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Students' Perception of Thermal Comfort Regarding Seat Selection in Lecture Room B.101 Department of Architecture, Diponegoro University, Semarang

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Abstract
Thermal comfort is a crucial factor influencing students' concentration and behavior in lecture rooms, yet uneven temperature distribution and airflow often create discomfort that affects seating preferences. This study aims to examine the relationship between students' thermal comfort perception and their seating choices in Lecture Room B.101 at the Architecture Department, Diponegoro University. A quantitative survey method was employed by distributing questionnaires to 26 respondents, consisting of closed-ended questions and one open-ended question, and the data were analyzed descriptively. The results indicate that most students are significantly affected by the direction and airflow from the air conditioner, leading them to avoid seats near the AC unit. Respondents generally prefer sitting at positions farther from the AC to achieve better thermal, humidity, and visual comfort toward the screen. These findings show that thermal perception plays an important role in students' adaptive behavior in choosing their seats. In conclusion, a clear relationship exists between thermal comfort and seating preferences, highlighting the need for proper airflow management and spatial layout arrangement in lecture room design to support an optimal learning environment.

Keywords: Adaptive behaviour, airflow distribution, lecture room, seating preference, thermal comfort

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Introduction

Thermal comfort constitutes a critical component of the quality of learning environments, as it directly influences students' concentration, cognitive performance, and behavior within classroom settings. ASHRAE Standard 55 defines thermal comfort as a condition of mind that expresses satisfaction with the thermal environment. This condition is influenced by environmental factors such as air temperature, humidity, and air velocity as well as personal factors, including metabolic rate and clothing insulation. An imbalance in any of these factors may lead to discomfort, which can adversely affect the effectiveness of the teaching and learning process (ASHRAE Standard 55-2017, 2017). In the context of lecture rooms in Indonesia, the issue of thermal comfort becomes increasingly significant due to the country's humid tropical climate. Under such conditions, indoor environmental quality is highly dependent on ventilation strategies, building orientation, and occupant density, all of which play a crucial role in shaping thermal conditions within learning spaces.

From a theoretical perspective, user behavior within a space including seating preferences is strongly influenced by perceived thermal comfort. Corgnati, Filippi, and Viazzo (2007) found that thermal discomfort whether due to excessive heat, cold conditions, or uneven air distribution can prompt individuals to seek seating locations that are perceived as more comfortable. Studies on thermal adaptation further indicate that occupants tend to adjust their behavior in order to achieve comfort, such as choosing seats near ventilation openings, avoiding areas exposed to direct solar heat from windows, or occupying zones with more stable airflow. Guevara, Soriano, and Mino-Rodriguez (2021) emphasize that thermal adaptation and prior thermal experience significantly influence seating preferences and subjective perceptions of comfort.

Students perceived thermal comfort is influenced not only by the physical conditions of the indoor environment but also by their perceptions and expectations of that environment. Recent studies published in the journal Buildings (MDPI) indicate that integrating objective data such as temperature, humidity, and PMV/PPD indices with subjective perceptions provides a more accurate representation of thermal comfort, particularly in educational spaces where occupancy levels vary significantly on a daily basis (Izzati et al. 2022). Furthermore, research published in Sustainability (MDPI) reveals that even minor temperature variations (approximately ±1–2°C from the comfort range) can significantly affect students' concentration and fatigue levels (Lala, Murtyas, and Hagishima 2022). Studies on indoor environmental conditions also demonstrate that uneven temperature distribution resulting from split air-conditioning systems, solar heat gain through windows, or natural ventilation can create microclimate zones within a space, which in turn influence students' seating preferences (Niza, da Luz, and Broday 2023).

Meanwhile, local studies on thermal comfort in learning environments generally remain focused on measuring the physical conditions of indoor spaces, without exploring their relationship with students' seating behavior. For instance, a study published in Jurnal Inersia (UNY) evaluates classroom thermal conditions through temperature and humidity measurements, yet does not relate these findings to user preferences or seating distribution patterns (Sativa and Adilline 2021). On the other hand, recent international research on the performance of educational buildings emphasizes the importance of a user-centered environmental design approach, in which user comfort and behavioral patterns are considered key parameters in spatial design (Kyropoulou 2023; Sun et al. 2025). This highlights the need to integrate physical conditions, user perceptions, and behavioral responses within research focused on students' thermal comfort.

