceeded 0.85, namely the relationship between behavioral regulation and cognitive-motivational engagement, the bootstrap confidence interval did not contain the value 1 and the t-statistic exceeded 1.96, indicating empirical distinctiveness of the constructs.

3.3. Structural Model Evaluation

All VIF values were below the 5 thresholds (range: 1.711–2.842), indicating that common method bias does not pose a serious threat to the validity of the structural estimates. This assumption evaluation is important because it can affect the model parameter estimates and reverse the direction of the coefficients.

Table 8: Collinearity Among Constructs

Construct	Cognitive-Motivational	Academic Achievement
Social-Emotional	1.711	1.777
Behavioral Regulation	1.711	2.842
Cognitive-Motivational	-	2.549

Table 9: Structural Model Evaluation

Endogenous Construct	R^2	$adj\ R^2$
Behavioral Regulation	0.416	0.415
Cognitive-Motivational	0.608	0.606
Academic Achievement	0.113	0.108

The R² revealed that 60.8% of the variance in cognitive-motivational was explained by social-emotional engagement and behavioral regulation. Social-emotional engagement contributed to 41.6% of the explained variance in behavioral regulation. For academic achievement, R² reached 11.3%, reflecting that the majority of variance in this outcome is driven by factors external to the current model.

Table 10: f^2 Effect Size

Exogenous Construct	Endogenous Construct		
	Behavioral Regulation	Cognitive-Motivational	Academic Achievement
Social-Emotional	0.711	0.040	0.007
Behavioral Regulation	-	0.648	0.057
Cognitive-Motivational	-	-	0.015

Effect size (f²) analysis showed that social-emotional engagement exerted a large effect on behavioral regulation (f² = 0.711), and behavioral regulation exerted a large effect on cognitive-

motivational engagement (f^2 = 0.648). In contrast, the direct link of social-emotional engagement on cognitive-motivational was small (f^2 = 0.040). The individual effects of the three higher-order constructs on academic achievement were relatively small, consistent with the modest R^2 for that outcome.

3.4. Mediation Analysis

In Table 11, bootstrap sampling is used to look at the direct and indirect links of the mediation structural model. Behavioral regulation turned out to be the strongest predictor of academic achievement (β = 0.385, t = 5.938, p < 0.001). This finding aligns with prior research on Indonesian high school students, which has reported positive links between student's self-regulated learning and academic outcome (Galizty & Sutarni, 2021) (Dewi, Mertasari & Ratnaya, 2024).

Table 11: Mediation Analysis

	Paths	Est.	T Stat.	2.5% CI	97.5% CI
	Direct Effect				
H_1	Social-Emotional → Behavioral Regulation*	0.645	15.046	0.559	0.727
H_2	Social-Emotional → Cognitive-Motivational*	0.161	4.252	0.086	0.231
H_3	Social-Emotional → Academic Achievement*	0.111	2.001	-0.003	0.220
H_4	Behavioral Regulation → Cognitive-Motivational*	0.666	17.724	0.594	0.738
H_5	Behavioral Regulation → Academic Achievement*	0.385	5.938	0.267	0.521
H_6	Cognitive-Motivational → Academic Achievement	-0.195	-2.763	-0.342	-0.071
	Indirect Effect				
	Through Behavioral Regulation :			Complementary mediation	
H_{7a}	Social-Emotional → Academic Achievement*	0.248	5.682	0.174	0.343
H_{7b}	Social-Emotional → Cognitive-Motivational*	0.430	11.409	0.366	0.511
	Through Cognitive-Motivational:			Competitive mediation	
H_{7c}	Social-Emotional → Academic Achievement	-0.031	-2.125	-0.067	-0.008
H_{7d}	Behavioral Regulation → Academic Achievement	-0.130	-2.696	-0.233	-0.046
	Total Effect				
	Social-Emotional → Cognitive-Motivational*	0.590	15.624	0.520	0.664
	Behavioral Regulation → Academic Achievement*	0.255	4.598	0.148	0.371
	Social-Emotional → Academic Achievement*	0.244	5.601	0.159	0.324

**The hypothesis is statistically significant at the 5% level*

More importantly, behavioral regulation significantly mediated the association between social-emotional and academic outcome. The direct path from social-emotional to academic achievement was small but significant (β = 0.111), whereas the indirect path through behavioral regulation was substantially larger (β = 0.248). This pattern indicates that a sense of school belonging, emotional regulation, and positive peer associations translate into academic achievement primarily by fostering stronger self-regulation skills rather than by influencing grades directly (Sari, Oktriyanti & Laniar, 2024). Behavioral regulation can therefore be interpreted as the behavioral bridge that transforms socio-emotional foundations into adaptive academic behavior. The indirect effect of behavioral regulation can increase the influence of social-emotional on cognitive-motivational (0.430), which strengthened by strong and significant social-emotional to behavioral regulation (0.645) and behavioral regulation to cognitive-motivational (β = 0.666). These findings are in line with prior studies that mediating role of behavioral regulation, social-emotional, and achievement relationships (Morosanova, Bondarenko & Fomina, 2022).

