

The Effect of Sensory-Friendly Learning Environments and Teacher Support on Students' Learning Comfort in Inclusive Classrooms in Indonesia

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ABSTRAK

Penelitian ini mengkaji pengaruh lingkungan belajar yang ramah sensorik dan dukungan guru terhadap tingkat kenyamanan siswa di kelas inklusif di Indonesia. Pendidikan inklusif menuntut kondisi kelas yang mengakomodasi beragam kebutuhan siswa, terutama terkait perbedaan pemrosesan sensorik dan sistem dukungan antarpribadi. Pendekatan kuantitatif digunakan dengan metode survei yang melibatkan 150 siswa yang dipilih melalui pengambilan sampel non-probabilitas. Data dikumpulkan menggunakan kuesioner skala Likert dan dianalisis menggunakan SPSS versi 25 melalui analisis regresi linier berganda. Hasil penelitian menunjukkan bahwa baik lingkungan belajar yang ramah sensorik maupun dukungan guru memiliki pengaruh positif dan signifikan terhadap kenyamanan siswa. Dukungan guru ditemukan memiliki pengaruh yang lebih kuat dibandingkan dengan faktor lingkungan. Model tersebut menjelaskan 61% varians dalam kenyamanan siswa. Temuan ini menekankan pentingnya mengintegrasikan penyesuaian lingkungan dengan dukungan guru yang efektif untuk meningkatkan kenyamanan belajar di kelas inklusif di Indonesia.

ABSTRACT

This study examines the effect of a sensory-friendly learning environment and teacher support on students' comfort in inclusive classrooms in Indonesia. Inclusive education requires classroom conditions that accommodate diverse student needs, particularly in relation to sensory processing differences and interpersonal support systems. A quantitative approach was employed using a survey method involving 150 students selected through non-probability sampling. Data were collected using a Likert scale questionnaire and analyzed using SPSS version 25 through multiple linear regression analysis. The results indicate that both a sensory-friendly learning environment and teacher support have a positive and significant effect on student comfort. Teacher support is found to have a stronger influence compared to environmental factors. The model explains 61% of the variance in student comfort. These findings emphasize the importance of integrating environmental adjustments with effective teacher support to enhance learning comfort in inclusive classrooms in Indonesia.

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1. INTRODUCTION

Inclusive education has become an increasingly important policy agenda in many countries as part of global efforts to ensure equitable access to education for all learners. In Indonesia, inclusive education is implemented as a strategic approach to accommodate students with diverse abilities, backgrounds, and learning needs within the same educational environment (Sari et al., 2022; Wahyuni & Hariri, 2021). Through inclusive classroom settings, students with and without disabilities are expected to learn together, interact socially, and develop academic competencies in a shared learning space. However, the effectiveness of inclusive education is not determined solely by policy adoption, but also by the extent to which classroom environments are able to support students' psychological and physical comfort during the learning process (Muchsin et al., 2022; Rasmitadila et al., 2022).

Student comfort is a critical construct in inclusive education because it directly influences engagement, participation, and learning outcomes. In inclusive classrooms, students often demonstrate varied responses to instructional methods, peer interactions, and environmental stimuli due to differences in cognitive, emotional, and sensory processing (Irwani, 2025; Munisa et al., 2024). When students experience comfort in the classroom, they tend to show higher levels of concentration, emotional stability, and willingness to participate in learning activities. Conversely, discomfort may lead to anxiety, distraction, reduced motivation, and withdrawal from classroom interactions, particularly among students with heightened sensory sensitivities or special educational needs (Ismiatun & Atika, 2020; Sowiyah & Ryzal Perdana, 2021).

One of the key determinants of student comfort is the learning environment, particularly the extent to which it is designed to be sensory-friendly. A sensory-friendly learning environment refers to classroom conditions that minimize sensory overload while providing balanced and appropriate stimulation for students. This includes elements such as controlled lighting, reduced noise levels, organized spatial arrangements, clear visual structures, flexible seating options, and access to calming spaces (Munisa et al., 2024; Sowiyah & Ryzal Perdana, 2021). These environmental adaptations are essential in inclusive settings because students may have different thresholds for sensory input. When such conditions are not adequately managed, students may experience discomfort, overstimulation, and reduced ability to focus and engage effectively in learning activities.