In fully air-conditioned lecture spaces such as Room B.101 in the Department of Architecture at Diponegoro University thermal comfort issues frequently arise due to uneven air distribution, variations in air-conditioning airflow intensity, and fluctuating occupancy levels resulting from changes in the number of students. These conditions underscore the importance of evaluating the relationship between thermal comfort and student behavior within such environments.

Based on this background, this study aims to analyze the relationship between students' thermal comfort perceptions and seating choices in lecture room B.101, Department of Architecture, Diponegoro University. Specifically, this study aims to: (1) Identify students' perceptions regarding temperature, humidity, and air flow in room B.101; (2) Determine how these perceptions influence seating location preferences; and (3) Analyze students' adaptation patterns to the room's thermal conditions.

Methods

This study employs a quantitative descriptive method with a survey approach. This method is selected to objectively capture students' perceptions of thermal comfort through numerical data obtained from questionnaires. The quantitative descriptive approach is particularly suitable for studies on user behavior in spatial environments, as it enables researchers to collect structured data in order to identify trends, patterns, and relationships among variables. Furthermore, this approach is widely used in thermal comfort research, as it allows for the assessment of occupants' perceptions through structured instruments such as questionnaires (Creswell 1994).

The survey technique is employed due to its effectiveness in capturing subjective perceptions from a large number of respondents and providing a statistical overview of thermal comfort factors. This approach is widely recommended in studies of indoor environmental quality, as highlighted in research published in Energy and Buildings and Building and Environment (Corgnati, Filippi, and Viazzo 2007; Guevara, Soriano, and Mino-Rodriguez 2021).

The research data consist of primary data obtained from questionnaires completed by students who utilize Room B.101. The questionnaire items cover various aspects of thermal comfort based on the parameters outlined in ASHRAE Standard 55, including air temperature, humidity, air velocity, airflow direction, and students' adaptive responses to air-conditioned environments. The questionnaire comprises closed-ended, semi-open, and open-ended questions to capture perceptions comprehensively. Several contemporary thermal comfort studies also employ a combination of objective and subjective questions to obtain a more accurate representation of occupants' comfort levels (Romero et al. 2025; Torriani, Lamberti, Salvadori, et al. 2023).

The questionnaire consisted of six questions addressed to respondents, as follows:

Q1. Do you perceive the air temperature in Room B.101 as too hot or too cold? (Hot / Neutral / Cold)
Q2. Does the direction of the air-conditioning airflow influence your choice of seating location? (Yes / No)
Q3. Does your seating distance from the air-conditioning unit affect the temperature you perceive? (Yes / No)
Q4. Do you find the humidity level in the classroom comfortable? (Yes / No)
Q5. When entering Room B.101, how do you determine your seating position?
Q6. Which seating location do you typically choose when using Room B.101? (Near the AC/Away from the AC/Others: _______)

Data collection technique

Data were collected online through Google Forms from 26 students of the Department of Architecture, Faculty of Engineering, Diponegoro University, who had experience using Room B.101 during lectures. This approach follows recommendations from thermal comfort studies in educational buildings, which emphasize the importance of collecting data directly from active users of the space, as they possess the most accurate understanding of the actual thermal conditions. Secondary data were obtained from scientific literature related to thermal comfort, user perception, thermal standards, and seating preference studies, sourced from reputable international and national journals.

