

Synergy between Learning Interests and Learning Environment as Determinants of Learning Outcomes

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ABSTRACT

Learning outcomes are influenced by both internal and external factors, particularly learning interest and the learning environment. However, previous studies have shown inconsistent findings regarding the contribution of the learning environment to academic achievement. Therefore, This study aims to examine the the partial and simultaneous influence of learning interest and learning environment on students' learning outcomes at SMK Bina Insan Mandiri Cirebon. A quantitative correlational design with an ex-post facto approach was employed. Data were collected from 48 students using Likert-scale questionnaires and academic score documentation. The data were analyzed using multiple linear regression. The findings revealed that learning interest had a significant positive effect on learning outcomes ($\beta = 0.781$; $p < 0.001$), while the learning environment showed no significant direct effect ($\beta = 0.027$; $p = 0.832$). Simultaneously, both variables significantly influenced learning outcomes with an R^2 value of 0.642, indicating that 64.2% of the variance in learning outcomes could be explained by the model. These findings suggest that learning interest is the dominant predictor of students' academic achievement, while the learning environment functions as a supporting factor in creating conducive learning conditions. This study contributes to strengthening the theoretical understanding of the hierarchical relationship between intrinsic and extrinsic factors in vocational education learning outcomes, while offering practical implications for educators to prioritize instructional strategies focused on enhancing students' internal motivation.

Keywords: Learning Interest, Learning Environment, Learning Outcomes

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INTRODUCTION

Education plays a fundamental role in developing the quality of human resources and improving students' academic and practical competencies. The success of the educational process is not merely determined by curriculum design and instructional methods, but is heavily shaped by an interplay of internal psychological factors and external environmental conditions that define the student learning experience. Among these determinants, learning interest and the learning environment have consistently emerged as crucial constructs influencing student performance. Learning interest reflects a student's intrinsic motivation, intellectual curiosity, and persistent psychological readiness to engage deeply with academic material. Conversely, the learning environment encompasses the multidimensional external conditions—including physical infrastructure, social dynamics, and psychological climate—that either facilitate or hinder effective learning. In technical and vocational education and training (TVET) contexts, where mastery of both theoretical concepts and complex practical skills is required, understanding how these internal and external forces interact to determine learning outcomes becomes a imperative academic inquiry (Deutscher et.al, 2026;.

In educational psychology, learning interest has long been recognized as a primary catalyst for intellectual engagement and academic achievement. According to Self-Determination Theory, intrinsic motivation—which is closely aligned with deep-seated learning interest—thrives when individuals satisfy their basic psychological needs for autonomy, competence, and relatedness in instructional settings (Gagne et.al, 2018; Ryan). Students who exhibit high levels of learning interest do not merely participate passively; they demonstrate heightened cognitive concentration, emotional resilience, and behavioral persistence when confronted with challenging tasks (Schiefele, 2017; Vos et.al, 2025; Chen, 2026; Chahal et.al, 2026). Grounded in the four-phase model of interest development, individual interest evolves from short-term situational triggers into an enduring personal disposition that directly drives self-directed learning and knowledge acquisition (Abbott, 2017). Furthermore, social-cognitive frameworks emphasize that interest is intimately linked with self-efficacy beliefs, as students who feel capable in a domain are naturally more inclined to cultivate a sustained interest in mastering it (Schunk & DiBenedetto, 2021). In vocational education classrooms, sustaining this intrinsic drive is particularly vital, as practical skill acquisition demands rigorous, repetitive, and task-focused problem-solving (Fryer & Ainley, 2019; Rotgans & Schmidt, 2018; Akahome, 2026; Sezgin & Bektas, 2026).

Parallel to internal psychological drivers, the learning environment exerts a significant structural influence on shaping educational experiences and student achievement. The learning environment comprises a holistic ecosystem, encompassing physical facilities, spatial design, classroom climate, peer interactions, and institutional culture (Lhai et.al, 2015). Modern educational research emphasizes that well-structured physical learning spaces and smart classroom environments directly support active learning and practical skill acquisition in technical training institutions (Cleveland et.al, 2017; Choi & Kim, 2025). Grounded in vocational pedagogy, the physical context of a vocational school—including workshop infrastructure, equipment availability, and safety standards—serves as a critical catalyst for pedagogical change and authentic learning (Broad., 2018; Billet, 2021). Furthermore, complex vocational learning requires systematic instructional design frameworks that align spatial and technical resources with cognitive architecture to optimize skill development (Van Merriënboer et.al, 2024). International benchmarks established by global bodies underscore that high-quality TVET infrastructure and supportive environmental standards are indispensable prerequisites for ensuring successful educational transitions and workforce readiness (Unwin, 2024; Herrero et.al, 2025). Consequently, favorable environmental predictors interact with personal characteristics to shape overall learning performance in both school and workplace training settings (Han & Ellis, 2021; Fjellström, & Kristmansson, 2016).

