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The Mediating Role of Learning Motivation: A Structural Equation Model of Student Learning Outcomes

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ABSTRACT
Student learning outcomes are shaped by both individual motivational processes and the academic environment. This study examined the direct and indirect associations among learning interest, campus environment, learning motivation, and student learning outcomes. Data were obtained from 172 students in the Faculty of Economics and Business at Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta, and analyzed using partial least squares structural equation modeling. The structural results showed that learning interest was not directly associated with learning outcomes (β = −.177, p = .062), but it was positively associated with learning motivation (β = .511, p < .001). Campus environment was positively associated with both learning outcomes (β = .325, p = .001) and learning motivation (β = .444, p < .001), while learning motivation was positively associated with learning outcomes (β = .265, p = .029). Learning motivation significantly mediated the relationships between learning interest and learning outcomes (β = .135, p = .035) and between campus environment and learning outcomes (β = .118, p = .048). The model explained 67.4% of the variance in learning motivation but only 20.3% of the variance in learning outcomes. These findings indicate that interest is more likely to translate into academic outcomes when it is accompanied by sustained motivation, whereas a supportive campus environment contributes through both direct and motivational pathways. The findings should nevertheless be interpreted cautiously because the reported cross-loading matrix contains a discriminant-validity anomaly that requires verification against the original PLS output.

Keywords: campus environment; learning interest; learning motivation; learning outcomes; mediation; PLS-SEM

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INTRODUCTION

Student learning outcomes are a central indicator of educational effectiveness because they reflect the extent to which learners acquire knowledge, skills, strategies, and attitudes during a program of study. Research in higher education consistently shows that academic performance is not determined by a single factor; instead, it reflects the combined influence of prior attainment, self-regulation, motivation, study behavior, and features of the learning environment (Richardson et al., 2012; Schneider & Preckel, 2017). Consequently, models that integrate personal and contextual predictors are more informative than explanations that treat academic success as the product of ability or interest alone.

Learning interest represents an affective-cognitive orientation toward a topic or activity. Interest can attract attention, increase willingness to engage, and develop from a situational response into a more stable individual disposition (Hidi & Renninger, 2006). Nevertheless, interest should not be equated with sustained effort. Motivational theories distinguish valuing or enjoying a learning activity from the regulatory processes that energize, direct, and maintain goal-oriented behavior (Deci & Ryan, 2000; Eccles & Wigfield, 2002; Pintrich, 2003). A student may therefore report high interest in a course without consistently investing the effort required to achieve strong learning outcomes.

Learning motivation provides a plausible mechanism through which interest becomes academic action. Motivation influences persistence, strategic behavior, and the allocation of

effort, all of which are closely related to achievement (Schunk et al., 2014; Credé & Kuncel, 2008). Engagement research similarly suggests that emotional attraction to learning is most consequential when it is accompanied by behavioral and cognitive participation (Fredricks et al., 2004). Indonesian studies have also reported positive relationships among motivation, self-efficacy, and learning outcomes, although the magnitude and direction of these relationships vary across contexts (Monika & Adman, 2017; Rochmah & Kurniawan, 2022).

The campus environment constitutes the social and instructional context in which motivation and learning are enacted. Lecturer–student interaction, peer relationships, teaching practices, and the broader academic climate can support students' sense of competence, belonging, and academic integration (Astin, 1993; Tinto, 1993; Pascarella & Terenzini, 2005). Learning-environment research has long emphasized that students' perceptions of classroom and institutional conditions are associated with both affective and cognitive outcomes (Fraser, 1998). Evidence from Indonesian higher education likewise indicates that campus conditions can shape motivation, interest, and achievement (Sudiksa et al., 2020; Wibowo, 2016).

Despite the theoretical relevance of these variables, two analytical questions remain important. First, it is unclear whether learning interest contributes to outcomes independently of motivation and campus environment. Second, motivation may function as an intervening process through which both interest and the campus environment are translated into outcomes. Addressing these questions requires simultaneous estimation of direct and indirect paths. The present study therefore applies partial least squares structural equation modeling (PLS-SEM) to examine a model linking learning interest and campus environment to learning outcomes, with learning motivation specified as a mediator.

