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Block System Learning and Vocational Student Outcomes: The Mediating Role of Learning Motivation

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ABSTRACT

This study investigates the structural relationships among block system learning, classroom management, learning motivation, and learning outcomes in vocational secondary education. Utilizing a quantitative ex post facto design, data were gathered using questionnaires and documentation from 197 eleventh-grade students in Computer and Network Engineering across Gowa Regency, Indonesia, selected via proportional random sampling from a total population of 239. Structural Equation Modeling–Partial Least Squares (SEM-PLS) was conducted for empirical analysis. Results demonstrate that block system learning ($\beta = 0.463$, $p < 0.001$) and classroom management ($\beta = 0.420$, $p < 0.001$) exert significant positive effects on learning motivation. Direct effects on learning outcomes were also confirmed for block system learning ($\beta = 0.264$, $p = 0.001$), classroom management ($\beta = 0.159$, $p = 0.036$), and learning motivation ($\beta = 0.207$, $p = 0.027$). Crucially, learning motivation partially mediates the influence of block system learning ($\beta = 0.096$, $p = 0.040$) and classroom management ($\beta = 0.087$, $p = 0.035$) on student learning outcomes. These findings underscore that the success of block scheduling in vocational instruction extends beyond mere time allocation, depending substantially on effective classroom management and heightened student motivation. This research provides solid empirical support for a motivational framework linking instructional design to vocational achievement, offering actionable strategic insights.

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1. INTRODUCTION

National development is fundamentally driven by the quality of human capital cultivated through formal education systems (Indrawati & Kuncoro, 2021). In this context, vocational secondary education fulfills a strategic imperative by equipping students with specialized technical competencies tailored to dynamic labor-market demands (Rahardjo, 2020). To maximize students' work readiness, contemporary vocational pedagogy in Indonesian vocational high schools is structurally designed

around a practice-intensive framework, typically balancing approximately 70% practical training with 30% theoretical instruction (Putra et al., 2025; Sudarsono et al., 2024). Such vocational learning must be deeply contextualized and applied to bolster job readiness, as hands-on, experiential learning is empirically proven to foster the mastery of industry-aligned skills (Hafid et al., 2025). Nevertheless, the efficacy of practical instruction hinges not merely on the presence of hands-on exercises but on the systematic design and implementation of the overarching instructional architecture (Wuryanto et al., 2026).

To optimize the execution of practical instruction, block scheduling has emerged as a salient pedagogical innovation within vocational high schools (Burhan & Arifin, 2020; Widarto et al., 2024). By reconfiguring the timetable into extended, continuous time blocks dedicated to a single subject, block scheduling enables students to engage deeply with complex technical concepts and execute practical assignments without time-induced fragmentation (Wahyudiyanto & Roniwijaya, 2018). Within vocational environments, this scheduling model empowers educators to deploy a broader spectrum of active pedagogical approaches—such as direct practical exercises, project-based learning, simulation, and collaborative group activities—with greater flexibility and depth (Ilmi & Rukun, 2020; Ramadhan et al., 2023). Responding to the imperative for sustained practical training, several institutions in Gowa Regency, including State Vocational High School 4 Gowa and State Vocational High School 5 Gowa, have adopted block system learning to enhance instructional quality and student achievement.

Despite its theoretical advantages, the implementation of block scheduling does not automatically translate into improved learning outcomes (Edward et al., 2024; Kapp et al., 2015). Its operational success relies heavily on teachers' pedagogical competence in managing extended instructional sessions (Aliyev, 2026). Classroom management thus emerges as a critical determinant, as block scheduling fundamentally alters traditional classroom dynamics by requiring teachers to judiciously allocate time between theoretical concepts and practical execution, manage shared equipment, and maintain cognitive engagement across prolonged periods (Widarto et al., 2024). Preliminary field observations and qualitative interviews with educators at State Vocational High Schools 4 and 5 Gowa revealed persistent operational challenges. Specifically, resource constraints—such as an inadequate ratio of hardware infrastructure including routers, switches, and workstations—force students into rotational waiting queues, thereby diminishing active learning time and disengaging learners. Furthermore, teachers struggle to sustain student focus over extended blocks; ineffective classroom management often transforms prolonged instructional periods into sources of cognitive fatigue and disinterest rather than deep, meaningful learning.