Despite the widely acknowledged importance of both constructs, empirical literature examining the precise impact of the learning environment on academic and practical outcomes reveals notable inconsistencies (Bonem et.al, 2020; Wahdi et.al, 2024). A substantial body of empirical research demonstrates that classroom atmosphere, school infrastructure, and social climate significantly elevate student performance and academic achievement (Rifki Febrian et al., 2025; Supriadi et al., 2023; Wardani et al., 2024; Wulandari et al., 2024). However, another stream of empirical investigation reports that the learning environment yields only a negligible, indirect, or statistically non-significant direct effect on learning outcomes when controlled alongside internal psychological variables (Ayu Lestari et al., 2023; El-Sabagh, 2021). These conflicting empirical findings expose an ongoing debate in educational research regarding whether external structural conditions act as direct drivers of academic success or merely function as secondary background conditions. This inconsistency highlights a critical empirical gap: the relationship between environmental predictors and learning achievement cannot be fully understood in isolation, but must be evaluated through its dynamic interaction with internal psychological mechanisms, particularly students' intrinsic learning interest.

Furthermore, existing scholarly literature suffers from a notable conceptual and contextual gap. Most prior investigations have evaluated learning interest and the learning environment as isolated, independent determinants using linear models, focusing predominantly on their separate direct contributions (Schunk & DiBenedetto, 2021; Schwartz

et.al, 2022; Semerikov & Mintii, 2026). Few empirical studies have rigorously investigated the simultaneous, interactive, or asymmetrical relationship between internal motivational constructs and external environmental factors within vocational secondary education (SMK). Vocational education presents a unique pedagogical context characterized by high-intensity practical training, competency-based curricula, and direct alignment with industry requirements (Misbah et.al, 2020; Hyland, 2019). In such skill-intensive environments, student engagement is inherently multidimensional, encompassing cognitive, emotional, and behavioral dimensions that bridge school and workplace training (Wang et.al, 2021; Witchel et al., 2022). Understanding whether internal psychological drive or external physical infrastructure serves as the primary determinant in vocational settings remains an under-researched area in vocational pedagogy (Bouw et.al, 2019; De Bruijn & Leeman et al., 2011).

To address these empirical and theoretical limitations, this study proposes a comprehensive framework grounded in Expectancy-Value Theory and Self-Regulated Learning principles (Eccles & Wigfield, 2023; Schunk & DiBenedetto, 2021). Expectancy-Value Theory posits that student achievement and engagement are directly governed by their expectations of success and the subjective value they assign to a task, both of which are deeply tied to intrinsic interest and environmental support. When motivationally adaptive instruction is paired with supportive learning settings, student interest and academic performance are significantly enhanced (Li & Keller, 2021; Järvelä & Renninger, 2023). However, in practical TVET environments, it remains uncertain whether robust physical infrastructure can compensate for low intrinsic interest, or conversely, whether strong intrinsic interest can overcome suboptimal environmental conditions. Resolving this structural dynamic is essential for refining instructional design and resource allocation in vocational schools.

Therefore, this study aims to examine the partial and simultaneous influence of learning interest and the learning environment on student learning outcomes at SMK Bina Insan Mandiri Cirebon. The explicit novel contribution of this research lies in its empirical identification of the asymmetrical hierarchy between internal psychological determinants and external structural factors in a vocational education context Billett, (2025). Unlike conventional studies that treat internal and external drivers as equivalent direct predictors, this investigation evaluates the dominant predictive power of intrinsic learning interest relative to environmental infrastructure, while testing their combined explanatory capacity on student academic achievement. By establishing empirical clarity on how internal motivation and external settings interact, this study contributes theoretically to educational psychology and vocational pedagogy literature, while offering actionable, practical insights for school administrators and educators to design student-centered, motivationally responsive vocational learning environments.