This study contributes by distinguishing between direct and motivation-mediated pathways in a single institutional sample. It also provides a more cautious interpretation of the measurement and structural evidence than the source manuscript, particularly where the reported indicator diagnostics do not fully support the original validity claims. The study asks whether learning interest, campus environment, and learning motivation are associated with student learning outcomes and whether learning motivation mediates the effects of interest and campus environment.

Theoretical Framework And Hypothesis Development

1. Learning Interest, Motivation, and Learning Outcomes

Interest directs attention toward learning content and can increase the subjective value attached to a task. In the four-phase model of interest development, situational interest may become more enduring when learners repeatedly re-engage with meaningful content (Hidi & Renninger, 2006). Expectancy–value and self-determination perspectives similarly propose that learners are more willing to invest effort when activities are valued and psychologically meaningful (Deci & Ryan, 2000; Eccles & Wigfield, 2002). These arguments support a positive relationship between learning interest and motivation.

The relationship between interest and achievement is less straightforward. Interest can facilitate engagement, but performance also depends on persistence, strategy use, prior knowledge, and the ability to regulate behavior. Meta-analytic evidence in higher education indicates that motivational and self-regulatory variables differ substantially in their associations with academic performance (Richardson et al., 2012; Schneider & Preckel, 2017). Thus, interest may have a direct relationship with outcomes, but its contribution may be attenuated once motivation and contextual factors are modeled simultaneously.

2. Campus Environment, Motivation, and Learning Outcomes

A supportive campus environment provides academic, relational, and instructional resources that can facilitate learning. Student-development theories emphasize that frequent interaction with lecturers, meaningful peer relationships, and academic integration promote persistence and development (Astin, 1993; Tinto, 1993; Pascarella & Terenzini, 2005). Perceived learning environments also influence affective responses, participation, and achievement (Fraser, 1998).

Campus conditions may affect outcomes directly by improving access to instruction and feedback, and indirectly by strengthening motivation. When students perceive that lecturers are accessible, course material is presented clearly, and peer relationships are constructive, they are more likely to experience competence and belonging. Empirical studies in Indonesian settings have reported positive associations between learning environments, motivation, and educational outcomes (Sudiksa et al., 2020; Wibowo, 2016; Mauliddiyah & Wulandari, 2022).

3. Learning Motivation and Its Mediating Role

Motivation energizes and sustains goal-directed learning. Motivated students are more likely to persist, adopt productive study strategies, and allocate effort to academic tasks (Pintrich, 2003; Schunk et al., 2014). Because these behaviors are proximal to performance, learning motivation is expected to be positively related to learning outcomes.

Mediation analysis clarifies whether interest and environmental conditions operate through motivation rather than only through direct paths. A significant indirect effect can exist even when the corresponding direct effect is not statistically significant; therefore, mediation should be evaluated from the bootstrapped indirect effect rather than from a sequence of separate significance tests (Preacher & Hayes, 2008; Zhao et al., 2010). Based on the proposed model, interest is expected to strengthen motivation, which in turn supports outcomes. The campus environment is likewise expected to influence outcomes partly by creating conditions that sustain motivation.

METHOD

The study used a quantitative, non-experimental design and was conducted in the Faculty of Economics and Business at Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta, between March and November 2022. The analysis examined structural associations among four latent constructs: learning interest, campus environment, learning motivation, and student learning outcomes. Because the design was observational, the estimated paths are interpreted as predictive associations rather than definitive causal effects (Kline, 2016).

The sample comprised 172 students selected through simple random sampling. The source manuscript states that the sample size was determined using Yamane's formula with a 5% margin of error. However, the population size used in that calculation was not reported; it should be added in a final submission to make the sampling procedure fully reproducible.

The measurement model included reflective indicators for learning interest, campus environment, learning motivation, and learning outcomes. Table 1 harmonizes the indicator codes with the PLS model and loading tables. The source manuscript contained an inconsistent extra code in its original indicator table; the coding below follows the structural model actually reported. The source did not provide the full item wording, response scale, instrument-development procedure, or evidence of content validation. These details should be supplied before journal submission because they are necessary for replication and construct interpretation.