Results and discussion

Perception of air temperature (Q1)

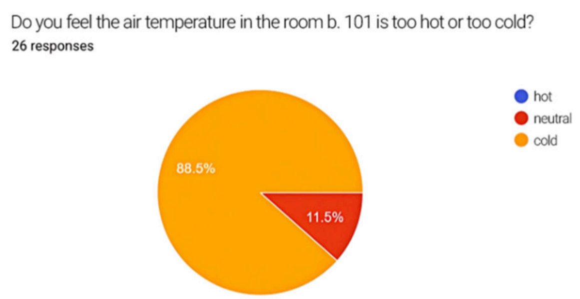

Figure 1
Student responses in Q1

The graph corresponding to the question "Do you perceive the air temperature in Room B.101 as too hot or too cold?" indicates that the majority of respondents selected the neutral category, while a smaller proportion reported feeling "cold." This pattern suggests that the thermal conditions in Room B.101 are not perceived uniformly by all students. Such variation in temperature perception aligns with the theoretical understanding that thermal sensation is highly influenced by individual factors and localized indoor conditions. As outlined in ASHRAE Standard 55, thermal perception may differ among individuals even under identical physical environmental conditions. The graphical results therefore reflect a diverse pattern of thermal perception, consistent with the concept of thermal sensation as a subjective and experience-based response.

Influence of air-conditioning airflow direction on seating preference (Q2)

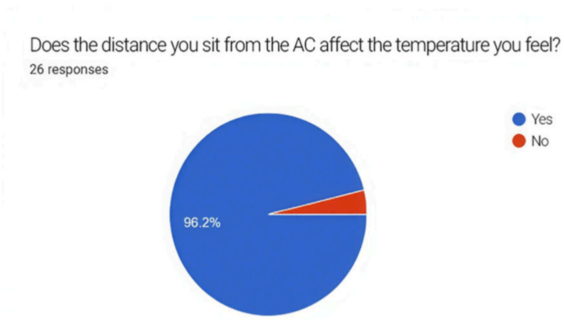

Figure 2
Student responses in Q2

The results of the graph for the question "Does the direction of the air-conditioning airflow influence your choice of seating location?" indicate that the majority of respondents answered "Yes," suggesting that airflow direction is a significant factor in their thermal comfort. This finding is consistent with existing literature, which identifies airflow direction as a key component of local thermal discomfort, particularly when air is directed onto the body, potentially causing sensations of overcooling or draft discomfort.

The graph indicates a tendency for students to be more sensitive to drafts or cool air directly impacting their bodies. As a result, the direction of air-conditioning airflow becomes a key consideration when selecting a seating position.

Influence of seating distance from the air-conditioning unit on perceived temperature (q3)

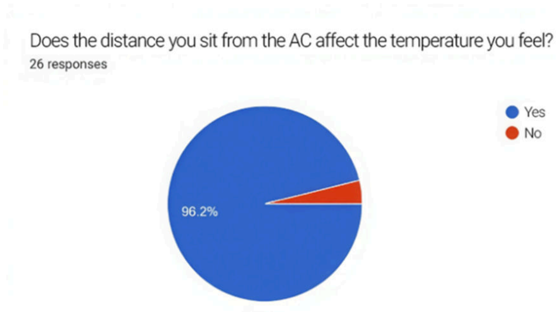

Figure 3
Student responses in Q3

For the question "Does your seating distance from the air-conditioning unit affect the temperature you perceive?", the graph indicates a predominance of "Yes" responses, although a small proportion of respondents selected "No." This pattern is consistent with theoretical perspectives suggesting that proximity to a cooling source can generate local temperature variations, as discussed in studies on air distribution in air-conditioned spaces. The distance from the air-conditioning unit influences the intensity of cool air received by occupants. Therefore, the graphical results reflect a perception pattern aligned with the concept of indoor thermal gradients.

Perception of air humidity (Q4)

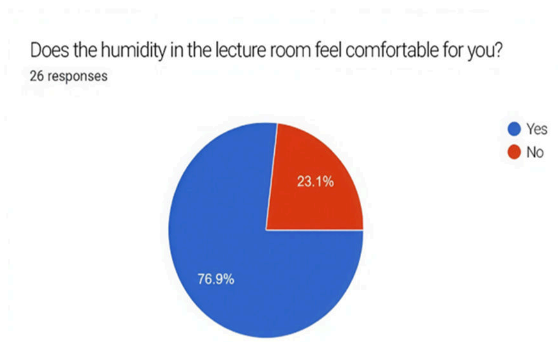

Figure 4
Student responses in Q4

The graph corresponding to the question "Do you find the humidity level in the classroom comfortable?" shows that the majority of respondents perceive the humidity as being within a comfortable range. However, a number of respondents reported discomfort, indicating variability in individual sensitivity to humidity.