These operational constraints directly impair students' psychological engagement, particularly their learning motivation, which is widely recognized as a pivotal driver of scholastic achievement (Winchester et al., 2021). Within the framework of block scheduling, motivation acts as the essential psychological catalyst that activates, directs, and sustains learning behaviors throughout extended sessions (Rahmi & Neviyarni, 2022). Empirical observations in the target schools revealed recurring instances of

declining enthusiasm, reduced cognitive focus, and erratic behavioral engagement among students during block periods. This evidence suggests that block scheduling alone is insufficient to elevate student motivation; rather, its motivational benefits are highly contingent upon the quality of classroom management. When classroom management fails to cushion the demands of extended time blocks, student motivation declines, ultimately causing learning outcomes to remain suboptimal.

The interplay among scheduling systems, classroom management, and learning motivation becomes particularly critical in technical disciplines such as the Computer and Network Engineering (TKJ) program (Panjaitan & Sari, 2026; Putri et al., 2024). TKJ demands rigorous mastery of advanced technical domains, including network installation, hardware configuration, and systematic troubleshooting. In this specialization, educational outcomes extend beyond mere cognitive retention to encompass practical skills and professional work attitudes. TKJ was purposefully selected as the locus of this research because its core competencies are highly technical, dynamic, and practice-oriented, requiring prolonged laboratory engagement and continuous hands-on training. Given the rapid technological shifts inherent in computer networking, TKJ students must develop high adaptability, making their learning success uniquely sensitive to the quality of practical instruction and classroom management under extended block scheduling (Hammer, 2020).

Although block system learning has been implemented across various vocational institutions, empirical research explicitly examining the interactive effects of block scheduling and classroom management on vocational learning outcomes—specifically through the explanatory lens of learning motivation as a mediating mechanism—remains remarkably sparse within the TKJ context. Extant literature has predominantly evaluated block scheduling (Burhan & Arifin, 2020; Denianti et al., 2025), classroom management (Purnomo, 2022; Fauzi et al., 2025), or learning motivation (Suharnadi et al., 2024) as isolated constructs. Consequently, the joint structural relationships and the mediating pathways connecting instructional scheduling and classroom management to vocational learning outcomes remain empirically underexplored.

To address this empirical gap, this study investigates the structural effects of block system learning and classroom management on the learning outcomes of TKJ students in Gowa Regency, explicitly testing learning motivation as a mediating construct. Specifically, the study addresses seven core research objectives: (1) analyzing the effect of block system learning on learning motivation; (2) analyzing the effect of classroom management on learning motivation; (3) analyzing the effect of block system learning on learning outcomes; (4) analyzing the effect of classroom management on learning outcomes; (5) analyzing the effect of learning motivation on learning outcomes; (6) evaluating the mediating role of learning motivation in the relationship between block system learning and learning outcomes; and (7) evaluating the mediating role of learning motivation in the relationship between classroom management and learning outcomes.

Grounded in this theoretical and empirical rationale, seven hypotheses were formulated to guide the empirical investigation: block system learning exerts a significant positive effect on learning motivation (H1); classroom management exerts a

significant positive effect on learning motivation (H2); block system learning exerts a significant positive effect on learning outcomes (H3); classroom management exerts a significant positive effect on learning outcomes (H4); learning motivation exerts a significant positive effect on learning outcomes (H5); learning motivation significantly mediates the effect of block system learning on learning outcomes (H6); and learning motivation significantly mediates the effect of classroom management on learning outcomes (H7).