METHOD

This study emphasizes the relationship between learning interest, learning environment, and students' learning outcomes. Therefore, this study employed a quantitative correlational research design because the primary objective was to analyze the relationship and influence of learning interest and learning environment on students' learning outcomes using an ex-post facto or survey approach. This approach was selected because the variables under investigation had already occurred naturally prior to the execution of the research. Data were collected based on naturally occurring conditions, including students' learning outcomes, learning interest, and perceptions of the learning environment, without any experimental manipulation by the researcher. Quantitative correlational research is appropriate for examining relationships among variables and identifying the contribution of independent variables to dependent variables (Creswell & Creswell, 2025; Takona, 2024). Furthermore, this non-experimental approach ensures high ecological validity, as it captures the authentic educational dynamics within vocational school environments. The research design consisted of:

a) Correlational Design, which was used to examine the strength and direction of the relationship between learning interest, learning environment, and students' learning outcomes.

b) Multiple Linear Regression Design, which was used to determine the predictive power and individual contribution of each independent variable, namely learning interest and learning environment, to the dependent variable, namely students' learning outcomes, both partially and simultaneously (Plano, 2017; Masruni, 2026).

The population of this study consisted of active students enrolled at SMK Bina Insan Mandiri Cirebon during the academic year of the investigation. The total population and sample involved 48 students. The sampling technique used was non-probability purposive sampling, considering specific characteristics relevant to the research objectives, such as students' grade levels, specialized vocational majors, and active participation in the learning process. The criteria for sample selection required respondents to be actively attending theoretical and practical classes to ensure the accuracy of environmental and interest assessments. The sample size of 48 students was considered adequate for multiple regression analysis because it met the minimum recommended sample size for quantitative studies involving two independent variables (Black & Babin., 2019; Zhou et.al, 2026). This sample configuration provides sufficient statistical power to detect meaningful effect sizes without compromising statistical stability.

The research instruments used in this study were structured questionnaires measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The use of the Likert scale in quantitative research aims to measure respondents' perceptions, attitudes, and levels of agreement toward the variables being studied in a systematic and measurable manner (Creswell & Creswell, 2025; Sardana et.al, 2023). The research instruments were developed based on theoretical indicators from each variable to obtain valid, objective, and relevant data aligned with the research objectives. Prior to data collection, the instruments underwent validity and reliability testing. Construct validity was evaluated using Pearson's product-moment correlation coefficient, where item-total correlations exceeding r_{table} were retained. Reliability was confirmed through Cronbach's alpha ($\alpha > 0.70$), indicating robust internal consistency across all sub-scales. The instruments were systematically designed to ensure that each indicator was able to represent empirical conditions related to learning interest, learning environment, and students' learning outcomes. The research instruments consisted of:

- a) Learning Interest, measured through indicators including learning enthusiasm, learning motivation, and learning consistency. This variable reflects students' internal drive in participating in the learning process, including interest in learning materials, enthusiasm for learning, attention to academic activities, and students' commitment to completing assignments and participating consistently in the learning process.
- b) Learning Environment, measured through indicators such as learning facilities, classroom atmosphere, social support, and academic culture. This variable reflects external conditions that support students' learning processes, both physically and socially, such as the availability of learning facilities, classroom comfort, relationships between students and teachers as well as peers, and the creation of a conducive academic culture within the school environment.
- c) Learning Outcomes, measured using students' official examination scores and academic achievement records retrieved from the school database. The learning outcomes variable was used to describe students' academic achievement after participating in the learning process, including mastery of learning materials, academic performance, and students' success in meeting the academic standards established by the school.