This condition is consistent with theoretical frameworks and ASHRAE Standard 55, which state that humidity influences thermal perception indirectly through its interaction with air temperature and air velocity.

The graph indicates that although the air-conditioning system is capable of reducing humidity levels, not all respondents perceive the conditions in the same way, resulting in continued variation in comfort perception.

Seating selection behavior (Q5)

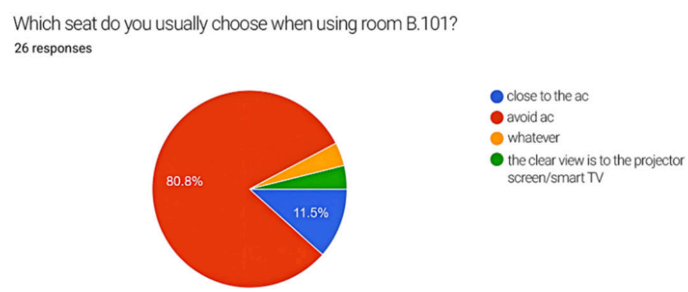

Figure 5
Student responses in Q5

The graph for the question "Does you change your seating position when the airflow direction feels uncomfortable?" indicates that the majority of respondents selected "Yes." This pattern aligns with the theory of adaptive thermal comfort, which suggests that occupants tend to take corrective actions such as relocating when experiencing discomfort. The results demonstrate that adaptive behavior, including changing seating positions or adjusting posture, represents a common response among students when airflow is perceived as disturbing.

Seating selection behavior (Q5)

Based on students' responses regarding how they determine their seating positions in Room B.101, several key patterns can be identified:

1. Avoidance of Direct Exposure to Air-Conditioning
   Many respondents reported choosing seats that are "not directly exposed to AC," "away from the AC," or "not directly affected by the airflow."
2. Visual Considerations Toward the Display
   Students tend to select positions that provide clear visibility of the projector screen or smart TV, such as central seating areas or positions offering the most comfortable visual angle.
3. Strategic Positioning Within the Classroom
   Some students prefer seats that are neither too close to the front nor too central, selecting positions that are perceived as "safe" (e.g., less likely to be called upon by the lecturer) while still maintaining a clear view of the instructor.
4. Social Factors
   A number of respondents indicated a preference for sitting near friends, highlighting the influence of social interaction on seating choice.

5. Overall Thermal Comfort Considerations
   Several respondents explicitly mentioned thermal comfort factors, such as selecting seats based on "comfortable temperature," "not too close to the AC," or depending on the current thermal conditions of the room.

The findings indicate that students' perceptions of thermal comfort have a strong influence on their seating preferences in Lecture Room B.101. According to ASHRAE Standard 55, thermal comfort is affected by variables such as air temperature, air velocity and direction, humidity, as well as individual factors including activity level and clothing insulation. Imbalances in these factors such as direct exposure to cold airflow from air-conditioning can lead to local thermal discomfort, even when the average room temperature remains within the comfort zone. This explains why the majority of students in this study tend to avoid seating areas directly beneath the path of AC airflow (ASHRAE Standard 55-2017, 2017).

1. Perception of Room Temperature and Its Relation to Thermal Comfort Theory
   The finding that most students perceive the room temperature as "fairly comfortable" indicates that the indoor conditions fall within the comfort range defined by Predicted Mean Vote (PMV) theory developed by Povl Ole Fanger. This model suggests that thermal comfort is achieved when individuals experience a "neutral" thermal sensation (PMV values between approximately -0.5 and +0.5), as widely referenced in contemporary thermal studies (Corgnati, Filippi, and Viazzo 2007). The predominance of neutral responses among students implies that parameters such as air temperature, humidity, and air movement generally remain within acceptable limits.
2. Perception of Airflow and Its Relationship with Seating Preferences
   Ventilation theory emphasizes that air movement plays a crucial role in enhancing thermal comfort by facilitating heat dissipation from the human body. The finding that students tend to feel more comfortable near ventilation sources such as windows or areas influenced by air-conditioning airflow is consistent with literature on air movement preference in tropical climates (Izzati et al. 2022). The existence of preferred seating zones associated with better airflow indicates that students naturally gravitate toward areas with more favorable ventilation conditions.
3. Variations in Perception Based on Seating Position and Indoor Thermal Zoning
   Uneven temperature distribution within the classroom aligns with the concept of indoor microclimate, which explains that proximity to air-conditioning units, windows, and occupant density influences localized thermal conditions. This phenomenon is also discussed in studies on thermal non-uniformity in air-conditioned spaces (Torriani, Lamberti, Fantozzi, et al. 2023). For instance, students seated in the central area may experience warmer conditions, while those closer to AC units perceive cooler temperatures. This supports the notion that thermal perception is significantly influenced by micro-scale thermal zones