2. METHOD

This study used a quantitative approach with an ex post facto method and a causal design, examining phenomena that had already occurred without manipulating the independent variables. The causal design was employed to analyze the direct and indirect relationships between two exogenous variables—block system learning (X_1) and classroom management (X_2)—one mediating variable, learning motivation (Z), and one endogenous variable, learning outcomes (Y). The population consisted of all eleventh-grade students enrolled in the Computer and Network Engineering (TKJ) program at vocational high schools in Gowa Regency that had implemented block system learning during the 2025/2026 academic year, namely vocational high schools 4 Gowa (140 students) and vocational high schools 5 Gowa (99 students), yielding a total population of 239 students. The sample size was determined using the Slovin formula with a 3% margin of error, resulting in a sample of 197 respondents. Proportional random sampling was applied, allocating 115 respondents from vocational high schools 4 Gowa and 82 respondents from vocational high schools 5 Gowa.

Data were collected using two techniques: (1) questionnaires measuring block system learning (21 items), classroom management (20 items), and learning motivation (20 items) using a four-point Likert scale (4 = strongly agree, 3 = agree, 2 = disagree, 1 = strongly disagree); and (2) documentation of learning outcomes (Y), operationalized as students' final-semester scores in TKJ productive subjects. Questionnaires were distributed digitally via Google Forms.

Indicators of block system learning included the effectiveness of instructional time use, depth and completeness of content coverage, adequacy of practice time, variation in teaching methods, and contribution to learning motivation (Burhan & Arifin, 2020). Indicators of classroom management encompassed management of the physical classroom environment, socio-emotional climate, behavior and discipline management, and time and process management (Salmiah & Abidin, 2022; Purnomo, 2022). Indicators of learning motivation followed Felea and Roman (2023), comprising the desire and drive to succeed, learning needs and drives, future aspirations, appreciation in learning, and a conducive learning environment.

Data were analyzed using Structural Equation Modeling with Partial Least Squares (SEM-PLS) in SmartPLS. The analysis proceeded in four stages: (1) descriptive statistical analysis categorization into three levels (high, moderate, low) based on the ideal mean and ideal standard deviation; (2) evaluation of the measurement model (outer model) through convergent validity testing (outer loading ≥ 0.70 and AVE > 0.50),

discriminant validity testing (Fornell-Larcker criterion), and construct reliability testing (Composite Reliability > 0.70); (3) evaluation of the structural model (inner model) through multicollinearity testing (VIF < 5.00), the coefficient of determination (R^2), and predictive relevance ($Q^2 > 0$); and (4) hypothesis testing using a bootstrapping procedure with 5,000 resamples at a significance level of $\alpha = 0.05$ (p-value < 0.05 or t-statistic > 1.96).

3. RESULTS AND DISCUSSION

Results

Descriptive Statistics

Descriptive statistics for the four research variables, based on data from 197 respondents, are presented in Table 1. The mean score for block system learning was 63.79 (76% of the ideal score), for classroom management 62.94 (78.7%), and for learning motivation 66.02 (82.5%); the mean score for learning outcomes was 87.58 on a 0–100 scale. Categorization results showed that 55.3% of students perceived block system learning as high, 54.3% perceived classroom management as high, 64.0% reported high learning motivation, and 95.9% achieved learning outcomes in the high category.

Table 1. Descriptive Statistics of the Research Variables

Variable	N	Min	Max	Mean	Mode	SD
Block System Learning (X_1)	197	21	84	63.79	63	13.59
Classroom Management (X_2)	197	20	80	62.94	62	13.97
Learning Motivation (Z)	197	20	80	66.02	68	13.61
Learning Outcomes (Y)	197	60	95	87.58	90	8.67

Measurement Model (Outer Model) Evaluation

Convergent validity testing showed that all indicators had outer loadings ≥ 0.70, ranging from 0.732–0.842 for block system learning, 0.720–0.834 for classroom management, and 0.766–0.875 for learning motivation. Average Variance Extracted (AVE) values were 0.642 for block system learning, 0.639 for classroom management, and 0.680 for learning motivation, all exceeding the 0.50 threshold. Discriminant validity, assessed using the Fornell-Larcker criterion, showed that the square root of AVE for each construct exceeded its correlations with other constructs, confirming adequate discriminant validity. Construct reliability, indicated by Composite Reliability values ranging from 0.972–0.977 (> 0.70), demonstrated very good internal consistency across all constructs.

