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Student engagement as a mediator of learning outcomes in vocational education

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ABSTRACT

This study examined the effects of self-regulated learning and social capital on learning outcomes through student engagement as a mediating variable among vocational high school students. A quantitative explanatory survey was conducted with 371 students selected using proportional stratified random sampling. Data were collected through validated questionnaires and academic records and analyzed using multiple regression, path analysis, and the Sobel test. Self-regulated learning and social capital significantly influenced student engagement and learning outcomes ($p < 0.001$). Student engagement also significantly predicted learning outcomes ($\beta = 0.303$, $p < 0.001$) and partially mediated the effects of self-regulated learning and social capital. The proposed model explained 88.7% of the variance in learning outcomes ($R^2 = 0.887$). Strengthening self-regulated learning, social capital, and student engagement can effectively improve vocational students' academic achievement and support evidence-based educational practices.



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Introduction

Learning outcomes are widely recognized as a key indicator of educational effectiveness because they reflect students' mastery of knowledge, skills, and competencies acquired through the learning process (Prananto et al., 2025; Tomaszewski et al., 2022). In vocational education, learning outcomes are particularly important because they determine students' readiness to meet labor market demands and adapt to changing industrial environments. However, despite continuous curriculum reforms, many vocational schools still encounter difficulties in achieving optimal academic performance (Kareem et al., 2022; Sattar et al., 2022). These challenges have encouraged researchers to investigate the factors that influence students' academic achievement in vocational education.

Recent studies have highlighted the importance of both personal and environmental factors in improving learning outcomes (Chhetri & Baniya, 2022; J. Wang et al., 2022). Self-regulated learning, as an internal factor, enables students to plan, monitor, and evaluate their own learning, thereby fostering persistence, effective learning strategies, and academic responsibility. Numerous studies have consistently demonstrated that self-regulated learning positively influences academic achievement across diverse educational settings (Shanshan & Loang, 2024; Wagino et al., 2024). At the same time, social capital, reflected in trust, social networks, and support from teachers, peers, and families, provides students with valuable academic and emotional resources

that enhance motivation, learning commitment, and academic performance (Okolie et al., 2022; Rafiq et al., 2022).

Student engagement has also become a central construct in educational research because it represents students' behavioral, emotional, and cognitive involvement in learning activities. Students with higher engagement are more likely to participate actively, invest greater effort, and develop positive learning experiences, leading to improved academic achievement and educational persistence. The increasing adoption of student-centered learning has further strengthened the importance of engagement as a predictor of learning success (Fute et al., 2025; Hmoud et al., 2025).

The relationship among self-regulated learning, social capital, student engagement, and learning outcomes can be explained through Bandura's Social Cognitive Theory, which emphasizes reciprocal interactions among personal, environmental, and behavioral factors. Within this framework, self-regulated learning represents a personal factor, social capital reflects environmental support, and student engagement serves as the behavioral process that facilitates learning and ultimately influences academic achievement (Mozammel et al., 2024; Wedyaswari et al., 2026). This perspective provides a comprehensive foundation for understanding learning outcomes in vocational education.

Although previous research has confirmed the positive effects of self-regulated learning, social capital, and student engagement on academic performance, existing evidence remains fragmented. Most studies have examined these variables separately or focused only on direct relationships with learning outcomes (Chatterjee et al., 2026; Ogba et al., 2025). Furthermore, limited research has investigated the mediating role of student engagement within an integrated model, particularly in vocational high schools, whose competency-based curricula and workplace-oriented learning environments differ substantially from general education settings (Esentürk et al., 2025; M. Wang, 2024).

Therefore, this study examines the effects of self-regulated learning and social capital on learning outcomes through student engagement among vocational high school students in Pesisir Selatan Regency, Indonesia. The novelty of this research lies in integrating personal and environmental factors into a single mediation framework, with student engagement serving as the mechanism linking self-regulated learning and social capital to learning outcomes (Liu et al., 2025; Mazid et al., 2025; Tannoubi et al., 2025). The findings are expected to enrich the application of Social Cognitive Theory in vocational education while providing practical recommendations for improving students' academic achievement.

Method

This study employed a quantitative research approach using an explanatory survey design to examine the direct and indirect effects of self-regulated learning and social capital on students' learning outcomes through student engagement as a mediating variable. The research was conducted among vocational high school students in Pesisir Selatan Regency, Indonesia. The population consisted of 5,159 students enrolled in 17 public and private vocational schools. The sample size was determined using the Slovin formula, resulting in 371 respondents. A proportional stratified random sampling technique was applied to ensure representation across districts and school types, followed by simple random sampling within each school to provide equal opportunities for all students to participate in the study.

