

# Students' Perception of Comfort in Using Air Conditioning at Tunku Tun Aminah Library

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## Abstract

Malaysia has a hot and humid climate throughout the year, making air conditioning a necessity in buildings. The Tunku Tun Aminah Library (PTTA) is a key learning center for students at Universiti Tun Hussein Onn Malaysia (UTHM), providing air conditioning facilities to enhance user comfort. This study aims to identify students' perceptions of the comfort of using air conditioning at PTTA in terms of air quality and health. A quantitative approach was used, with a survey conducted among 387 respondents. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 27. The findings indicate that students' perception of air quality is moderate, while their perception of health effects is low. The study suggests that PTTA should improve temperature control and indoor environment quality to enhance student comfort and learning quality

## 1. Introduction

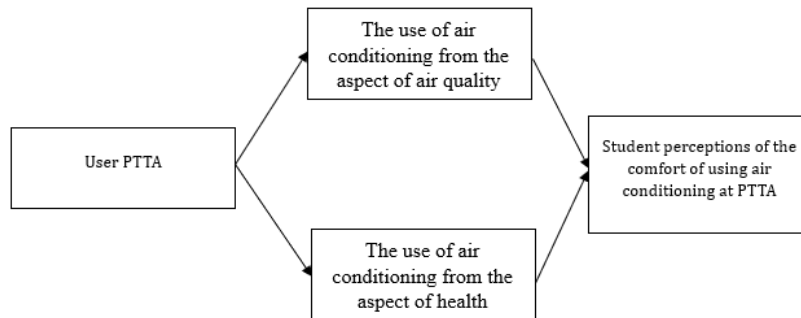
Libraries play a crucial role in providing a conducive environment for students to conduct research, complete assignments, and enhance their knowledge (Eskha, 2018). One key factor that influences the comfort level of library users is the air conditioning system, which helps regulate temperature and maintain air quality. The Tunku Tun Aminah Library (PTTA) at Universiti Tun Hussein Onn Malaysia (UTHM) is equipped with air conditioning to ensure students' comfort while studying.

Malaysia's hot and humid climate makes air conditioning a necessity in indoor spaces, including educational institutions (Jabatan Meteorologi Malaysia, 2024). However, the effectiveness of air conditioning in providing a comfortable learning environment depends on several factors, such as temperature settings, air circulation, and indoor air quality. Despite the presence of air conditioning, students may have differing perceptions of its comfort level based on their personal experiences and health conditions (Daud et al., 2015).

Previous studies have shown that poor thermal comfort in buildings can lead to reduced concentration and productivity among occupants (Anuar & Tahir, 2022). Furthermore, inadequate ventilation and air quality issues can result in negative health effects, such as respiratory problems and fatigue (Ganji et al., 2023). Given these concerns, it is essential to investigate students' perceptions of the comfort of using air conditioning at PTTA. This study focuses on two main aspects: air quality and health. By understanding students' perspectives, the university administration can take appropriate measures to improve the learning environment and ensure that the library remains a comfortable and productive space for academic activities.

This study was conducted to identify students' perceptions of the comfort of using air conditioning at PTTA UTHM. The aspects of air quality and health will be focused on to see the comfort of students who use air conditioning at PTTA. This was done to identify UTHM students who use air conditioning facilities in the library feel comfortable with the services provided. In addition, in identifying the comfort of UTHM students who use air conditioning services provided by PTTA by knowing its influence on their experience in using the library.

In this study, the conceptual framework will involve UTHM students who use air conditioning in PTTA as the study respondents. The aspects that provide comfort to students when using air conditioning in the library are the main variables that will be discussed, namely air quality and health aspects as shown in Figure 1. Therefore, by identifying air quality and health aspects, it is possible to know students' perceptions of the comfort of using air conditioning in PTTA, allowing the researcher to answer the questions and achieve the study objectives.



**Fig 1.** Conceptual framework

## 1.1 Perception

In this study, perception refers to students' views on the comfort of using air conditioning at PTTA, which may be influenced by external factors such as individual differences and library design. According to Shaari and Hanafi (2020), perceptions of indoor environmental quality vary based on personal experiences and external conditions, including temperature, humidity, and air quality, all of which play a key role in determining user comfort. Therefore, this study evaluates students' perceptions in terms of air quality and health.