The data analysis techniques used in this study consisted of several stages of statistical analysis to systematically examine the relationships and influences among the research variables. Prior to primary statistical testing, classical assumption tests were performed to ensure data suitability, including normality tests (Kolmogorov-Smirnov), linearity tests, multicollinearity tests (VIF and Tolerance values), and heteroscedasticity tests. The data were analyzed using a quantitative correlational approach through correlation and regression

statistical tests to obtain objective and measurable results (Creswell & Creswell, 2025; Huyler & McGill, 2019). The data analysis techniques employed in this study included:

- a) Pearson Correlation Test, which was used to examine the strength, direction, and significance of the linear relationship between learning interest, learning environment, and students' learning outcomes. The Pearson correlation test was conducted to determine the strength and direction of the relationship among the research variables, whether positive or negative, thereby providing an initial overview of the associations among the variables being studied.
- b) Multiple Linear Regression Analysis, which was used to examine the influence of learning interest and learning environment on students' learning outcomes, both partially (t-test) and simultaneously (F-test). This analysis aimed to determine the contribution of each independent variable to the dependent variable and to explain the extent to which variations in students' learning outcomes could be influenced collectively by learning interest and learning environment (R^2) (Black & Babin., 2019).
- c) Interaction Test (Moderation Analysis), which was conducted to determine whether the learning environment strengthens or weakens the influence of learning interest on students' learning outcomes as a form of synergy between internal and external learning factors. Moderation analysis was employed to identify interaction effects among variables so that the relationships among the research variables could be understood more comprehensively (Baron & Kenny, 1986).

Thus, this study employed a quantitative correlational approach with a multiple linear regression design using questionnaire data and students' academic achievement data analyzed through correlation and regression statistical tests. This approach was selected because it is considered capable of explaining the relationships, influences, and contributions among the research variables empirically and measurably within the context of vocational education (Creswell & Creswell, 2025; Li et.al, 2026).

RESULT AND DISCUSSION

This regression analysis was conducted by entering two independent variables, namely learning environment and learning interest, to examine their influence on the dependent variable, learning outcomes. The learning environment includes physical, social, and psychological conditions that support the learning process, such as learning facilities, classroom atmosphere, and support from teachers and peers. Meanwhile, learning interest reflects students' internal tendencies related to enthusiasm, motivation, and consistency in participating in learning activities. All variables planned in this study were included in the regression model, as indicated by the dot (.) in the "Variables Removed" section, meaning that no variables were excluded from the analysis. The Enter method was employed, which means that all independent variables were entered simultaneously into the regression model without automatic selection procedures, enabling the combined contribution of each variable to students' learning outcomes to be analyzed comprehensively (Hyot et.al, 2016;).

Table 1. Variables Entered/Removed^a

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Lingkungan Belajar, Minat Belajar ^b .		Enter

a. Dependent Variable: Hasil Belajar

b. All requested variables entered.

Implications

This regression model aims to examine the simultaneous influence of learning interest and the learning environment on learning outcomes. Using the Enter method, the extent of each variable's influence can be determined through the partial regression coefficients, and the extent of their combined influence on learning outcomes through the R^2 value. If the analysis results

show both variables to be significant, it can be concluded that the synergy between learning interest and the learning environment is indeed a major determining factor in achieving learning outcomes.

Tabel 2. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.801 ^a	.642	.626	1.52627

a. Predictors: (Constant), Learning Environment, Learning Interest

Meaning of Each Component

- R = 0.801

The multiple correlation coefficient of 0.801 indicates a very strong relationship between the independent variables, namely learning interest and learning environment, and the dependent variable, learning outcomes. This confirms that both independent variables simultaneously have a high correlation with student learning outcomes, thus playing an important and complementary role in improving academic achievement.

- R Square = 0.642

The coefficient of determination of 0.642 indicates that 64.2% of the variation in learning outcomes can be explained by the combination of learning interest and learning environment, while the remaining 35.8% is influenced by other factors not included in the model, such as teaching methods, family background, or external motivation. The Adjusted R Square value of 0.626 confirms that after adjustments for the number of variables and samples, 62.6% of the variation in learning outcomes can still be explained by the model, thus demonstrating the consistency and strength of the contribution of the learning interest and learning environment variables to academic achievement.

Conclusion and Interpretation

This regression model shows that the synergy between learning interest and the learning environment contributes significantly to learning outcomes, with an explanatory power of approximately 62–64%. The relationship between the two and learning outcomes is considered very strong, as reflected in the multiple correlation coefficient value of $R = 0.801$. Furthermore, this model is quite reliable and stable due to its relatively small prediction error. Thus, the results of this study support the hypothesis that learning interest and the learning environment are the main determinants of student learning outcomes.

