Dinamika Pendidikan 20 (2) (2025) 239-245

Dinamika Pendidikan

http://journal.unnes.ac.id/journals/dp

Influence of Classroom Environment, Lecturer Competence, and ICT Resources on Perceived Academic Performance Mediated by Student Engagement

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DOI: 10.15294/dp.v20i2.30274

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History Article

Submitted July 14, 2025
Revised September 20, 2025
Accepted January 12, 2026

Keywords

Academic Performance; Classroom Environment, ICT Resources; Lecturer Competence; Student Perception; Student Engagement

Abstract

This study was done to analyze the influence of student engagement on the perception of academic performance; the classroom environment perception on student engagement; the lecturer competence perception on student engagement; the ICT resources perception on student engagement; and the classroom environment perception, lecturer competence, and ICT resources on the perception of academic performance mediated by student engagement. This study employs a quantitative descriptive method, analysing data from questionnaires collected from 395 students selected through probability sampling with proportionate random sampling. Data analysis techniques included descriptive statistics, regression analysis, collinearity diagnostics (VIF), significance tests, and model fit. The results indicate that student engagement has a positive and significant impact on academic performance; classroom environment has a positive and significant impact on student engagement; lecturer competence has a positive and significant impact on student engagement; ICT resources has a positive and significant impact on student engagement; classroom environment has a positive and significant impact on academic performance mediated by student engagement; lecturer competence has a positive and significant impact on academic performance mediated by student engagement; also ICT resources has a positive and significant impact on academic performance mediated by student engagement. These findings suggest that higher education institutions should prioritize engagement-oriented learning strategies by enhancing lecturers' pedagogical competence, optimizing ICT resources, and improving classroom learning environments to enhance students' academic performance.

How to Cite

Noviani, L., Putri, N. A., & Oktaviani, L. K. (2025). Influence of Classroom Environment, Lecturer Competence, and ICT Resources on Perceived Academic Performance Mediated by Student Engagement. *Dinamika Pendidikan*. 20(2), 239-245.

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p-ISSN 1907-3720
e-ISSN 2502-5074

INTRODUCTION

Academic achievement is a fundamental indicator of the quality of human capital and plays a strategic role in national development (Hanushek & Woessmann, 2015). Higher education institutions are therefore expected not only to produce graduates with strong academic outcomes but also to contribute to sustainable national development by preparing skilled, adaptable, and resilient human resources.

Academic performance is closely related to the self-determination theory proposed by Ryan & Deci (2020). Most students aim to achieve good academic performance because it helps them prepare for the competitive era (Hanaysha et al., 2023). However, many students feel stressed by high academic expectations. Stress affects students' mental health and reduces their academic performance. The American College Health Organization (2024) states that 94% of college students struggle with learning difficulties, and 1 in 5 students suffer from anxiety, which negatively impacts academic performance. In Indonesia, similar data also show that 36.7%–71% of students experience academic stress (Ambarwati et al., 2019).

Universitas Sebelas Maret (UNS) students reported that 69.6% experienced stress (Harbowo, 2023; Sugandi, 2021). This highlights the need to examine external factors such as the classroom environment, lecturer competence, and ICT resources, which can enhance student engagement and academic performance. Student perceptions of academic performance are crucial because they are often used as an indirect measure of learning outcomes (Cunningham, 2021; Lindner, 1999; Trigueros et al., 2020).

The physical classroom environment significantly influences learning comfort and success. Facilities such as lighting, furniture, and technological aids are crucial for student engagement and academic outcomes (Hannah, 2013; Shaleh & Anhusadar, 2021). Although many classrooms at UNS are equipped with Smart TVs and projectors, a 2024 UNS Student Executive Board survey found that several issues persist, including malfunctioning LCD screens and a lack of comfortable classrooms (Kementerian Riset dan Data BEM UNS, 2024). This fact strengthens the urgency of research on the influence of ICT resources on student engagement, because limited access to technological facilities can hinder students' active participation in lecture activities.

Furthermore, lecturer competence is essential for building a supportive and effective learning environment. Lecturers' pedagogical and social competence has been shown to affect student engagement (Almarghani & Mijatovic, 2017; Owusu-Agyeman & Moroeroe, 2023; Sultan & Shafi, 2014). Although most UNS lecturers hold master's and doctoral degrees and have participated in PEKERTI training, student assessments of lecturer performance remain moderate (Unit Penjaminan Mutu FKIP UNS, 2024). This suggests that teaching methods and quality still need improvement.