West et al. (2024) describe perception as a sensory stimulus interpreted into an organized experience, meaning students may have differing views on comfort depending on how they interpret air conditioning effects. Schiavon et al. (2017) found that individual control over temperature and ventilation increases satisfaction with thermal comfort, suggesting that allowing students to adjust temperature settings could improve their comfort levels.

Additionally, Fanger (2001) highlights that thermal comfort is affected by air velocity and user activity level, emphasizing the need for a holistic approach to optimizing indoor environmental conditions at PTTA. Frontczak and Wargocki (2011) identified a strong relationship between air quality perception and both thermal comfort and indoor air cleanliness, showing that good air quality enhances overall comfort. Corgnati et al. (2007) found that thermal comfort perception varies based on cultural and climatic backgrounds, suggesting that different temperature preferences should be considered when designing and managing air conditioning systems in libraries.

## 1.2 Comfort

In this study, comfort refers to students feeling at ease and relaxed when using air conditioning at PTTA. Comfort plays a crucial role in enabling students to focus on their studies effectively. According to Amin (2023), a comfortable environment helps students improve academic performance, particularly for those utilizing library facilities. Similarly, Buyung and Shafii (2017) found that a comfortable environment enhances overall well-being and productivity, enabling students to complete their tasks more efficiently.

Research by Diah et al. (2002) indicated that schools in the Kinta area lacked comfort due to their concrete structure, demonstrating how physical building characteristics impact classroom comfort. Therefore, ensuring a comfortable environment is essential for improving the quality of learning. Aziz and Hanapi (2021) stated that factors such as temperature, humidity, and airflow significantly influence user satisfaction and comfort, highlighting the importance of considering these elements in designing air conditioning systems to meet students' needs at PTTA.

Additionally, Shafii (2012) emphasized that proper air circulation is necessary to reduce temperature and enhance user comfort. Effective ventilation contributes to a more pleasant indoor environment, particularly in libraries where air conditioning is heavily utilized.

### 1.3 Air Quality

Nowadays, climate change has led people to focus on outdoor air pollution while often overlooking indoor air quality, which significantly affects their comfort. According to Mazlan, Hamzah, and Mahmud (2015), air quality refers to the condition of air within a building that influences the comfort of its occupants. Maintaining good indoor air quality is essential to ensuring a comfortable environment. In this study, the researcher examines the aspects of air quality that impact students' comfort when using air conditioning at PTTA. Ahmad et al. (2013) found that furniture, learning spaces, and air quality are key factors in ensuring a comfortable teaching and learning process, highlighting the importance of air quality in creating an optimal environment.

Air quality should be monitored and maintained by relevant authorities to meet established standards and promote user well-being. A study by Ismail, Sukarti, and Gimin (2018) revealed that air quality at Politeknik Merlimau did not meet required standards, potentially affecting students' comfort and learning experiences. This finding emphasizes the need for continuous air quality monitoring to ensure necessary improvements. Additionally, the Department of Occupational Safety and Health (2010) introduced guidelines to improve indoor air quality and prevent discomfort among workers, underscoring the significance of air quality in maintaining comfort.

Good air quality enhances productivity during activities. Shafii (2012) stated that poor thermal comfort caused by low air quality negatively affects productivity. Consequently, poor air quality in the library may hinder students' ability to complete assignments effectively. Ismail, Sukarti, and Gimin (2018) asserted that good air quality is a fundamental right for every individual, emphasizing the importance of clean air for optimal comfort. Kosonen and Tan (2004) also stressed that everyone has a basic right to a healthy indoor environment, which positively impacts student well-being.

### 1.4 Health Affect

Health is generally defined as the absence of disease, but it also encompasses physical, mental, and emotional well-being. According to Ghani et al. (2022), health is crucial for individual well-being, enabling people to function at their full potential. Poor health can affect a person's comfort, as physical ailments make it difficult to concentrate and complete tasks. Rahman (2014) highlighted that environmental discomfort often stems from health issues, such as coughs, colds, and fevers, which hinder concentration and overall well-being.

While air conditioning is intended to provide cooling, it can also pose health risks. Nor, Othman, and Saad (2022) stated that health problems may arise despite air conditioners being equipped with air filters. Proper maintenance and cleaning are necessary to prevent bacterial growth, which can lead to respiratory issues. Jamain (2021) found that poor maintenance of air conditioning systems can result in mold and bacteria buildup, further exacerbating health problems. However, Lin et al. (2013) reported that air conditioning can reduce indoor pollution and improve cardiovascular health, demonstrating its potential benefits in mitigating air quality issues.