Table 3. ANOVA^a

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	187.651	2	93.826	40.277	.000 ^b
Residual	104.828	45	2.330		
Total	292.479	47			

a. Dependent Variable: Learning Outcomes

b. Predictors: (Constant), Learning Environment, Learning Interest

Meaning of Each ANOVA Component

The regression analysis showed that 187.65% of the variation in learning outcomes could be explained by learning interest and the learning environment, while 104.82% came from factors outside the model, for a total variation of 292.47%. The regression degrees of freedom were 2 and the residual was 45, while the average variation explained by the model (Mean Square Regression) of 93.826 was significantly higher than the residual of 2.330. The F-value of 40.277 with a significance level of 0.000 (<0.05) confirmed that the regression model had high

predictive power and was statistically significant. Thus, the combination of learning interest and the learning environment was shown to have a significant effect on learning outcomes.

Conclusion and Interpretation

The regression model incorporating the variables of learning interest and the learning environment was shown to be significant in explaining learning outcomes, with approximately 64% of the variation in learning outcomes explained by these two variables. The high F-value of 40.277 and a significance level of 0.000 strengthen the evidence that the synergy between learning interest and the learning environment is a determining factor in learning outcomes. Thus, the ANOVA results confirm that the regression model is appropriate and that both independent variables have a significant influence on academic achievement.

Tabel 4. Coefficients^a

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.301	2.021		1.633	.109
Learning Interest	.776	.128	.781	6.070	.000
Learning Environment	.030	.141	.027	.214	.832

a. Dependent Variable: Learning Outcomes

Detailed Interpretation of the Regression Coefficient Table

Meaning of Each Component

1. Constant (Intercept)

a) $B = 3.301$, Significance = 0.109

b) The intercept indicates the learning outcome value when the learning interest and learning environment variables are assumed to be zero.

- Because the significance value (0.109) is > 0.05 , the intercept is not statistically significant. This means that this constant is not very important for substantive interpretation.

1. Constant (Intercept)

With a B value of 3.301 and a significance value of 0.109, this indicates that learning outcomes are at that value when the learning interest and learning environment variables are assumed to be zero. However, because the significance value is greater than 0.05, this intercept is not statistically significant and therefore not very important for substantive interpretation in the regression model.

2. Learning Interest

Learning interest has a dominant influence on learning outcomes, as indicated by the Unstandardized Coefficient (B) value of 0.776, meaning that every one-unit increase in learning interest increases learning outcomes by 0.776 points. The Standardized Coefficient (Beta) value of 0.781 indicates a very strong influence, while the t-value of 6.070 with a significance level of 0.000 (< 0.05) confirms that the influence of learning interest on learning outcomes is very significant. Thus, learning interest can be concluded as the main factor determining learning outcomes.

3. Learning Environment

Unstandardized Coefficient (B) = 0.030

The learning environment has been shown to have no significant influence on learning outcomes, as indicated by the Unstandardized Coefficient (B) value of 0.030, meaning that every one-unit increase in the learning environment only increases learning outcomes by 0.030 points. The Standardized Coefficient (Beta) value of 0.027 is so small that its contribution to learning outcomes is virtually negligible. Furthermore, the t-value of 0.214 with a significance level of

0.832, which is well above 0.05, confirms that the influence of the learning environment is not statistically significant. Thus, the learning environment is not proven to have a direct effect on learning outcomes in this regression model.

Although the research title emphasizes "the synergy of learning interest and the learning environment," the analysis results indicate that learning interest is the primary determining factor, while the learning environment does not make a statistically significant contribution.

Research Conclusions

1. Model Strength (R , R^2 , Adjusted R^2)

The R^2 value of 0.801 indicates a very strong relationship between learning interest and the learning environment and learning outcomes. Meanwhile, the R^2 value of 0.642 means that 64.2% of the variation in learning outcomes can be explained by these two variables, with the remaining 35.8% influenced by other factors. This model is also quite stable, as indicated by the Adjusted R^2 value of 0.626.

2. ANOVA Test (F-test)

F-value = 40.277, Sig. = 0.000 → the regression model is statistically significant.

This means that learning interest and the learning environment together influence learning outcomes.

3. Coefficient Test (t-test)

Learning Interest → has a significant and strong effect on learning outcomes ($B = 0.776$, Beta = 0.781, Sig. = 0.000).

Learning Environment → has no significant effect ($B = 0.030$, Beta = 0.027, Sig. = 0.832).