Table 2. Measurement Model Evaluation (Outer Model)

Construct	Indicator Ranges	Outer Loadings Range	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)	Discriminant Validity (Fornell–Larcker)
Block System Learning	X1 Indicators	0.732 – 0.842	Exceeds 0.70	972	642	Square root of AVE exceeds inter-construct correlations
Classroom Management	X2 Indicators	0.720 – 0.834	Exceeds 0.70	975	639	Square root of AVE exceeds inter-construct correlations
Learning Motivation	Y Indicators	0.766 – 0.875	Exceeds 0.70	977	680	Square root of AVE exceeds inter-construct correlations
Recommended Threshold	—	≥0.700	>0.700	>0.700	>0.500	AVE >construct correlations

Table 3. Summary of Construct Reliability and Convergent Validity Assessment

Assessment Criterion	Parameter Threshold	Empirical Value / Range	Evaluation / Decision
Indicator Reliability	Outer Loadings ≥0.700	0.720 – 0.875	Established (All indicators retained)
Internal Consistency	Composite Reliability >0.700	0.972 – 0.977	Established (High reliability)
Convergent Validity	Average Variance Extracted >0.500	0.639 – 0.680	Established
Discriminant Validity	Fornell–Larcker Criterion	AVE>rij	Established (Adequate construct distinction)

Structural Model (Inner Model) Evaluation

Multicollinearity testing showed that all VIF values were below 5.00, with the highest value (2.664) observed for the path from learning motivation to learning outcomes, indicating no multicollinearity issues within the structural model. The R^2 value for learning motivation was 0.625 (moderate category), indicating that 62.5% of the variance in learning motivation was explained by block system learning and classroom management. The R^2 value for learning outcomes was 0.312 (weak category), indicating that 31.2% of the variance in learning outcomes was explained by the three predictor variables. Both endogenous variables showed positive Q^2 values (learning motivation = 0.622; learning outcomes = 0.284), indicating good predictive relevance of the model.

Hypothesis Testing

Direct Effects

Bootstrapping results for the direct-effect hypotheses are presented in Table 4. All five direct-effect hypotheses (H1–H5) were supported, with p-values < 0.05 and t-statistics > 1.96.

Table 4. Hypothesis Testing Results for Direct Effects (Path Coefficients)

Relationship	β	t-statistic	p-value	Decision
Block System Learning → Learning Motivation	0.463	7.718	0.000	Supported
Classroom Management → Learning Motivation	0.420	7.206	0.000	Supported
Block System Learning → Learning Outcomes	0.264	3.454	0.001	Supported
Classroom Management → Learning Outcomes	0.159	2.100	0.036	Supported
Learning Motivation → Learning Outcomes	0.207	2.214	0.027	Supported

Indirect Effects (Mediation)

Results for the indirect-effect (mediation) hypotheses are presented in Table 5. Both mediation hypotheses (H6 and H7) were supported, demonstrating that learning motivation partially mediates the relationship between block system learning and learning outcomes, as well as between classroom management and learning outcomes.

Table 5. Hypothesis Testing Results for Indirect Effects (Mediation)

Mediation Path	β	t-statistic	p-value	Decision
Block System Learning → Learning Motivation → Learning Outcomes	0.096	2.057	0.040	Supported
Classroom Management → Learning Motivation → Learning Outcomes	0.087	2.106	0.035	Supported

Discussion

Effect of Block System Learning on Learning Motivation

The results confirm that block system learning had a significant positive effect on learning motivation (β = 0.463; t = 7.718; p = 0.000), supporting H1. The path coefficient of 0.463, falling within the moderate-to-strong range, indicates that students' perceptions of block scheduling explain more than one-third of the variation in their learning motivation.