Furthermore, Information and Communication Technology (ICT) is increasingly crucial in this digital era. The availability of technological facilities such as Wi-Fi, computers, and projectors supports active learning (Kouser & Popat, 2022; Ma & Ruannakarn, 2024). UNS has provided extensive ICT infrastructure; however, according to a 2024 UNS Student Executive Board survey, its utilization remains suboptimal. Several previous studies have reported inconsistent findings regarding the effects of these factors on academic performance (Bardach & Klassen, 2020; Canales & Maldonado, 2018). Therefore, this study takes a novel approach by treating student engagement as a mediating variable to examine in greater depth how perceptions of the classroom environment, lecturer competence, and ICT resources influence students' academic performance.

Student engagement is necessary because it relates to student motivation, attention, and active participation in the learning process (Gunuc & Kuzu, 2015; Jamaluddin et al., 2022). Self-Determination Theory provides an important foundation for understanding how the needs for autonomy, competence, and relatedness drive student engagement and achievement (Ryan & Deci, 2020; Wang et al., 2020). Based on the foregoing discussion, this study aims to investigate the mediating role of student engagement in the relationships between perceived classroom environment, lecturer competence, and ICT resources, and students' perceived academic performance. The novelty of this study lies in extending the use of student engagement as a mediating construct within a higher-education PLS-SEM framework, focusing on undergraduate students at UNS in the 2024/2025 academic year.

METHODS

This study implemented a descriptive quantitative approach. The aim was to analyse the influence of students' perceptions of the classroom environment, lecturer competence, and ICT resources on perceived academic perfor-

mance, with student engagement as a mediating variable. The study was conducted at UNS in the even semester of the 2024/2025 academic year. This study had three main variables. The exogenous variables were classroom environment (X1), lecturer competence (X2), and ICT resources (X3). The endogenous variable was students' perceptions of academic performance (Y), and the mediating variable was students' engagement (Z). The correlation among these variables was analyzed to determine whether student engagement mediates the relationship between perceptions of the learning environment and academic performance.

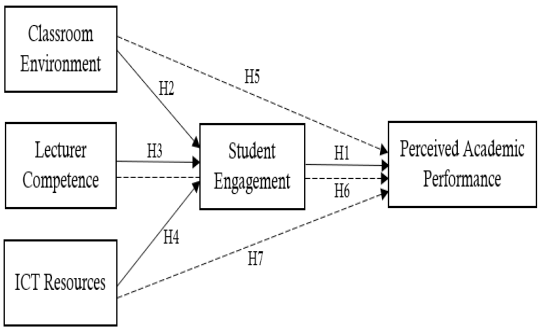

Figure 1. Research Framework

The study population comprised undergraduate students at UNS in the 2024/2025 academic year. Proportionate stratified random sampling was employed, with the sample size calculated using Slovin's formula. The total number of respondents was 395. Samples were drawn proportionally from each faculty member to ensure fair representation of the population. Each research variable in this study was measured using questionnaire items adapted from previously validated instruments. The measurement of the classroom environment variable was adapted from Nguyen & Leblanc (2002). Lecturer competence was measured using items adapted from Almarghani & Mijatovic (2017). ICT resources were assessed using questionnaire items adapted from Almarghani & Mijatovic (2017). Perceived academic performance was measured using indicators adapted from Cunningham (2021). Student engagement was measured using indicators adapted from Almarghani & Mijatovic (2017).

Data were collected using a Google Form questionnaire with a 1–5 Likert scale. The instrument's validity was assessed using convergent validity (loading factors > 0.70 and AVE > 0.50) and discriminant validity (HTMT < 0.90). Cronbach's Alpha and Composite Reliability were used to assess internal consistency, with ideal values > 0.70.

The data analysis technique in this study used the PLS-SEM (Partial Least Squares Structural Equation Modelling) approach with SmartPLS 4.0. The analysis began with descriptive statistics to examine data trends, followed by outer-model analysis to assess convergent and discriminant validity and reliability, using Cronbach's Alpha and Composite Reliability. Collinearity was assessed using the VIF. Inner model analysis was used to assess the strength of relationships among latent variables; $R^2 > 0.33$ indicates a moderate relationship, and Q^2 values above 0 indicate good predictive ability. Model fit was assessed using SRMR and NFI to evaluate the model's suitability for the data. Hypothesis testing was conducted using one-tailed bootstrapping techniques; results were considered statistically significant if the t-statistic exceeded 1.96 or the p-value was less than 0.05. Meanwhile, the mediation test employed a specific indirect-effect analysis using the same criteria to determine whether the student engagement variable mediates the relationship between the exogenous and endogenous variables.

RESULTS AND DISCUSSION

Research Participants

This study involved 395 active undergraduate students at Sebelas Maret University, comprising 124 males (31.39%) and 271 females (68.61%). Most respondents were in the 6th semester (37.22%), followed by the 4th (21.77%) and 2nd (19.75%) semesters.