Data analysis was performed using descriptive and inferential statistical techniques with the assistance of SPSS software. Descriptive statistics were employed to describe respondents' characteristics and variable distributions through means, percentages, and respondent achievement levels. Hypothesis testing was conducted using multiple regression and path analysis to examine the direct effects among variables and the mediating role of student engagement. The mediation effect was further evaluated using the Sobel test. Before hypothesis testing, classical assumption tests including normality, heteroscedasticity, and multicollinearity assessments were conducted to verify the suitability of the regression model. Statistical significance was determined at the 0.05 level, and all analyses were performed to evaluate the proposed conceptual framework linking self-regulated learning, social capital, student engagement, and learning outcomes among vocational high school students.

Results and Discussions

This section presents the findings of the study concerning the relationships among self-regulated learning, social capital, student engagement, and learning outcomes among vocational high school students in Pesisir Selatan Regency. The analysis begins with a description of respondents' demographic characteristics and the distribution of research variables, followed by hypothesis testing using multiple regression and path analysis. Descriptive

statistics were employed to provide an overview of respondents' perceptions regarding each construct, while inferential analyses were conducted to examine the direct and indirect effects among variables within the proposed conceptual framework. Furthermore, classical assumption tests were performed to ensure that the regression model met the required statistical assumptions. The results provide empirical evidence regarding the role of self-regulated learning and social capital in shaping learning outcomes, both directly and through the mediating role of student engagement.

Table 1. Demographic Characteristics of Respondents (N = 371)

Variable	Category	n	%
Gender	Male	155	41.78
	Female	216	58.22
Extracurricular Participation	Participating	237	63.88
	Not Participating	134	36.12
Major	Accounting and Finance (AKL)	102	27.49
	Computer and Network Engineering (TKJ)	64	17.25
	Motorcycle Engineering (TSM)	44	11.86
	Other Majors	161	43.40

Table 1 presents the demographic profile of the respondents. The study involved 371 vocational high school students from 17 schools in Pesisir Selatan Regency. Female students constituted the majority of the sample (58.22%), while male students accounted for 41.78%. Most respondents actively participated in extracurricular activities (63.88%), indicating a relatively high level of engagement in school-related activities outside the classroom. Regarding academic majors, Accounting and Finance (AKL) represented the largest proportion of students (27.49%), followed by Computer and Network Engineering (17.25%) and Motorcycle Engineering (11.86%). These findings demonstrate that the sample adequately represents diverse vocational education backgrounds.

Table 2. Descriptive Statistics of Research Variables

Variable	Mean	TCR (%)	Category
Self-Regulated Learning	3.66	73.26	Good
Social Capital	3.99	79.84	Good
Student Engagement	4.07	81.40	Good

Table 2 shows the descriptive statistics of the independent variables. Self-regulated learning achieved a mean score of 3.66 with a respondent achievement level (TCR) of 73.26%, indicating a good level of learning self-management among students. Social capital obtained a higher mean score of 3.99 and a TCR value of 79.84%, also categorized as good. Next, student learning engagement reached an average score of 4.07 with a Respondent Achievement level (TCR) of 81.40% in the good category.

Table 3. Regression Analysis of the Proposed Research Model

Model	Dependent Variable	Predictor	B	β	t	p	R	R ²	Adj. R ²	F	Model p
1	Students Engagement	Self-Regulated Learning	0,276	0,410	8,958	<0.005	0,705	0,497	0,494	181,782	<0.005
1	Students Engagement	Social Capital	0,263	0,380	8,309	<0.005	0,705	0,497	0,494	181,782	<0.005
2	Learning Outcomes	Self-Regulated Learning	0,414	0,454	18,965	<0.005	0,942	0,887	0,886	963,078	<0.005
2	Learning Outcomes	Social Capital	0,312	0,333	14,065	<0.005	0,942	0,887	0,886	963,078	<0.005
2	Learning Outcomes	Students Engagement	0,411	0,303	12,267	<0.005	0,942	0,887	0,886	963,078	<0.005

Table 3 summarizes the regression analysis used to test the proposed research model. In Model 1, self-regulated learning and social capital significantly predict student engagement, explaining 49.70% of the variance. In Model 2, both self-regulated learning, social capital, and student engagement significantly affect learning outcomes, with the model explaining 88.70% of the variance. Self-regulated learning shows the strongest direct effect on learning outcomes, followed by social capital. When student engagement is added to the model as a mediator, the influence of self-regulated learning on learning outcomes thru engagement is 12.4%. Meanwhile, the influence of social capital on learning outcomes thru engagement is 11.50%. For a better understanding of

the structural relationships between the variables in the study, the proposed research model is presented in the following figure.