This finding is consistent with Denianti et al. (2025), who reported that block scheduling contributed 43.2% to student motivation at Vocational School 1 Buahdua, and supports Burhan and Arifin's (2020) argument that the extended time allocation of block scheduling allows students to engage with content more intensively without fragmentation caused by frequent subject transitions. Three mechanisms appear to underlie this effect. First, block scheduling provides sufficient practice time (Ilmi & Rukun, 2020); unlike conventional scheduling, which typically allocates only one to two hours for practice, block scheduling allows students to complete a full TKJ learning

cycles such as fiber-optic installation or VLAN configuration—which strengthens self-efficacy. Second, block scheduling gives teachers flexibility to vary instructional methods (Buck & Tyrrell, 2022), such as Cisco Packet Tracer simulations and peer teaching, which helps prevent boredom and sustain curiosity. Third, block scheduling reduces the cognitive load associated with transitioning between subjects, allowing students to devote their full mental capacity to mastering TKJ content.

Effect of Classroom Management on Learning Motivation

The results confirm that classroom management had a significant positive effect on learning motivation ($\beta = 0.420$; $t = 7.206$; $p = 0.000$), supporting H2. This finding aligns with Fauzi et al. (2025), who reported a 40.1% contribution of classroom management to learning motivation, and reinforces the arguments of Purnomo (2022) and Raharja et al. (2023) that effective classroom management plays an important role in creating psychological conditions conducive to motivation.

Within the context of extended-duration block scheduling, classroom management becomes increasingly critical. Three mechanisms help explain this effect: (1) a positive socio-emotional climate, in which teachers who build warm interpersonal relationships create a sense of psychological safety that encourages students to ask questions and experiment; (2) consistent behavior and discipline management, which provides psychological certainty that allows students to direct their mental energy fully toward learning; and (3) effective time and pacing management, which anticipates fatigue through varied activities and sustains student focus throughout the session. These findings underscore that classroom management functions as teachers' capacity to build a psychological ecosystem conducive to motivation, rather than merely a technical skill of organizing physical space (Pangestika, 2025).

Effect of Block System Learning on Learning Outcomes

The results confirm that block system learning had a significant positive effect on learning outcomes ($\beta = 0.264$; $t = 3.454$; $p = 0.001$), supporting H3. The path coefficient of 0.264 falls within the weak-to-moderate range. Nonetheless, this finding supports Erwansa and Aini (2025), who reported that block scheduling contributed to a mean student learning outcome of 83.79, and reinforces Burhan and Arifin's (2020) argument that block scheduling produces higher competency achievement than conventional scheduling.

Two principal mechanisms explain this effect. First, adequate practice time allows students to complete a full learning cycle: in TKJ, tasks such as network installation or device configuration can be initiated, carried out, and completed within a single continuous session rather than restarted in subsequent meetings. Second, block scheduling enables faster and more meaningful feedback, since teachers have sufficient time to monitor student work and provide immediate correction. The R^2 value of 0.312 indicates that 68.8% of the variance in learning outcomes is explained by factors outside the model, such as prior ability, family conditions, laboratory facility quality, and

additional tutoring, reflecting the well-established finding that learning outcomes are shaped by a wide range of variables (Wirda et al., 2020).

Effect of Classroom Management on Learning Outcomes

The results confirm that classroom management had a significant positive effect on learning outcomes ($\beta = 0.159$; $t = 2.100$; $p = 0.036$), supporting H4. The path coefficient of 0.159, categorized as weak, is smaller than the effects of block system learning (0.264) and learning motivation (0.207) on learning outcomes. This suggests that classroom management, while important, functions more as a supporting factor than as a direct determinant of academic achievement, consistent with Salmiah and Abidin (2022) and Korpershoek et al. (2025), who argue that the effectiveness of classroom management in improving learning outcomes depends substantially on its synergy with other components of the instructional system.

Within extended-duration block scheduling, classroom management becomes increasingly important for preventing declines in instructional quality toward the end of a session. Teachers skilled in classroom management can read students' condition, adjust their methods, and provide timely breaks to sustain concentration. Without effective classroom management, the potential benefits of block scheduling and high learning motivation are unlikely to translate into maximal gains in learning outcomes.