Table 1. *Constructs and observed indicators*

Construct	Code	Indicator label
Learning interest	X1	Feeling of enjoyment
Learning interest	X2	Student engagement
Learning interest	X3	Interest or attraction toward learning
Campus environment	X4	Lecturer–student interaction
Campus environment	X5	Relationships among students
Campus environment	X6	Method of presenting course material
Learning motivation	Y1	Student aspirations or goals
Learning motivation	Y2	Perceived learning ability
Learning motivation	Y3	Physical and psychological condition
Learning motivation	Y4	Environmental conditions
Learning motivation	Y5	Dynamic elements of learning
Learning motivation	Y6	Lecturers' efforts to facilitate learning
Learning outcomes	Y7	Intellectual skills
Learning outcomes	Y8	Cognitive strategies

Construct	Code	Indicator label
Learning outcomes	Y9	Verbal information
Learning outcomes	Y10	Motor skills
Learning outcomes	Y11	Attitude

Note. Indicator labels are retained from the source manuscript and aligned with the codes shown in the reported PLS model.

The model was estimated using PLS-SEM. This approach is suitable for simultaneously assessing a measurement model and a structural model when the analytical objective emphasizes prediction and explained variance (Hair et al., 2019; Hair et al., 2022). The measurement model was evaluated using indicator loadings, Cronbach's alpha, composite reliability, average variance extracted (AVE), and cross-loadings. Conventional guidance regards composite reliability values around .70 or higher as desirable and AVE values of .50 or higher as evidence that a construct explains at least half of the variance in its indicators (Fornell & Larcker, 1981; Nunnally & Bernstein, 1994).

Discriminant validity was examined from the reported cross-loading matrix. Contemporary PLS-SEM practice also recommends the heterotrait–monotrait ratio (HTMT), because traditional criteria may fail to detect discriminant-validity problems (Henseler et al., 2015). HTMT values were not available in the source data and therefore could not be reported.

The structural model was assessed using inner variance inflation factors (VIF), coefficients of determination (R^2), effect sizes (f^2), standardized path coefficients, t statistics, and p values. VIF values below 5 were treated as evidence against severe collinearity. Effect sizes were interpreted using approximate benchmarks of .02, .15, and .35 for small, medium, and large effects (Cohen, 1988). Statistical significance was evaluated using the reported bootstrapped t statistics and p values, although the number of bootstrap subsamples was not specified in the source manuscript. Mediation was assessed from the significance and direction of the indirect effects (Preacher & Hayes, 2008; Zhao et al., 2010).

RESULTS AND DISCUSSION

1. Measurement Model

The initial outer loadings are presented in Table 2. Three indicators were removed in the source analysis: X2 (.513), Y1 (.593), and Y2 (−.100). After removal, all retained indicators had loadings of at least .624. Although the final loadings meet the threshold used in the source manuscript, indicators with loadings between .40 and .70 are not necessarily removed automatically; deletion should also consider content validity, composite reliability, and the theoretical coverage of the construct (Hair et al., 2022). Accordingly, the removal of X2 and Y1 requires a stronger substantive justification than is available in the source manuscript.

Table 2. *Outer loadings before and after indicator removal*

Construct	Indicator	Initial loading	Final loading
Learning interest	X1	.960	.981
Learning interest	X2	.513	Removed
Learning interest	X3	.954	.981
Campus environment	X4	.799	.802
Campus environment	X5	.805	.799
Campus environment	X6	.769	.773
Learning motivation	Y1	.593	Removed
Learning motivation	Y2	−.100	Removed
Learning motivation	Y3	.625	.624
Learning motivation	Y4	.658	.657
Learning motivation	Y5	.794	.819
Learning motivation	Y6	.728	.765
Learning outcomes	Y7	.873	.874
Learning outcomes	Y8	.673	.676
Learning outcomes	Y9	.754	.755
Learning outcomes	Y10	.715	.709
Learning outcomes	Y11	.877	.877

Table 3 shows that composite reliability ranged from .810 to .981 and AVE ranged from .519 to .962. These values satisfy the conventional thresholds applied in the study. Cronbach's alpha for learning motivation was .695, which is marginally below .70 but may be acceptable

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in an exploratory model when composite reliability is adequate. The learning-interest construct was represented by only two highly similar indicators after deletion, producing an exceptionally high AVE (.962). This pattern may indicate item redundancy rather than broad construct coverage.