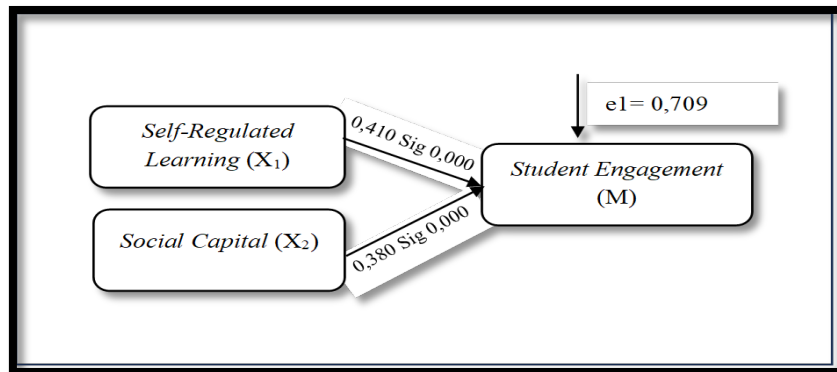


Figure 1. Sub Structural Relationship Pathway Diagram 1

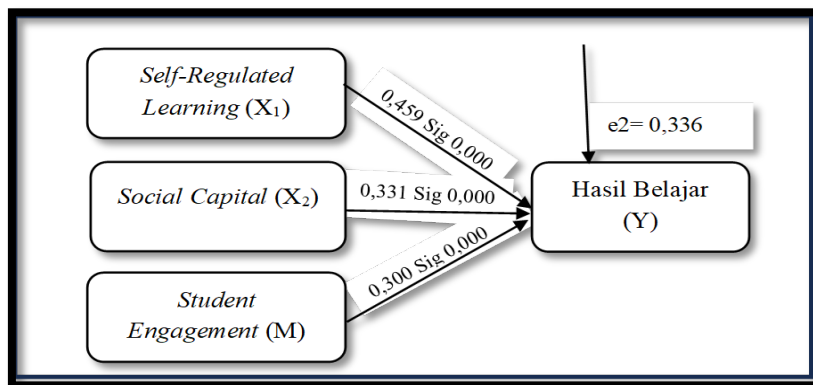


Figure 2. Sub-Structural Relationship Pathway Diagram 2

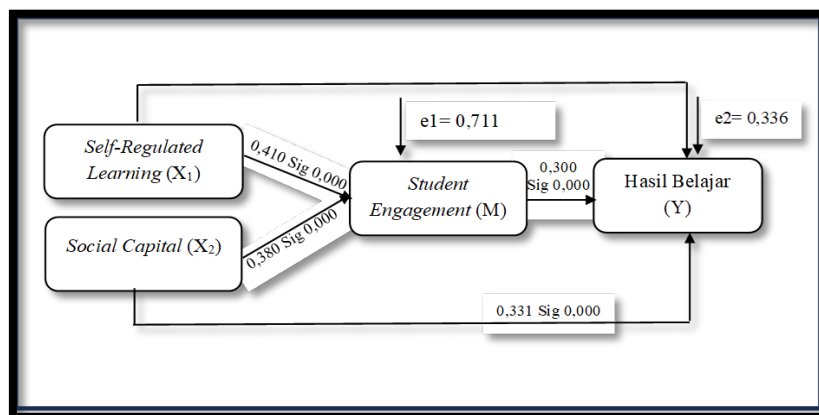


Figure 3. Diagram of the Sub Structural 1 and Sub Structural 2 Connection Path

Table 4. Summary of Hypothesis Testing

Hypothesis	Path	F	p	Result
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H1	Self-Regulated Learning and Social Capital to Student Engagement	181,782	<0.005	Supported
H2	Self-Regulated Learning, Social Capital and Student Engagement to Learning Outcomes	963,078	<0.005	Supported
H3	Self-Regulated Learning and social capital on learning outcomes thru student engagement as a mediating variabel	0.239	<0.005	Supported

Table 4 summarizes the hypothesis testing results. All proposed hypotheses were supported at the 0.001 significance level. Self-regulated learning exerted the strongest direct effect on learning outcomes, while social capital significantly contributed both directly and indirectly through student engagement. Furthermore, student engagement significantly influenced learning outcomes, confirming its important role within the proposed research framework. These findings support the assumption that improving students' learning autonomy and strengthening social support systems can enhance engagement and ultimately improve academic achievement. For a better understanding of the structural relationships among the study variables, the proposed research model is presented in Figure 4.