Health concerns related to air conditioning use, such as dry skin and respiratory problems, should not be overlooked, especially for students who spend long hours in air-conditioned library environments. Jung and Kim (2020) found that prolonged exposure to cold air can contribute to skin conditions, which may lead to discomfort and distraction. Sulaiman et al. (2012) noted that itchy skin caused by air conditioning exposure can negatively impact focus, as individuals become preoccupied with scratching. Long-term exposure to air conditioning may result in various health issues, ultimately affecting students' comfort and academic performance.

## 2. Methodology

This study adopts a survey research design, utilizing a quantitative approach and questionnaire as the primary data collection instrument. Chua (2006) stated that survey research is used to gather opinions on specific topics. In this research, the population consists of students who visit PTTA. Based on data from PTTA librarians, an average of 21,676 students visits the library each month. A sample is a subset of the population. This study employs simple random sampling, a method where each participant has an equal chance of selection. According to Shaari (2022), simple random sampling ensures that the sample maintains similar characteristics to the overall population, which in this study refers to students who visit PTTA. The sample size is determined using Krejcie and Morgan's (1970) Sample Size Determination Table. With a total population of 20,000 students, a sample size of 377 students is selected to represent the entire population.

## 2.1 Research Instrument

This study employs a questionnaire as the primary instrument for data collection. A questionnaire is chosen because it allows for a large sample size and ensures consistent data collection. According to Chua (2006), questionnaires are commonly used instruments in social science research. This study utilizes a descriptive approach, which is well-suited for data collection through surveys. Questionnaires also allow respondents to take their time and make thoughtful decisions when answering. This survey questionnaire is designed with three sections and the total number of questions in the survey is 39. The measurement scale for Sections B and C will use a four-point Likert scale to capture respondents' answers as in Table 1. The questionnaire is designed to be simple and quick to complete, reducing the time required for respondents to answer.

This pilot study aims to obtain preliminary feedback on the issue being studied by distributing a questionnaire to 30 student samples from the Faculty of Technical and Vocational Education. The researcher chose this sampling because of its relevance to the study. To assess the effectiveness of the pilot study, the researcher will use the Cronbach's Alpha coefficient. In the pilot study, questions with a Cronbach's Alpha coefficient value greater than  $\alpha > 0.6$  will be used in the actual study, while those with a value less than  $\alpha < 0.6$  will be discarded. This ensures that the instruments used have high reliability and validity. The results of the pilot study found that the Cronbach's Alpha value for the air quality variable was 0.795, indicating a good level, while the Cronbach's Alpha value for the health variable was 0.943, indicating an excellent level, as shown in Table 2.

## 3. Results and Discussion

### 3.1 Student perceptions of the comfort of using air conditioning at the Tunku Tun Aminah Library from the aspect of air quality

The study found that the average mean value of students' perceptions of the comfort of using air conditioning at PTТА in terms of air quality was 2.51. This indicates that students generally feel that the indoor air comfort is acceptable but has not reached an optimal level. These findings align with those of Kim et al. (2022), which showed that user satisfaction with thermal comfort was below satisfaction. Students feel comfortable but at a moderate level, likely because the air conditioning temperature plays a crucial role in their comfort. This is consistent with the study by Göçer et al. (2019), which found that during winter, some respondents complained about increasing the air conditioning temperature. This suggests that temperature plays an important role in providing comfort, especially in enhancing user perception. This may be because the temperature set by PTТА management is within an appropriate range. According to Chew (2015), the most comfortable indoor temperature for students in Malaysia is 25.7°C, with an acceptable outdoor temperature range between 27.0-34.6°C.

In addition, students' perceptions of air quality are moderate, possibly due to the fluctuating air conditioning temperature at PTТА depending on the weather. When the weather is hot, the set temperature may not provide comfort to students. This aligns with Mitrakusuma et al. (2022), who found that rising outdoor temperatures affected air conditioning system performance. This situation can reduce students' comfort because the increase in outdoor temperature prevents PTТА's air conditioning from being set at the appropriate temperature. According to Buonocore et al. (2020), the ideal temperature for thermal comfort during hot weather in Brazil is between 23°C to 24°C. Meanwhile, the study by Izzati et al. (2022) found that the ideal air conditioning temperature for comfort in Malaysia ranges from 23°C to 27°C. Therefore, it is likely that on the day of the study, the outdoor temperature at PTТА was hot, making the comfort temperature much lower than usual.