within the indoor environment (Torriani, Lamberti, Salvadori, et al. 2023).

4. Relationship Between Thermal Perception and Seating Selection Behavior
   According to behavioral adaptation theory, individuals actively adjust their actions to improve comfort, including selecting seating locations that best suit their thermal preferences. The findings of this study showing that students tend to avoid overly cold areas near AC airflow or warmer zones—are consistent with adaptive models of thermal comfort. Similar findings reported by Guevara, Soriano, and Mino-Rodriguez (2021) indicate that students deliberately choose seating positions to minimize thermal discomfort, particularly avoiding excessively cold areas. This demonstrates a strong relationship between thermal perception and seating behavior.
5. Compliance of Indoor Conditions with Thermal Comfort Standards
   Thermal comfort standards such as ASHRAE Standard 55 and related studies suggest that comfortable classroom temperatures typically range between 23–27°C, with relative humidity levels of 40–60%. The perception of the room as “fairly comfortable” suggests that Room B.101 likely falls within this range. However, the presence of students reporting warmer conditions indicates potential issues of uneven thermal distribution, as also highlighted in studies on non-uniform indoor thermal environments (Rivel et al. 2025).
6. Implications for Classroom Design
   These findings underscore that thermal comfort plays a crucial role in shaping students’ learning experiences. Elements such as the placement of air-conditioning units significantly influence thermal conditions within the space. Literature on energy-efficient building design in tropical climates emphasizes the importance of cross-ventilation strategies and effective cooling zoning. The need for students to adjust their seating positions to achieve comfort suggests that the current spatial conditions are not fully optimized. This highlights the importance of design evaluation and post-occupancy assessment, as recommended in contemporary thermal comfort research (Ting et al. 2025).

From an architectural and space management perspective, these findings indicate that merely maintaining air-conditioning temperatures within a neutral range is insufficient. Greater attention must be given to air distribution, airflow direction, the positioning of AC outlets, and seating arrangements to prevent direct exposure to cold drafts. Studies on educational environments demonstrate that thermally comfortable seating positions are positively correlated with improved learning comfort, concentration, and student productivity (Torriani, Lamberti, Fantozzi, et al. 2023). Therefore, practical solutions may include reconfiguring seating layouts, implement thermal zoning strategies, and utilize air diffusers to achieve more uniform airflow distribution.

Based on the findings of this study, it can be concluded that students' perceptions of thermal comfort significantly influence their seating preferences in Lecture Room B.101. The majority of students experience discomfort primarily related to the direction and intensity of airflow from the air-conditioning system. Consequently, they tend to select seating positions away from AC units to avoid direct exposure to cold drafts. Although the overall temperature and humidity levels of the room generally fall within a comfortable range, uneven air distribution creates distinct thermal zones within the space. This condition encourages adaptive behaviors among students, such as choosing specific seating locations or relocating to achieve a more comfortable environment. These findings indicate that thermal comfort is not solely determined by the average room temperature, but also by factors such as airflow direction and individual sensitivity. Overall, the study demonstrates that the more favorable students' thermal perceptions are, the more likely they are to select seating positions that align with their comfort preferences. These findings highlight the importance of considering air distribution design, AC placement, and seating layout arrangements in the design of lecture spaces to enhance students' comfort and learning experience.

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