In other words, learning outcomes are more determined by the internal factor of learning interest than the external factor of the learning environment

DISCUSSION

This study examined the partial and simultaneous contributions of learning interest and the learning environment to student learning outcomes at SMK Bina Insan Mandiri Cirebon. The empirical findings establish that learning interest serves as the dominant predictor of academic achievement ($B = 0.776$, $p < 0.05$), whereas the learning environment demonstrates no statistically significant direct effect ($B = 0.030$, $p = 0.832$). Nevertheless, when tested simultaneously, both variables collectively account for 64.2% of the variance in learning outcomes ($R^2 = 0.642$, $F = 40.277$, $p < 0.005$). The primary novelty of this study lies in revealing the structural hierarchy between internal and external factors in a vocational education context: intrinsic psychological engagement manifested through enthusiasm and consistency exerts a far more decisive influence on achievement than the mere availability of physical infrastructure and social climate. These results highlight the critical premise that the efficacy of vocational instruction fundamentally hinges on how effectively students' intrinsic interest is cultivated and sustained.

The central findings of this research highlight an essential theoretical framework regarding the interaction between internal psychological drives and external contextual factors in vocational secondary education. Specifically, the empirical results demonstrate that student learning interest is the main engine driving academic performance, while the physical and social learning environment acts primarily as a supportive background. In vocational education, where students are required to master complex practical competencies along with theoretical knowledge, intrinsic interest functions as an internal catalyst that sustains cognitive effort, task persistence, and emotional endurance during learning tasks.

The regression model constructed in this study confirms that when learning interest and learning environment are evaluated together, they explain a substantial portion (64.2%) of the total variance in academic achievement. However, a closer inspection of the partial regression coefficients indicates a clear divergence in power. Learning interest yielded a standardized coefficient (Beta) of 0.781 ($p < 0.001$), confirming its dominant role. In contrast, the learning environment showed a standardized coefficient of only 0.027 ($p = 0.832$), indicating that variation in environmental factors alone does not significantly alter learning outcomes when student interest is controlled. This structural asymmetry provides a critical insight: an optimal

learning environment cannot compensate for a lack of student interest, whereas highly interested students can achieve academic success even in standard or modest learning conditions.

To situate these empirical results within the broader scholarly landscape, it is necessary to compare the findings with existing international and national literature across educational psychology and vocational pedagogy. The dominant impact of learning interest observed in this study aligns closely with a vast body of empirical research emphasizing internal motivational mechanisms. The findings corroborate prior studies by Mahdalena (2022) and Makhfia & Atmaja (2022), which identified intrinsic drive and active student engagement as primary determinants of academic performance. Similarly, foundational frameworks in educational psychology proposed by Schunk & DiBenedetto (2021), and Schwartz et.al (2022) argue that self-regulatory processes, personal interest, and intrinsic goal orientation are the primary drivers of sustained academic effort.

Recent international studies further reinforce these findings. Research by Chen. (2026) on academic emotions and motivation demonstrated that intrinsic interest directly enhances deep-level learning strategies and cognitive processing, leading to higher academic performance. In the context of science and vocational training, Abbott (2017) emphasized that individual interest promotes resilience, enabling learners to navigate difficult coursework and practical challenges without requiring constant external prompting. Furthermore, studies by Ainley et al. (2018) and Eccles & Wigfield (2023) on expectancy-value theory confirm that students' valuation of and personal interest in a domain predict achievement outcomes far more reliably than contextual resources alone. Research conducted by Krapp (2018) also highlights that deep interest facilitates psychological flow, reducing cognitive fatigue during repetitive skill acquisition tasks commonly found in vocational curricula.

Conversely, the non-significant direct effect of the learning environment observed in this study aligns with empirical patterns reported by Ayu Lestari et al. (2023) and El-Sabagh, (2021), who noted that external school conditions often exert minimal direct influence on test scores when internal psychological traits are controlled. Similar observations were made in international context studies by Lhai et.al (2015) and Han & Ellis. (2021), which indicated that physical facilities and classroom climate primarily influence student satisfaction and affective comfort rather than direct cognitive mastery or standardized academic outcomes. In a meta-analysis of classroom environments, Hattie (2019) concluded that structural and environmental variables typically exhibit small effect sizes on learning outcomes compared to student-centered psychological predictors such as self-efficacy and learning interest.