Table 3. *Internal consistency and convergent validity*

Construct	Cronbach's α	Composite reliability	AVE
Learning outcomes	.838	.887	.613
Campus environment	.702	.834	.626
Learning interest	.961	.981	.962
Learning motivation	.695	.810	.519

The cross-loading matrix is shown in Table 4. Most indicators loaded more strongly on their intended construct than on the other constructs. However, Y6 had a reported cross-loading of .931 on learning interest, which exceeds its loading of .765 on learning motivation. On the values as reported, discriminant validity is therefore not fully established. Because the .931 value is also inconsistent with the broader loading pattern, it may reflect a transcription or coding error. The original software output should be checked before publication, and HTMT should be reported (Henseler et al., 2015).

Table 4. *Cross-loadings of retained indicators*

Indicator	Learning outcomes	Campus environment	Learning interest	Learning motivation
X1	.159	.462	.981	.704
X3	.173	.471	.981	.713
X4	.307	.801	.340	.548
X5	.323	.799	.438	.592
X6	.377	.773	.347	.486
Y3	.275	.474	.219	.624
Y4	.307	.462	.293	.657
Y5	.333	.617	.434	.819
Y6	.171	.448	**.931**	.765
Y7	.874	.386	.150	.312
Y8	.676	.335	.222	.342
Y9	.755	.330	.142	.310
Y10	.709	.237	−.030	.159
Y11	.877	.341	.140	.256

Note. The bold value for Y6 (.931) exceeds the indicator's loading on its assigned construct (.765), indicating a discriminant-validity problem or a transcription error that must be verified.

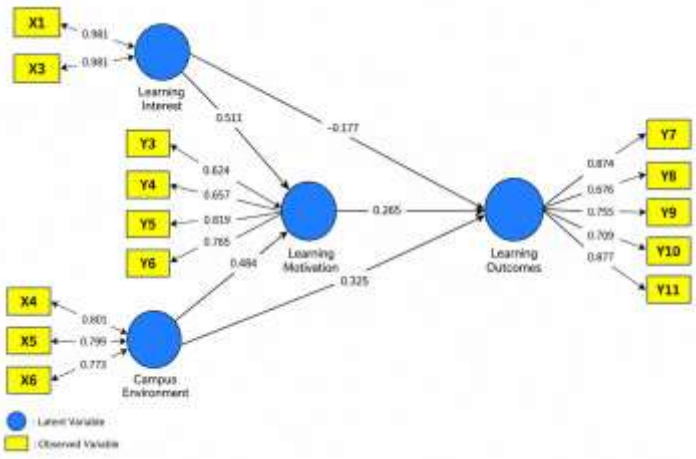

Figure 1. *Structural model and standardized path coefficients.*

2. Structural Model

All reported inner VIF values were below 5, ranging from 1.292 to 3.071, which indicates that severe collinearity was not evident among the predictor constructs. The effect-size results require correction from the source interpretation. Learning motivation had a small effect on learning outcomes (f^2 = .029), campus environment had a small effect on learning outcomes (f^2 = .070) and a large effect on learning motivation (f^2 = .468), learning interest had a negligible-to-small effect on learning outcomes (f^2 = .019), and a large effect on learning motivation (f^2 = .621).

Table 5. *Inner VIF and f² effect sizes*

Structural path	VIF	f²	Interpretation
Learning motivation → Learning outcomes	3.071	.029	Small
Campus environment → Learning outcomes	1.898	.070	Small
Campus environment → Learning motivation	1.292	.468	Large
Learning interest → Learning outcomes	2.095	.019	Negligible/small
Learning interest → Learning motivation	1.292	.621	Large

Learning interest and campus environment jointly explained 67.4% of the variance in learning motivation (adjusted R^2 = .670), indicating strong explanatory performance for the mediator. By contrast, learning interest, campus environment, and learning motivation jointly explained 20.3% of the variance in learning outcomes (adjusted R^2 = .189). The latter value indicates limited explanatory power and should not be characterized as a medium effect without qualification.