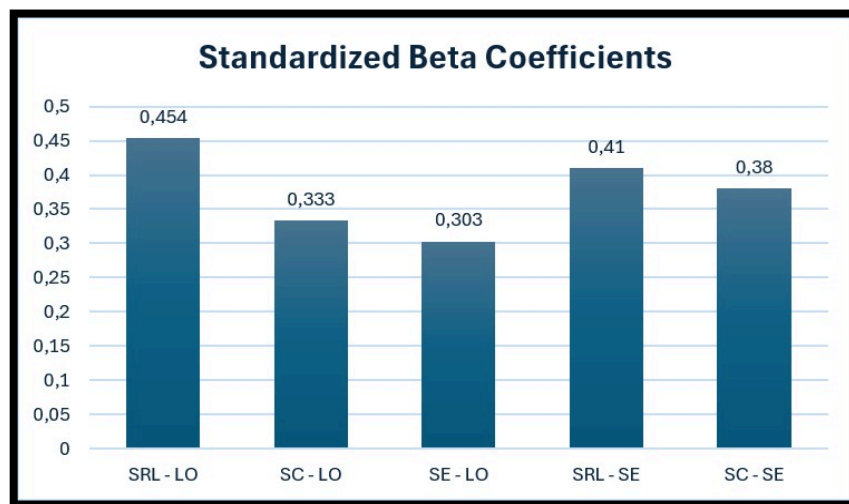


Figure 4. Standardized Beta Coefficients

Table 5. Classical Assumption Tests

Test	Indicator	Result	Conclusion
Normality	Kolmogorov-Smirnov Sig.	0.200	Normal Distribution
Heteroscedasticity	Sig. Range	0.238–0.482	No Heteroscedasticity
Multicollinearity	Tolerance	0.503–0.549	No Multicollinearity
	VIF	1.821–1.988	Acceptable

Table 5 presents the results of the classical assumption tests. The Kolmogorov-Smirnov significance value exceeded 0.05, confirming that the residuals were normally distributed. The heteroscedasticity test showed significance values above 0.05 for all predictors, indicating homoscedastic residual variance. Additionally, all tolerance values were above 0.10 and VIF values were below 10, demonstrating the absence of multicollinearity. Therefore, the regression models satisfied the required statistical assumptions and were appropriate for hypothesis testing.

The direct influence of self-regulated learning and social capital on student engagement

Based on the research results, Self-Regulated Learning and Social Capital have been proven to have a positive influence on Student Engagement. This indicates that the better students are at managing their own learning processes and the stronger their social capital, the higher their engagement in learning activities. The results of the partial hypothesis test also prove that both variables have a positive and significant effect on Student Engagement, thus the research hypothesis can be accepted. Among these two variables, Self-Regulated Learning has a more dominant influence compared to Social Capital, indicating that students' ability to manage, direct, and evaluate their own learning process is a stronger factor in increasing student engagement during the learning

process. These findings affirm that strengthening self-regulated learning abilities, supported by good social capital, can optimally enhance Student Engagement.

Another important finding is the significant influence of self-regulated learning on student engagement. Students with higher levels of self-regulation demonstrated stronger behavioral, emotional, and cognitive involvement in learning activities. This relationship indicates that self-regulated learners are more likely to actively participate in classroom discussions, maintain attention during lessons, and invest greater effort in completing academic tasks. Such students possess clear academic goals and are capable of monitoring their learning progress, which strengthens their commitment to educational activities. This result corroborates previous findings by Fidan & Koçak Usluel, (2024); Gebregergis & Csukonyi, (2024), who reported that self-regulated learning fosters active participation and sustained engagement in educational settings. The finding also confirms that student engagement can be viewed as a behavioral manifestation of effective self-regulation.

The results further indicate that social capital significantly contributes to student engagement. Students who feel greater trust, stronger social networks, and supportive educational relationships show higher levels of engagement in the learning process. Positive interactions with teachers and peers create a sense of belonging and psychological safety, encouraging students to participate more actively in academic activities. These findings are consistent with the studies of Aldbyani et al. (2026); Ntumi et al. (2025); Zhao et al. (2025), which emphasize that a supportive social environment strengthens students' emotional attachment to school and increases their desire to invest in learning. In vocational schools, where collaborative and practical learning experiences are common, social capital serves as an important resource for maintaining student engagement and reducing disengagement behaviors.