However, when cognitive-motivational mediation effect is added, the parameter coefficient decreases and reverses the direction of the relationship (-0.031), due to its influence on cognitive-motivational and academic achievement relationship (-0.195). The social-emotional and academic achievement relationship strengthens empirical evidence that the social-emotional developments is an important factor in supporting students' success in Indonesia educational contexts.

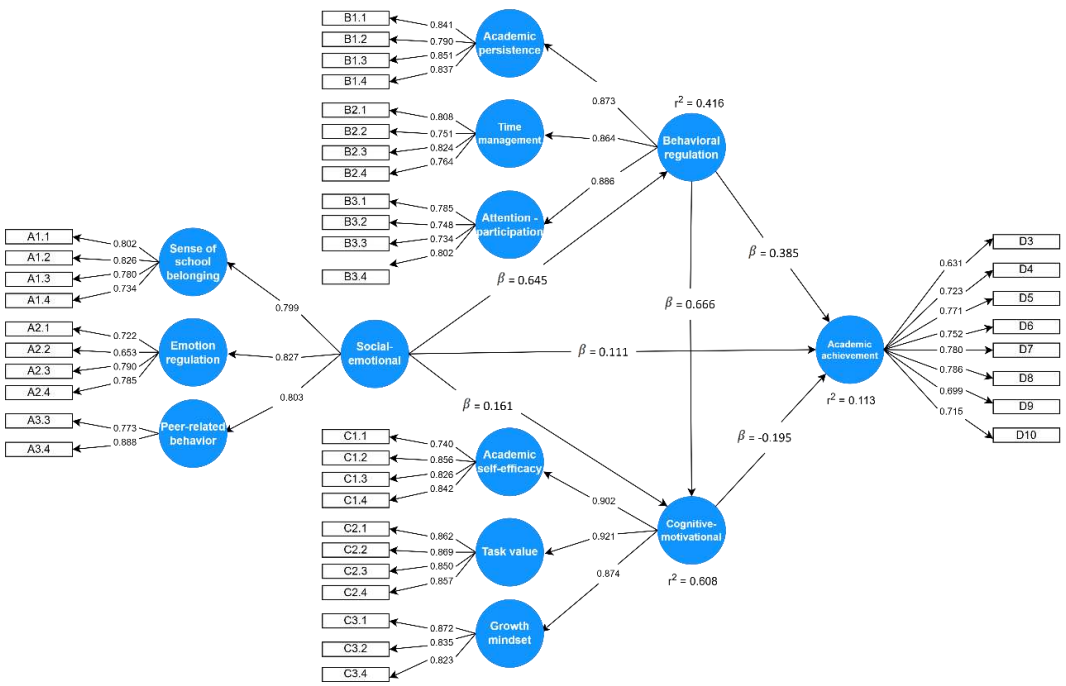

Figure 3: School Readiness Construct Path Diagram

Figure 3 shows SEM-PLS diagram, the strongest association in the entire model was the indirect coefficient from social-emotional engagement to cognitive-motivational through behavioral regulation (β = 0.590), built on the strong sequential links from social-emotional engagement to behavioral regulation (β = 0.645) and from behavioral regulation to cognitive-motivational engagement (β = 0.666). This integrated structural pattern illustrates that school readiness is not a collection of parallel factors but a cascading process in which socio-emotional foundations enable self-regulation, which in turn sustains motivational cognition, which ultimately, when accompanied by effective behavioral regulation, supports academic achievement.

IV. CONCLUSION

This study modeled senior high school readiness in Indonesian students as a higher-order multidimensional construct using SEM-PLS, integrating social-emotional, behavioral regulation, and cognitive-motivational engagement. The study extends self-regulated learning frameworks by positioning behavioral regulation as the central mediating mechanism that transforms socio-emotional foundations into academic achievement, and by revealing a competitive mediation pattern in which cognitive-motivational engagement exhibits a counterintuitive negative indirect effect. The study demonstrates the value of higher-order SEM-PLS for modeling psychological-educational constructs with non-normal data. The results imply that educational interventions in Indonesian senior high schools should prioritize the development of self-regulation skills: persistence, time management, and attention control rather than focusing solely on motivational enhancement. Future research should extend this model by incorporating objective achievement measures, longitudinal designs, and multi-group analyses to check the invariance of the proposed frameworks.

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