Table 1. Demographic of the respondents

Gender	Number	Percentage
Male	124	31.39
Female	271	69.61
Total	395	100
Semester	Number	Percentage
2	78	19.75
4	86	21.77
6	147	37.22
8	82	20.76
10	1	0.25
12	0	0
14	1	0.25

Source: Primary Data (2025)

Convergent Validity

Table 2. Convergent Validity Testing

Variables & Questions	*Loading Factor*	AVE	Status
Classroom Environment (CE)		0,720	
Clean and tidy	0,844		Valid
Enough lighting	0,820		Valid
Audible for the teachers and students	0,844		Valid
Providing working space	0,854		Valid
Visible board	0,881		Valid
Lecturer Competence (LC)		0,649	
Able to connect the materials	0,789		Valid
Able to explain the main points of the materials	0,780		Valid
Able to explain the upcoming materials.	0,766		Valid
Able to give real examples.	0,776		Valid
Comprehend the materials	0,872		Valid
Able to do eye contact and deliver body languange	0,773		Valid
Able to guide students	0,876		Valid
ICT Availibility (ICT A)		0,629	
Using computer facility.	0,760		Valid
Laboratorium and scientific workshop.	0,766		Valid
Audio visual tools	0,723		Valid
Electronic and internet service.	0,799		Valid
Modern equipment.	0,907		Valid
Academic Performance (Y)		0,644	
Fulfilling all inquiries.	0,788		Valid
Completing all assignments.	0,841		Valid
Completing assignments based on the instruction.	0,884		Valid
Completing assignmens as expected.	0,767		Valid
Performance meets the expectation.	0,724		Valid
Student Engagement (Z)		0,603	
Evaluating academic and administration staff.	0,729		Valid
Participating in social events.	0,789		Valid
Giving opinion.	0,803		Valid
Giving critics.	0,772		Valid
Giving curriculum evaluation.	0,761		Valid
Participating in giving quality assurance.	0,758		Valid
Attending meeting and discussion.	0,819		Valid

Source: Processed Primary Data (2025)

Table 2 presents convergent validity values: each item's loading is > 0.70, and the AVE is > 0.5. The value of each item in each variable is valid because its loading factor > 0.70 and its AVE > 0.50.

Reliability

Table 3. Reliability Testing

Variable	*Cronbach's alpha*	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	Status
Classroom environment	0,903	0,908	0,928	Reliable
Lecturer competence	0,909	0,914	0,928	Reliable
ICT availibility	0,852	0,870	0,894	Reliable
Academic performance	0,861	0,875	0,900	Reliable
Student engagement	0,891	0,896	0,914	Reliable

Source: Processed Primary Data (2025)

Table 3 presents Cronbach's alpha and composite reliability for each variable. The Cronbach's alpha and composite reliability values for each variable were >0.70. This means that each variable in this study has been reliable.

Model Figure

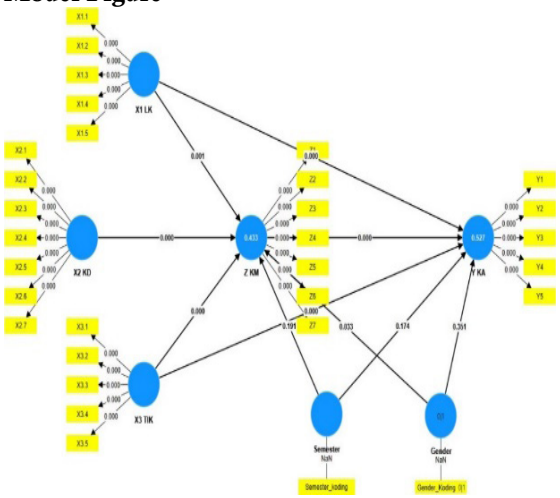

Figure 2. Measurement Model

Table 4. Hypotheses' Results

	Original Sample (O)	Sample mean (M)	Standard deviation (STDEV)	T-statistics	P-Values
CE - SE	0,178	0,177	0,055	3,260	0,001
LC - SE	0,178	0,177	0,055	3,260	0,001
ICT - SE	0,406	0,407	0,062	6,601	0,000
SE – AP	0,199	0,200	0,058	3,452	0,000
CE – SE – AP	0,049	0,049	0,018	2,692	0,004
LC – SE – AP	0,113	0,114	0,031	3,583	0,000
ICT – SE – AP	0,055	0,055	0,017	3,178	0,001

Source: Processed Primary Data (2025)

Table 4 shows that students' perceptions of the classroom environment, lecturer competence, and ICT resources significantly affect student engagement, as indicated by p-values < 0.05. Furthermore, student engagement significantly influences students' perceived academic performance. Student engagement significantly mediates the relationships between classroom environment, lecturer competence, and ICT resources and perceived academic performance, as indicated by p-values < 0.05.