The direct influence of self-regulated learning, social capital, and student engagement on learning outcomes

The research results show that Self-Regulated Learning, Social Capital, and Student Engagement have a positive and significant impact on Learning Outcomes. These findings indicate that improvements in self-learning abilities, social capital, and student engagement in learning will be followed by an increase in learning outcomes. Partial test results also prove that all three variables significantly affect Learning Outcomes, with Self-Regulated Learning being the most dominant variable. Overall, the research results affirm that self-regulation ability, social capital, and student engagement are important factors in improving learning outcomes.

The findings reveal that self-directed learning has a significant positive effect on learning outcomes among vocational high school students. These results indicate that students who are able to set learning goals, manage their study time, choose appropriate learning strategies, seek academic help, and evaluate their learning progress tend to achieve better academic performance. The standardized coefficients indicate that self-directed learning is the strongest predictor of learning outcomes, suggesting that students' internal learning management plays a crucial role in determining academic success. These findings are consistent with the Social Cognitive Theory by Kwan et al. (2025), which emphasizes that personal factors, particularly self-regulation abilities, are fundamental determinants of behavior and academic achievement. This also supports previous research by Chin et al. (2025); L. Wang et al. (2024), which reported that students with higher levels of self-regulation demonstrate better academic performance due to their ability to effectively control cognitive and motivational processes during learning.

The study also found that social capital significantly affects learning outcomes. These results indicate that students who receive stronger support from teachers, peers, and family members tend to achieve higher academic performance. Social capital provides access to valuable resources, emotional support, academic guidance, and positive learning norms that facilitate educational success. In the context of vocational education, where collaborative learning and the development of practical skills are emphasized, social relationships become very important for academic achievement. These findings are in line with the work of Adula & Kant (2024); Britwum et al. (2026), who argue that a supportive social environment enhances students' motivation, confidence, and perseverance, ultimately leading to better learning outcomes. These findings further reinforce the environmental dimension of Social Cognitive Theory, highlighting the importance of the social context in shaping academic behavior.

This study also confirms that student engagement significantly affects learning outcomes. Students who are actively engaged cognitively, behaviorally, and emotionally achieve better academic results compared to those with lower levels of engagement. These findings highlight the importance of engagement as a mechanism through which students translate their abilities and available resources into academic success. Engaged students are more likely to focus on learning tasks, show perseverance when facing difficulties, and actively participate in class activities. These behaviors ultimately enhance knowledge acquisition and academic performance. These results support previous studies by Chen et al. (2024); Jiang et al. (2025), and Redmond et al. (2018), which consistently

identify student engagement as one of the strongest predictors of educational achievement in various learning contexts.

The indirect influence of self-regulated learning and social capital on learning outcomes thru student engagement as a mediating variable

The important contribution of this study lies in examining student engagement as a mediating variable. The findings show that self-regulated learning and social capital not only directly affect learning outcomes but also have an indirect effect thru student engagement. This shows that students with strong self-regulation abilities and a supportive social environment tend to be more engaged in learning activities, which in turn improves their academic performance. The mediation mechanism supports the proposition of Social Cognitive Theory that personal and environmental factors influence outcomes thru behavioral processes (Iqbal et al., 2026; Nouwen et al., 2022). These findings expand on previous studies that primarily examined direct relationships between variables and provide empirical evidence that engagement serves as an important pathway linking individual abilities and social resources to academic achievement.

The findings indicate that learning outcomes among vocational high school students are shaped by a complex interaction between personal factors, environmental resources, and behavioral engagement. The integrated model tested in this study explains a substantial proportion of the variance in learning outcomes, demonstrating strong predictive power. The results indicate that efforts to improve academic achievement should not only focus on teaching practices but also on strengthening students' independent learning skills, enhancing social support systems, and encouraging meaningful engagement in learning activities. From a practical perspective, schools should implement interventions that promote independent learning, encourage positive relationships between teachers and students as well as among peers, and create a learning environment that actively engages students. Such a comprehensive strategy is likely to contribute to the continuous improvement of academic performance and the quality of education in vocational education environments.

Conclusions

This study concludes that self-directed learning and social capital significantly affect the learning outcomes of vocational high school students, both directly and indirectly thru student engagement. Self-directed learning emerges as the strongest predictor of learning outcomes, indicating that students who effectively manage their learning processes tend to achieve higher academic performance. Social capital also contributes positively by providing supportive social relationships that enhance students' learning experiences. Additionally, student engagement was found to significantly improve learning outcomes and partially mediate the effects of self-directed learning and social capital. These findings indicate that improving academic achievement in vocational education requires a comprehensive approach that strengthens students' self-regulation abilities, encourages a supportive social environment, and promotes active engagement in the learning process.

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