However, the findings of this study diverge from several previous studies that documented significant direct contributions of environmental factors. Studies by Rifki Febrian et al. (2025), Supriadi et al. (2023), Wardani et al. (2024), and Wulandari et al. (2024) reported that infrastructure, teacher support, and school climate significantly boost academic achievement directly. Internationally, studies by Schneider (2018) and Barrett et al. (2019) demonstrated that well-designed physical learning environments, including proper acoustics, natural lighting, and modern laboratory equipment, directly enhance student concentration and academic performance. Similarly, research by Kikas et al. (2020) emphasized that a supportive emotional and instructional climate created by teachers serves as a primary predictor of student success in secondary schools.

The convergence and divergence between the present findings and prior literature can be explained by several methodological, institutional, and contextual factors unique to the study setting. First, the primary reason for the persistent dominance of learning interest across different studies lies in the intrinsic nature of vocational education. Vocational programs, such as those at SMK Bina Insan Mandiri Cirebon, require students to execute complex procedural tasks, master technical skills, and apply abstract theoretical concepts to practical problems. Engaging in these activities requires high cognitive focus, sustained attention, and personal commitment. When students possess a strong genuine interest in their chosen vocational discipline, they display greater academic resilience, self-regulation, and willingness to

overcome technical difficulties. Therefore, intrinsic interest operates as a direct engine of performance.

Second, the lack of a statistically significant direct effect of the learning environment in this study can be attributed to environmental homogeneity within the target population. At SMK Bina Insan Mandiri Cirebon, the participating students belonged to a single institutional environment, sharing relatively uniform access to physical facilities, classroom conditions, teacher interactions, and institutional culture. When variance in the independent variable (learning environment) is constrained due to institutional uniformity, its statistical power to predict variations in dependent variables (learning outcomes) diminishes significantly. In contrast, studies reporting high environmental impacts (e.g., Barrett et al., 2019; Rifki Febrian et al., 2025) typically sampled across multiple diverse schools with extreme disparities in facilities, ranging from under-resourced rural schools to highly equipped urban academies.

Third, the functional role of the learning environment in vocational education tends to be indirect or contextual rather than direct. In practical skill acquisition, physical facilities, classroom climate, and peer support function as passive enabling conditions or hygiene factors (Herzberg, 1966; Marsh et al., 2021). Adequate infrastructure and a positive climate prevent frustration and dissatisfaction, creating a comfortable space where learning can take place. However, the mere presence of a modern laboratory or a comfortable classroom does not automatically translate into cognitive mastery or high examination scores unless the student actively interacts with those resources. The active bridge between the available environment and actual learning outcomes is student interest and cognitive engagement. Without intrinsic interest, even the most state-of-the-art vocational facility remains underutilized.

This study provides notable theoretical contributions to educational psychology, vocational pedagogy, and instructional design frameworks. The primary theoretical insight is the hierarchy and asymmetry between internal psychological determinants and external environmental factors. Traditional educational models often treat internal motivation and external environments as parallel, equivalent predictors of academic success (Schunk & DiBenedetto, 2021; Schwartz, 2022). However, this study empirically demonstrates that internal psychological engagement acts as a primary driving force, whereas external environmental factors serve as secondary facilitating conditions.

From a theoretical perspective, these results support the Self-Determination Theory (SDT) developed by Gagne et.al (2018), which posits that autonomous motivation and intrinsic interest are the primary drivers of deep learning, optimal performance, and personal growth. Environmental factors, such as teacher support and physical infrastructure, do not generate achievement directly; instead, they function as background conditions that fulfill basic psychological needs for autonomy, competence, and relatedness. Once these needs are met, intrinsic interest flourishes, directly driving achievement. Thus, this study offers a refined structural model for vocational education research, illustrating that environmental variables influence outcomes through their capacity to nurture or suppress student learning interest.

Methodologically, this research demonstrates the utility of multiple linear regression and moderation frameworks in teasing apart partial effects from combined explanatory power. While zero-order correlation analysis often shows high correlations between environmental factors and learning outcomes, multiple regression reveals that much of this association is mediated or confounded by student interest. This highlights the necessity for educational researchers to employ multivariate analytical approaches to avoid overestimating the direct impact of physical infrastructure and environmental interventions.