Table 6. *Explained variance in endogenous constructs*

Endogenous construct	R^2	Adjusted R^2
Learning motivation	.674	.670
Learning outcomes	.203	.189

The direct-path results are reported in Table 7. Learning interest was negatively but not significantly associated with learning outcomes (β = −.177, p = .062); therefore, H1 was not supported. Learning interest was positively associated with learning motivation (β = .511, p < .001), supporting H2. Campus environment was positively associated with both learning outcomes (β = .325, p = .001) and learning motivation (β = .444, p < .001), supporting H3 and H4. Learning motivation was positively associated with learning outcomes (β = .265, p = .029), supporting H5.

Table 7. *Direct effects and hypothesis decisions*

Hyp.	Path	β	t	p	Decision
H1	Learning interest → Learning outcomes	−.177	1.864	.062	Not supported
H2	Learning interest → Learning motivation	.511	7.091	< .001	Supported
H3	Campus environment → Learning outcomes	.325	3.225	.001	Supported
H4	Campus environment → Learning motivation	.444	6.322	< .001	Supported
H5	Learning motivation → Learning outcomes	.265	2.182	.029	Supported

Both indirect effects were statistically significant. The indirect association between learning interest and learning outcomes through motivation was β = .135 (p = .035), supporting H6. Because the direct path from interest to outcomes was not significant, this pattern is consistent with indirect-only mediation. The indirect association between campus environment and learning outcomes through motivation was β = .118 (p = .048), supporting H7. Because both the direct and indirect campus-environment paths were positive and significant, this pattern is consistent with complementary mediation (Zhao et al., 2010).

The total effect of learning interest on learning outcomes is obtained by adding the direct and indirect coefficients (−.177 + .135 = −.042), not by squaring the coefficient and converting it to a percentage. The reported total effect was not significant (t = .530, p = .596). The total effect of campus environment was .443 (.325 + .118) and was significant (t = 5.961, p < .001).

Table 8. *Indirect and total effects on learning outcomes*

Hyp.	Effect	β	t	p	Decision
H6	Learning interest → Motivation → Outcomes	.135	2.112	.035	Supported
H7	Campus environment → Motivation → Outcomes	.118	1.980	.048	Supported
—	Total: Learning interest → Outcomes	−.042	.530	.596	Not significant
—	Total: Campus environment → Outcomes	.443	5.961	< .001	Significant

Discussion

1. Interpretation of the Main Findings

The results show that learning interest was not directly associated with learning outcomes after campus environment and learning motivation were included in the model. This finding does not imply that interest is irrelevant. Instead, the significant interest-to-motivation path and the significant indirect effect indicate that interest is more likely to influence outcomes when it is converted into sustained motivational energy. This interpretation is consistent with theories

that distinguish valuing or enjoying a task from the self-regulatory processes required to persist and perform (Deci & Ryan, 2000; Eccles & Wigfield, 2002; Pintrich, 2003).

The interest result also illustrates why a non-significant direct path should not be treated as evidence that no meaningful relationship exists. Interest had a large effect on motivation (f^2 = .621), while motivation was positively associated with outcomes. The total effect of interest was nevertheless close to zero because the negative direct coefficient offset the positive indirect coefficient. This suppression-like pattern warrants further investigation with stronger measurement and longitudinal data. It may reflect model specification, overlap among constructs, sampling variability, or the discriminant-validity problem visible in the cross-loading matrix.

Campus environment emerged as the most consequential predictor of learning outcomes in the model. It had a significant direct relationship with outcomes and a significant indirect relationship through motivation. The result supports the view that academic environments influence students through multiple mechanisms: they provide instructional and relational resources while also shaping students' willingness to invest effort (Astin, 1993; Tinto, 1993; Pascarella & Terenzini, 2005). The finding is also consistent with Indonesian evidence linking campus or learning environments to motivation and achievement (Sudiksa et al., 2020; Wibowo, 2016; Rochmah & Kurniawan, 2022).