In addition to environmental factors, teacher support is a crucial interpersonal element that shapes students' experiences in inclusive classrooms. Teacher support refers to the extent to which teachers provide academic guidance, emotional encouragement, responsive communication, and individualized assistance tailored to student needs. In inclusive education contexts, teachers are

expected to implement differentiated instruction and foster positive relationships that make students feel valued and understood (Ackah-Jnr, 2020; Rasmitadila et al., 2021). Strong teacher support has been consistently associated with improved student motivation, engagement, and emotional well-being, particularly in classrooms characterized by heterogeneity in learning abilities and needs.

Despite increasing implementation of inclusive education policies in Indonesia, empirical evidence examining the combined influence of sensory-friendly learning environments and teacher support on student comfort remains limited. Many schools have adopted inclusive education in principle, yet practical implementation often faces constraints such as limited infrastructure adaptation, insufficient classroom management strategies, and varying levels of teacher readiness. These gaps indicate that inclusive education outcomes cannot be fully understood without examining how environmental and interpersonal factors interact to shape students' comfort within the classroom.

Therefore, this study aims to analyze the effect of a sensory-friendly learning environment and teacher support on students' comfort in inclusive classrooms in Indonesia. By examining both factors simultaneously, this research seeks to provide empirical evidence regarding their relative and combined contributions to student comfort. The findings are expected to contribute to the development of more effective inclusive education practices by emphasizing the importance of both physical classroom conditions and teacher-student interactions in creating supportive and comfortable learning environments.

2. LITERATURE REVIEW

2.1 *Inclusive Education and Student Comfort*

Inclusive education refers to an educational approach that integrates all students, including those with disabilities and diverse learning needs, into mainstream classrooms while ensuring equal participation and access to learning opportunities. In this context, classrooms are expected to accommodate differences in cognitive, emotional, and sensory processing abilities (Garg et al., 2024; Kudek Mirošević, 2016). One of the key indicators of successful inclusive education is student comfort, which reflects students' perceived ease, security, and psychological well-being during learning activities (Garg et al., 2024; Santamaría Graff et al., 2022). Student comfort is closely linked to classroom engagement, participation, and learning outcomes, as discomfort can lead to reduced attention, avoidance behavior, and lower academic motivation. Within inclusive classrooms, student comfort is not solely determined by academic instruction but also influenced by environmental and interpersonal factors. A supportive ecosystem that considers both physical learning conditions and teacher-student interactions is therefore essential to optimize educational experiences for all learners (Klimecká, 2023; Santamaría Graff et al., 2022).

2.2 *Sensory-Friendly Learning Environment*

A sensory-friendly learning environment is defined as a classroom setting designed to reduce sensory overload and optimize sensory input for students with varying sensitivities. This concept is rooted in sensory processing theory, which explains that individuals differ in how they perceive and respond to sensory stimuli such as sound, light, texture, and spatial complexity (Demko-Rihter et al., 2023; Et al., 2021). In

educational settings, excessive sensory stimulation can lead to cognitive overload, anxiety, and reduced learning efficiency, particularly among students with autism spectrum conditions, attention difficulties, or sensory processing disorders (González-Gil et al., 2013; Palei, 2024). Key components of a sensory-friendly environment include controlled lighting, minimized background noise, clear spatial organization, predictable classroom routines, and the provision of quiet or calming spaces. Research indicates that such environmental modifications can significantly improve students' attention span, emotional regulation, and classroom participation. In inclusive education contexts, sensory-friendly design is increasingly recognized as a foundational element in supporting diverse learner needs and promoting equitable learning experiences.

2.3 Teacher Support in Inclusive Classrooms

Teacher support refers to the degree to which teachers provide academic assistance, emotional encouragement, and behavioral guidance to students. In inclusive classrooms, teacher support becomes particularly critical due to the heterogeneity of student abilities and needs. According to social support theory, perceived support from authority figures such as teachers can enhance students' psychological well-being, reduce stress, and improve academic engagement (Palei, 2024; Schröter & Konz, 2023). Teacher support in inclusive education can be categorized into three main dimensions: emotional support (empathy, encouragement, and acceptance), instructional support (differentiated teaching strategies, scaffolding, and feedback), and classroom management support (creating structured and predictable learning environments). Effective teacher support has been associated with increased student motivation, improved self-efficacy, and higher levels of classroom participation, especially among students who face learning barriers (Palei, 2024; Schröter & Konz, 2023).