The Influence of Student Engagement on Academic Performance

The analysis results show that student engagement significantly and positively influences academic performance. Student engagement encompasses attendance, assignment completion,

and participation in curricular organisations and evaluations. Students who are actively engaged tend to be highly motivated and to take responsibility for their learning, which directly contributes to improved academic achievement. This finding aligns with research by Dogan (2015) and Finn & Zimmer (2012).

The Influence of the Classroom Environment on Student Engagement

The classroom environment has a positive and significant influence on student engagement. A comfortable, clean, and well-organized physical environment, with adequate facilities, helps students become more focused and engaged in lectures. A supportive learning environment increases cognitive and affective engagement. This finding is supported by additional research, which emphasizes the importance of learning space quality for student participation (Shernoff et al., 2017)via student engagement. The present study examined the influence of environmental challenge and support on learning in high school classrooms, and the potential for student engagement to act as a mediator in this relationship. Data were collected in seven classrooms in six different subjects in several US high schools. The 104 students in these classes participated in the Experience Sampling Method (ESM.

The Influence of Lecturer Competence on Student Engagement

Lecturers' competence also significantly influences student engagement. Pedagogically and socially competent lecturers can create effective learning and a pleasant classroom atmosphere. Students are valued and encouraged to participate in the learning process. A good relationship between lecturers and students increases their self-confidence and participation. This finding is supported by Dogan (2015) and Rashid & Asghar (2016).

The Influence of ICT Resources on Student Engagement

ICT resources positively affect student engagement. Facilities, including computer laboratories, internet access, and audiovisual equipment, make students feel their learning needs are met. This encourages higher emotional and cognitive engagement in the learning process. This research aligns with the results reported by Dekhane et al. (2013) and Gunuc & Kuzu (2015).

The Influence of Classroom Environment on Academic Performance Mediated by Student Engagement

The results indicate that student engagement mediates the relationship between the classroom environment and academic performance. A supportive classroom environment fosters engagement, encouraging students to achieve optimal academic outcomes. This statement aligns with research indicating that positive learning experiences improve student motivation and performance (Hanaysha et al., 2023; Imms & Byers, 2017).

The Influence of Lecturer Competence on Academic Performance is Mediated by Student Engagement

Lecturer competence indirectly influences student academic performance through engagement. Lecturers with strong pedagogical and social skills increase student engagement in learning, which is crucial for improving student academic performance. Harbour et al. (2015) and Hanaysha et al. (2023) support this finding.

The Influence of ICT Resources on Academic Performance is Mediated by Student Engagement

Student engagement also mediates the relationship between ICT resources and academic performance. Adequate ICT resources enable students to engage more actively with the material and complete assignments. High engagement leads to improved perceptions of their academic performance. This finding aligns with research by Bakker et al. (2015) and Tsay et al. (2020).

Importantly, the mediation analysis in this study indicates a partial mediation effect, meaning that ICT resources influence academic performance both directly and indirectly through student engagement. This shows that the presence of ICT infrastructure alone is insufficient to optimally increase students' academic achievement unless it is accompanied by a learning process that actively involves students. In other words, ICT functions not only as a structural resource but also as a catalyst that requires engagement-based use to maximize educational benefits.

In addition, this study's findings carry several important research implications. First, the results of this research have important practical implications for universities and lecturers in efforts to improve the quality of learning, especially technology-based learning. Second, supporting and expanding understanding in Self-Determination Theory (SDT), which emphasizes the importance of fulfilling psychological basics such as autonomy, competence, and relatedness

in increasing motivation and involvement. Third, consistent with the campus-class technology concept, technology-integrated learning can encourage students to be more active and participate in academic activities. Lastly, future research is encouraged to explore variables in light of other variables, such as intrinsic motivation or social learning support.

CONCLUSION

The study's results indicate that student engagement has a positive and significant effect on academic performance. The more active students are in campus activities and learning, the better their academic achievement. A well-organized, convenient classroom environment has also been shown to increase student engagement in learning. In addition, lecturer competence, both pedagogical and social, encourages active student participation. The availability of adequate Information and Communication Technology (ICT) has also been shown to strengthen student engagement in learning. Furthermore, student engagement mediates the relationships between the classroom environment, lecturer competence, and academic performance, such that better classroom environment and lecturer competence are associated with greater student engagement, ultimately improving academic performance.

ACKNOWLEDGEMENT

We want to thank Universitas Sebelas Maret for funding this research through contract letter number 194.2/UN27.22/PT.01.03/2024.

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