Learning motivation was a statistically significant predictor of outcomes, but its f^2 value (.029) was small. Statistical significance should therefore not be confused with a large practical contribution. In contrast, interest and campus environment explained a substantial proportion of variance in motivation. The model is thus considerably better at explaining students' motivational state than their reported learning outcomes. This asymmetry is theoretically plausible because academic outcomes depend on many additional factors, including prior achievement, self-efficacy, study skills, time management, attendance, and assessment characteristics (Credé & Kuncel, 2008; Richardson et al., 2012; Schneider & Preckel, 2017).

2. Theoretical Implications

The findings support a process-oriented account of academic achievement. Interest appears to function primarily as an antecedent of motivation rather than as an independent driver of outcomes, whereas the campus environment operates through both direct and motivational pathways. This distinction refines simple models that assume that students perform well merely because they like a subject. The results instead suggest that affective attraction must be translated into persistence and goal-directed behavior.

The mediation pattern also demonstrates the value of evaluating indirect effects directly. The interest pathway represents indirect-only mediation, while the campus-environment pathway represents complementary mediation (Zhao et al., 2010). These two patterns imply that the same mediator can play different roles depending on the predictor: motivation is the principal pathway for interest, but only one of several pathways through which campus conditions relate to outcomes.

3. Practical Implications

For academic managers, the findings suggest that interventions should not focus exclusively on stimulating interest. Interest-building activities are useful, but they should be paired with structures that support persistence, goal setting, feedback, and self-regulation. Academic advising, formative feedback, mentoring, and structured study-planning programs may help students translate interest into sustained learning behavior.

The campus-environment findings point to lecturer–student interaction, peer relationships, and the presentation of course material as practical intervention targets. Faculty development should emphasize clear instruction, responsive feedback, inclusive classroom interaction, and opportunities for constructive peer learning. Because the campus environment has both direct and indirect associations with outcomes, improvements in these areas may support achievement while simultaneously strengthening motivation.

4. Limitations and Directions for Future Research

Several limitations constrain the interpretation of the findings. First, the study was conducted in one faculty at one university, which limits generalizability. Second, the observational design does not establish temporal or causal ordering. Longitudinal or experimental research is needed to determine whether changes in interest and campus environment precede changes in motivation and outcomes.

Third, essential instrument information was not reported, including the full item wording, response scale, source or adaptation of the measures, and evidence of content validity. The learning-interest construct was reduced to two highly similar indicators, which may narrow its conceptual coverage. Fourth, the reported cross-loading of Y6 on learning interest (.931) exceeds its loading on learning motivation (.765). This anomaly means that discriminant validity cannot be accepted without checking the original output and reporting HTMT (Henseler et al., 2015).

Fifth, the analysis did not report the number of bootstrap subsamples, predictive relevance (Q^2), out-of-sample prediction, or an overall approximate fit index such as SRMR. These omissions should be addressed in a final analysis following current reporting recommendations (Hair et al., 2019; Hair et al., 2022). Finally, learning outcomes were represented by self-reported competency dimensions rather than independently verified grades or standardized performance. Future studies should combine validated self-report measures with objective academic records and incorporate additional predictors such as prior achievement, self-efficacy, engagement, study strategies, and learning facilities.

CONCLUSION

This study examined whether learning motivation mediates the associations of learning interest and campus environment with student learning outcomes. Learning interest did not have a statistically significant direct relationship with outcomes, but it was strongly associated with motivation and had a significant indirect relationship with outcomes through motivation. Campus environment was positively associated with both motivation and outcomes and also had a significant indirect relationship with outcomes. Learning motivation therefore served as the principal pathway connecting interest to outcomes and as a complementary pathway connecting the campus environment to outcomes.

The model explained a substantial proportion of variance in learning motivation but only a limited proportion of variance in learning outcomes. Institutions should therefore strengthen the academic environment and motivational support while recognizing that achievement also depends on factors outside the present model. The substantive conclusions remain promising, but verification of the cross-loading anomaly and fuller reporting of the measurement and sampling procedures are necessary before the study can meet the methodological expectations of a reputable international journal.

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