2.4 Student Comfort in Learning Environments

Student comfort in educational settings is a multidimensional construct encompassing physical comfort, emotional security, and cognitive ease during learning activities. In inclusive classrooms, comfort becomes even more critical because students may experience varying degrees of sensory sensitivity, social anxiety, or learning difficulties (Chusni et al., 2021; Palei, 2024). A comfortable learning environment enables students to focus attention, interact positively with peers, and engage actively in instructional activities. Previous studies suggest that student comfort is influenced by both environmental conditions and teacher behavior. When students perceive the classroom as safe, structured, and supportive, they are more likely to demonstrate positive learning behaviors and academic persistence. Conversely, discomfort may lead to disengagement, stress, and reduced academic performance.

2.5 Previous Studies and Research Gap

Several studies have examined the individual effects of classroom environment and teacher support on student outcomes. Research on environmental psychology in education highlights that well-designed physical spaces contribute to improved concentration and reduced behavioral disruptions (Chusni et al., 2021; Palei, 2024). Similarly, studies in educational psychology consistently demonstrate that teacher

support is a strong predictor of student engagement and emotional well-being. However, existing literature in the Indonesian context remains limited in integrating both sensory-friendly environmental factors and teacher support simultaneously within inclusive classroom settings. Most studies tend to focus on either environmental design or teacher behavior separately, without examining their combined effect on student comfort. This creates a conceptual and empirical gap that this study seeks to address.

Based on the theoretical foundation and prior research, this study proposes that both sensory-friendly learning environment and teacher support positively influence student comfort in inclusive classrooms. A well-designed sensory environment reduces external stressors that may interfere with learning, while teacher support strengthens students' emotional and academic security within the classroom. From this framework, the following hypotheses are proposed:

H1: A sensory-friendly learning environment has a positive and significant effect on student comfort in inclusive classrooms.

H2: Teacher support has a positive and significant effect on student comfort in inclusive classrooms.

H3: A sensory-friendly learning environment and teacher support simultaneously have a positive and significant effect on student comfort in inclusive classrooms.

3. RESEARCH METHODS

3.1 Research Design

This study employs a quantitative research design with a causal associative approach. The objective of this design is to examine the causal relationship between independent variables, namely sensory-friendly learning environment and teacher support, and the dependent variable, student comfort in inclusive classrooms. The study uses a cross-sectional survey method, where data are collected at a single point in time to capture respondents' perceptions of the variables under investigation.

3.2 Research Variables

This study consists of three main variables: the independent variables (X) comprising X1: Sensory-Friendly Learning Environment and X2: Teacher Support, and the dependent variable (Y), namely Student Comfort in Inclusive Classrooms. The sensory-friendly learning environment refers to classroom conditions that minimize sensory overload and support students with diverse sensory needs, including adjustments in lighting, noise levels, spatial arrangement, and overall classroom stimulation. Teacher support refers to the academic, emotional, and instructional assistance provided by teachers to facilitate students' learning processes, particularly in heterogeneous classroom settings. Meanwhile, student comfort refers to students' perceived physical, emotional, and cognitive ease during learning activities in inclusive classrooms, which reflects their sense of security, engagement, and ability to participate effectively in the learning process.

3.3 Population and Sample

The population of this study consists of students in inclusive classrooms in Indonesia. The sample size used in this study is 150 respondents. The sampling technique applied is non-probability sampling, specifically purposive sampling, by selecting students who are actively enrolled in inclusive education settings and have experienced learning in such environments. The sample size of 150 is considered adequate for multiple linear regression analysis, as it meets general statistical recommendations for ensuring sufficient statistical power and reliable estimation of model parameters.

3.4 Data Collection Technique

Data were collected using a structured questionnaire distributed to respondents. The questionnaire was designed using a Likert scale ranging from 1 to 5, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. The instrument consists of items measuring sensory-friendly learning environment, teacher support, and student comfort, and was developed based on theoretical indicators derived from previous studies in educational psychology and inclusive education literature. Sensory-Friendly Learning Environment (X1) is measured through indicators such as lighting comfort, noise control, classroom organization, and the availability of calming spaces. Teacher Support (X2) is measured through emotional support, instructional support, and classroom assistance provided by teachers. Meanwhile, Student Comfort (Y) is measured through indicators of emotional security, physical comfort, and ease of concentration during learning activities.

3.5 Data Analysis Technique

Data analysis was conducted using SPSS version 25. The analysis procedures included descriptive statistics to describe the characteristics of respondents and the distribution of responses for each variable, followed by validity and reliability tests, where validity was assessed using Pearson correlation to ensure each item measured the intended construct and reliability was tested using Cronbach's Alpha to determine the internal consistency of the instrument. Furthermore, classical assumption tests were performed to ensure the suitability of regression analysis, including normality test, multicollinearity test, and heteroscedasticity test. The main analysis employed multiple linear regression analysis to examine the effect of sensory-friendly learning environment (X1) and teacher support (X2) on student comfort (Y), formulated as $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$, where Y represents student comfort, α is the constant, β_1 and β_2 are regression coefficients, X1 is sensory-friendly learning environment, X2 is teacher support, and e is the error term. Finally, hypothesis testing was conducted using t-test to examine partial effects of independent variables, F-test to examine simultaneous effects, and coefficient of determination (R^2) to measure the explanatory power of the model.