Effect of Learning Motivation on Learning Outcomes

The results confirm that learning motivation had a significant positive effect on learning outcomes ($\beta = 0.207$; $t = 2.214$; $p = 0.027$), supporting H5. This finding reinforces Zajda (2023) motivational theory, which posits learning motivation as an internal factor shaping the quality of student engagement. Two mechanisms help explain this effect: (1) highly motivated students demonstrate greater persistence in facing challenging tasks, such as troubleshooting failed network configurations, and this additional effort differentiates their achievement; and (2) learning motivation fosters deep learning, whereby students move beyond memorization to genuine conceptual understanding and application in novel situations.

The relatively weak coefficient also indicates that motivation alone is insufficient to guarantee high learning outcomes. A motivated student who lacks adequate prior knowledge, sufficient laboratory facilities, or competent teacher guidance will still struggle to achieve optimal outcomes. This is consistent with Suharnadi et al. (2024), who argue that motivation must be matched by adequate environmental support for its potential to be realized in practice.

Mediating Role of Learning Motivation

The results confirm that learning motivation mediates the effect of block system learning on learning outcomes ($\beta = 0.096$; $t = 2.057$; $p = 0.040$) and the effect of classroom management on learning outcomes ($\beta = 0.087$; $t = 2.106$; $p = 0.035$), supporting H6 and H7. Because the indirect coefficients are smaller than their corresponding direct coefficients, learning motivation functions as a partial rather than

full mediator: block system learning and classroom management influence learning outcomes through two simultaneous pathways—a direct pathway and an indirect pathway operating through learning motivation (Wahyudiyanto & Roniwijaya, 2018).

This finding carries important theoretical implications. Block system learning and classroom management do not raise students' academic achievement directly; rather, they first act on students' psychological state by generating and strengthening learning motivation. Once motivation is established, this psychological energy is expressed through more persistent, active, and directed learning behavior, which in turn improves learning outcomes. The finding reinforces Self-Determination Theory, which holds that learning environments supporting students' basic psychological needs—competence, autonomy, and relatedness—enhance intrinsic motivation and, consequently, learning outcomes (Ryan & Deci, 2022). Practically, this finding underscores that efforts to improve learning outcomes are unlikely to succeed if they focus solely on technical scheduling or classroom order without deliberately cultivating students' learning motivation as the connecting mechanism.

4. CONCLUSION

This study demonstrates that both block system learning ($\beta = 0.463$, $p < 0.001$) and classroom management ($\beta = 0.420$, $p < 0.001$) exert statistically significant positive effects on learning motivation among Computer and Network Engineering (TKJ) vocational students in Gowa Regency. Furthermore, direct positive contributions to learning outcomes were confirmed for block system learning ($\beta = 0.264$, $p = 0.001$), classroom management ($\beta = 0.159$, $p = 0.036$), and learning motivation ($\beta = 0.207$, $p = 0.027$). Crucially, structural mediation analysis reveals that learning motivation partially mediates the relationship between block system learning and learning outcomes ($\beta = 0.096$, $p = 0.040$), as well as between classroom management and learning outcomes ($\beta = 0.087$, $p = 0.035$). Taken together, these findings provide compelling empirical evidence that the efficacy of block scheduling in vocational education is not merely a function of structural time allocation; rather, its operational success depends heavily on active classroom management and the deliberate cultivation of students' intrinsic motivation.

To capitalize on these empirical insights, institutional stakeholders and educators must adopt targeted strategies. School administrators should maintain block-scheduling frameworks while expanding hardware infrastructure and providing professional development focused on pedagogical management tailored for extended-duration laboratory sessions. Concurrently, teachers ought to leverage block scheduling's flexibility by diversifying practical methodologies, delivering timely constructive feedback, and fostering a supportive socio-emotional environment that sustains student engagement. Students are encouraged to strengthen intrinsic drive by aligning daily laboratory practices with long-term career trajectories as network technicians. Finally, given that the structural model accounts for 31.2% of the variance in learning outcomes ($R^2 = 0.312$), future research should incorporate complementary constructs—such as

student self-efficacy, laboratory quality, or socio-economic support—and expand the geographic sample size to enhance theoretical robustness and empirical generalizability.

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