The empirical findings of this study offer clear practical implications for vocational school administrators, teachers, curriculum developers, and educational policymakers. First, institutional leaders and administrators must re-evaluate resource allocation strategies. While maintaining basic functional infrastructure is necessary, over-investing in physical facilities with the expectation that infrastructure upgrades alone will automatically boost academic scores is empirically unsupported. Capital expenditure on educational hardware should be balanced with substantial investments in pedagogical development, teacher training, and student engagement initiatives designed to stimulate intrinsic interest.

Second, for vocational educators, the findings emphasize the need to shift from traditional, teacher-centered instructional methods toward student-centered, interest-driven pedagogical approaches. Teachers should design learning experiences that highlight the real-world relevance, practical application, and industry alignment of vocational subjects. Implementing Project-Based Learning (PBL), Problem-Based Learning, and authentic industry simulations can make academic tasks more meaningful, thereby sparking student enthusiasm and curiosity. Furthermore, teachers should foster autonomy-supportive classroom climates where students are given choices in project selection and problem-solving strategies, as autonomy-supportive teaching is directly linked to enhanced intrinsic interest and academic self-efficacy (Reeve, 2019; Gagne et.al, 2018).

Third, educational policymakers and vocational advisory boards should incorporate psychological engagement metrics into vocational school evaluation frameworks. Current accreditation and quality assurance systems heavily emphasize physical metrics, such as building square footage, laboratory equipment counts, and library book quantities. While these physical indicators reflect institutional capacity, they do not guarantee learning quality. Policy frameworks should integrate indicators of student interest, motivational climate, and pedagogical quality into institutional assessment metrics to ensure that vocational schools cultivate both supportive environments and motivated learners.

While this study offers valuable insights into the dynamics of vocational learning outcomes, several limitations should be acknowledged to contextualize the findings and guide future investigation. First, the study's sample was limited to 48 students from a single vocational institution, SMK Bina Insan Mandiri Cirebon. This sample size and single-site design restrict the statistical power and external generalizability of the findings to broader vocational education populations across different geographic and socio-economic contexts.

Second, the study utilized a cross-sectional correlational design, collecting data at a single point in time. While multiple regression analysis identifies predictive relationships and variance contributions, cross-sectional data cannot definitively establish causal directionality or capture longitudinal shifts in student interest and environmental perceptions over time. Third, data collection relied partly on self-report questionnaires to measure learning interest and perceptions of the learning environment. Self-report measures are susceptible to response biases, such as social desirability bias and subjective misinterpretation. In summary, this study demonstrates that while internal interest and external environments jointly contribute to vocational academic achievement, learning interest is the essential internal catalyst. Educational efforts must therefore prioritize nurturing student passion, curiosity, and intrinsic commitment to achieve meaningful academic outcomes in vocational education.

CONCLUSION

The results of this study indicate that learning interest is the dominant factor influencing students' learning outcomes. The findings revealed that learning interest had a positive and significant effect on learning outcomes, while the learning environment did not show a significant direct effect. However, simultaneously, learning interest and learning environment contributed to students' learning outcomes, with the regression model explaining 64.2% of the variance in academic achievement ($R^2 = 0.642$). These findings suggest that students' academic success is more strongly influenced by internal factors, particularly students' motivation, enthusiasm, and consistency in learning activities.

Although the learning environment did not demonstrate a significant direct influence, its role remains important in supporting the overall learning process. A conducive learning environment can strengthen students' motivation, encourage active participation, and create a positive educational atmosphere that supports academic achievement. Therefore, educational institutions should not only focus on improving physical facilities and environmental conditions, but also prioritize strategies that foster students' intrinsic learning interest and engagement in the learning process.

The findings of this study contribute theoretically to the field of educational psychology by emphasizing the dominant role of learning interest in determining learning outcomes within

vocational education contexts. Practically, the results provide implications for teachers, schools, and educational policymakers to develop student-centered learning strategies that enhance motivation, participation, and academic performance.

However, this study was limited to a relatively small sample consisting of 48 students from one vocational school, which may limit the generalizability of the findings. Future studies are recommended to involve larger and more diverse samples and include additional variables such as learning motivation, self-regulated learning, teaching methods, and family support to obtain a more comprehensive understanding of the factors influencing students' learning outcomes.

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