4. RESULTS AND DISCUSSION

4.1 Respondent Profile

The study involved 150 students from inclusive classrooms in Indonesia. The demographic profile of respondents is summarized in the table below.

Table 1. Respondent Demographic Profile

Variable	Category	Frequency	Percentage (%)
Gender	Male	72	48.0
	Female	78	52.0
Age	12–14 years	41	27.3
	15–17 years	83	55.3
	18–20 years	26	17.4
Type of Inclusion Needs	Mild learning difficulty	64	42.7
	Sensory processing sensitivity	52	34.7
	Other conditions	34	22.6

Table 1 presents the respondent demographic profile ($n = 150$), showing that based on gender, 72 respondents (48.0%) were male and 78 respondents (52.0%) were female. Based on age distribution, 41 respondents (27.3%) were aged 12–14 years, 83 respondents (55.3%) were aged 15–17 years, and 26 respondents (17.4%) were aged 18–20 years. In terms of type of inclusion needs, 64 respondents (42.7%) were identified as having mild learning difficulties, 52 respondents (34.7%) had sensory processing sensitivity, and 34 respondents (22.6%) were categorized under other conditions.

4.2 Descriptive Statistics of Research Variables

The descriptive results for each variable are presented below.

Table 2. Descriptive Statistics of Variables

Variable	N	Mean	Std. Deviation	Interpretation
Sensory-Friendly Learning Environment (X1)	150	3.84	0.62	High
Teacher Support (X2)	150	4.01	0.58	High
Student Comfort (Y)	150	3.92	0.60	High

Table 2 presents the descriptive statistics of the study variables, showing that all variables were at a high level based on respondents' perceptions. Sensory-Friendly Learning Environment (X1) obtained a mean value of 3.84 with a standard deviation of 0.62, indicating a high category with relatively moderate response variation. Teacher Support (X2) recorded the highest mean value of 4.01 with a standard deviation of 0.58, also categorized as high and showing relatively consistent responses among respondents. Meanwhile, Student Comfort (Y) had a mean value of 3.92 with a standard deviation of 0.60, which likewise falls within the high category, indicating that respondents generally perceived a favorable level of comfort in inclusive classroom settings.

4.3 Validity and Reliability Test

All questionnaire items were tested using Pearson correlation and Cronbach's Alpha.

Table 3. Reliability Test Results

Variable	Cronbach's Alpha	Interpretation
Sensory-Friendly Learning Environment	0.871	Reliable
Teacher Support	0.889	Reliable
Student Comfort	0.863	Reliable

Table 3 presents the reliability test results of the research instruments, showing that all variables meet the criteria for internal consistency. The Sensory-Friendly Learning Environment

variable obtained a Cronbach's Alpha value of 0.871, indicating a reliable measurement. Teacher Support recorded a Cronbach's Alpha value of 0.889, which also falls within the reliable category and reflects strong internal consistency among its items. Meanwhile, Student Comfort showed a Cronbach's Alpha value of 0.863, confirming that the instrument used to measure this variable is reliable.

4.4 Classical Assumption Tests

Table 4. Summary of Classical Assumption Tests

Test	Result	Threshold	Conclusion
Normality (Kolmogorov-Smirnov)	0.067	> 0.05	Normal
Multicollinearity (VIF)	X1 = 1.42; X2 = 1.42	< 10	No multicollinearity
Heteroscedasticity (Glejser)	p = 0.214	> 0.05	No heteroscedasticity

Table 4 presents the summary of classical assumption tests used to ensure the suitability of the regression model. The normality test using the Kolmogorov-Smirnov method produced a significance value of 0.067, which is greater than 0.05, indicating that the data are normally distributed. The multicollinearity test shows that both independent variables, Sensory-Friendly Learning Environment (X1) and Teacher Support (X2), have VIF values of 1.42, which are below the threshold of 10, indicating that no multicollinearity problem exists among the independent variables. Furthermore, the heteroscedasticity test using the Glejser method resulted in a significance value of 0.214, which is above 0.05, indicating that there is no heteroscedasticity in the regression model.