Air pollution within PTТА also contributes to students' comfort, with their perception of air quality being lower. This suggests that there is less air pollution in PTТА when using air conditioning. Air pollution plays an important role in comfort when using air conditioning in a room. The study by Kim et al. (2022) showed that respondents expressed dissatisfaction with the air pollution that occurred. This indicates that users feel discomfort and dissatisfaction with air quality due to air pollution. Furthermore, the study by Eguiluz-Gracia et al. (2020) reported that indoor air pollution could cause discomfort.

Students felt comfortable while using air conditioning in PTТА because the results showed that their perception of air pollution was low. Additionally, students were comfortable with the relative humidity in the PTТА rooms. This is because students did not need to use excessive facial moisturizers, as the air humidity in PTТА was at an appropriate level. The study by Park et al. (2023) found that low relative humidity can lead to dry skin, indicating that low humidity can cause discomfort. Students did not feel the need for extra facial moisturizer due to the suitable humidity level. The study by Ness (2022) showed that relative humidity levels between 40% and 60% provide comfort to users.

### 3.2 Student perceptions of the comfort of using air conditioning at the Tunku Tun Aminah Library from the aspect of health

The study findings found that the mean value of students' perceptions of the comfort of using air conditioning at PT TA from a health perspective was 1.84 and was at a low level. This suggests that there is no significant health issues associated with air conditioning that could cause discomfort to students. Kakoulli et al. (2022) found that poor air quality is linked to health problems, which can eventually lead to discomfort for users. The air conditioning system provided by PT TA management is clean and efficient, making students feel comfortable with the service. According to Rahman and

Shafii (2013), poorly maintained air conditioning can lead to health issues such as coughing. Well-maintained air conditioning can enhance user comfort and prevent potential health problems. Eleyowo and Amusa (2019) stated that air conditioning could cause discomfort by leading to illnesses such as colds, fever, headaches, and chest pain. Therefore, regular cleaning of air conditioning units is necessary to prevent health issues. Ganji et al. (2023) also found that unclean air conditioning increases the risk of indoor infections such as asthma.

Additionally, students feel comfortable because the ventilation provided by PT TA management is in good condition. Proper ventilation ensures maximum comfort for students. Jia (2021) stated that good ventilation enhances user comfort and helps prevent health problems that may lead to illness. According to Kim et al. (2022), a well-functioning ventilation system plays a crucial role in maintaining indoor air quality and reducing health risks in enclosed spaces. Therefore, proper ventilation is essential to prevent health issues. Aziz and Hanapi (2021) also noted that good ventilation can help reduce health risks while increasing students' comfort.

Student comfort is also linked to their ability to concentrate while using air conditioning in PT TA. This indicates that students do not face concentration-related issues that could cause discomfort when using air conditioning. Jia et al. (2021) found that clean air quality not only provides a healthy environment for students but also enhances their concentration while studying. Similarly, Bilal (2024) stated that a comfortable environment can improve student focus, showing that a conducive atmosphere allows users to concentrate better on their tasks. Therefore, the comfort provided by air conditioning helps students focus on their activities. Liu (2021) also highlighted that a comfortable classroom environment enhances student concentration and improves their learning experience.

## 4. Conclusion

Overall, by achieving the research objectives, the researcher concludes that students' perception of air conditioning usage in PT TA is at a moderate level. The moderate perception of air quality suggests that several factors contribute to this rating. Meanwhile, the health aspect shows a lower level, indicating that students do not experience any health issues when using air conditioning. However, regular maintenance and improvements to the ventilation system are still recommended to ensure better air quality. The findings of this study are expected to serve as a guide for PT TA management in enhancing and improving air conditioning services. It is also hoped that this research will contribute to future studies and benefit students by creating a more comfortable environment when using air conditioning services in PT TA.

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## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

**Study conception and design:** Muhammad Khairi Afiq Mohd Jamil, Nurul Hidayah Liew Abdullah

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