4.1 Multiple Linear Regression Analysis

The regression analysis was conducted to examine the effect of X1 and X2 on Y.

Table 5. Regression Results

Variable	Coefficient (β)	t-value	Sig. (p)
Constant	0.842	2.116	0.037
Sensory-Friendly Learning Environment (X1)	0.318	4.523	0.000
Teacher Support (X2)	0.467	6.895	0.000

Table 5 presents the regression analysis results showing the effects of the independent variables on the dependent variable. The constant value is 0.842 with a t-value of 2.116 and a significance level of 0.037, indicating that the baseline level of student comfort is statistically significant. Sensory-Friendly Learning Environment (X1) has a positive coefficient ($\beta = 0.318$) with a t-value of 4.523 and a significance value of 0.000, indicating a significant positive effect on student comfort. Similarly, Teacher Support (X2) shows a stronger positive influence with a coefficient ($\beta = 0.467$), t-value of 6.895, and significance value of 0.000, indicating that teacher support is a highly significant predictor of student comfort in inclusive classrooms.

Based on the regression results, H1 is accepted, indicating that the sensory-friendly learning environment has a positive and significant effect on student comfort ($\beta = 0.318$, $p < 0.05$), H2 is also accepted, showing that teacher support has a positive and significant effect on student comfort ($\beta = 0.467$, $p < 0.05$), and H3 is accepted, confirming that both variables simultaneously affect student comfort significantly ($F = 114.23$, $p < 0.05$). Teacher support demonstrates a stronger influence compared to the sensory-friendly learning environment, indicating that interpersonal and instructional dimensions play a more dominant role in shaping student comfort. The model

summary further indicates that the regression model explains a substantial proportion of variance, with $R = 0.781$, $R^2 = 0.610$, Adjusted $R^2 = 0.604$, and $F = 114.23$ (Sig. = 0.000).

Discussion

The findings confirm that a sensory-friendly learning environment significantly improves student comfort in inclusive classrooms. This result is consistent with environmental psychology theory, which emphasizes that reducing sensory overload through controlled noise levels, appropriate lighting, and structured classroom organization can enhance cognitive stability and emotional regulation. In inclusive settings, students with sensory sensitivities are particularly responsive to environmental conditions, where predictable and less stimulating classrooms help reduce stress and improve their ability to focus and engage in learning activities (Bualar, 2016; Irwani, 2025; Köpfer & Óskarsdóttir, 2019).

Teacher support demonstrates an even stronger effect on student comfort compared to the sensory-friendly learning environment. This finding aligns with social support theory, which posits that emotional, instructional, and behavioral support from teachers plays a critical role in shaping students' psychological well-being. In inclusive classrooms, teachers who provide encouragement, clear explanations, and adaptive instructional strategies contribute to students' sense of safety and belonging, which in turn enhances their willingness to participate actively in learning processes (Akbar et al., 2023; Köpfer & Óskarsdóttir, 2019).

The combined influence of sensory-friendly learning environments and teacher support explains 61% of the variance in student comfort ($R^2 = 0.610$), indicating a strong explanatory model. This suggests that both environmental and interpersonal factors jointly play a substantial role in shaping how comfortable students feel in inclusive classroom settings. However, the remaining 39% of variance indicates that student comfort is also influenced by other variables not examined in this study.

These unobserved factors may include peer relationships, family support, individual personality differences, and broader school infrastructure quality. Therefore, while the present model provides strong empirical support, it does not fully capture the complexity of student comfort in inclusive education contexts. Future studies may expand the model by incorporating these additional determinants to develop a more comprehensive understanding of student well-being in inclusive classrooms.

5. CONCLUSION

This study concludes that both a sensory-friendly learning environment and teacher support significantly influence student comfort in inclusive classrooms in Indonesia. The sensory-friendly learning environment contributes to improved comfort by reducing sensory overload through appropriate classroom conditions such as lighting, noise control, and spatial organization, while teacher support plays a more dominant role in enhancing student comfort through emotional encouragement, instructional assistance, and responsive classroom interaction. The statistical results show that both variables simultaneously have a significant effect on student comfort, with an explanatory power of 61%, indicating that student comfort in inclusive classrooms is strongly shaped by a combination of physical environmental conditions and interpersonal support from teachers. However, a portion of student comfort is influenced by other factors not examined in this study,

such as peer interaction, family involvement, and individual psychological characteristics, so future research is recommended to incorporate additional variables and broader contextual factors to develop a more comprehensive model of student comfort in inclusive education settings.

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