

CHAPTER I

INTRODUCTION

1.1. Background

University is a formal educational institution which has a function as a means of creating a generation that has knowledge, attitudes and skills. Apart from preparing learning that is appropriate to educational institutions, universities must provide conducive and comfortable learning spaces that comply with Indonesian National Standards [1]. Several aspects that can be considered before creating a comfortable classroom are: Comfort, flexibility, and the use of communication technology. Aspects like this are needed to increase the effectiveness of learning in the classroom [2].

Thermal comfort is a state of mind and satisfaction that can be expressed in a thermal or comfortable state in the surrounding environment. Comfort according to ASHRAE (*American Society Of Heating Refrigerator and Air-Conditioning Engineers*). This means that thermal comfort is greatly influenced by human conditions in the environment. Where the human condition itself is very influential on mental and physical conditions. Clothing and activities are the main human factors in the thermal comfort conditions in a room. Meanwhile, the environment has several factors such as: air temperature, relative humidity of the air flow, and surface temperature [3].

Maintaining conducive and comfortable conditions is a major factor for the campus environment, especially in terms of thermal comfort in classrooms. Factors that can maintain conducive and comfortable conditions in a room are building buildings that comply with Indonesian National Standards and installing artificial cooling, such as: AC and fan [4]. The human body can feel comfortable or uncomfortable in the classroom used. Several factors can influence body comfort in the classroom, such as: Room temperature and room humidity [5].

This research was carried out by taking manual measurements and distributing questionnaires to occupants. This research aims to measure the level of thermal comfort in classrooms and provide recommendations in accordance with Indonesian National Standards. This research will also provide order to achieve acceptable indoor thermal comfort condition [6].

In addition to carrying out measurements, this research requires a standard guide that can be used as a reference to assist in researching thermal comfort in classrooms. Thermal comfort in question is a standard measurement of thermal comfort and lighting in classrooms. One of the guidelines used is SNI 03-6572-2001. Where SNI 03-6572-2001 can be used as a guide in building design and thermal comfort in rooms [7]. This table can be shown below.

Table 1.1 Thermal Comfort Limits According to SNI 03-6572-2001

Category	Active Temperature (TE)	Air Humidity (RH)
Cool Comfortable Upper Threshold	20,5°C – 22,8°C 24°C	50 % 80 %
Comfortable Optimal Upper Threshold	22,8°C – 25,8°C 28°C	70 %
Warm Comfortable Optimal Upper Threshold	25,8°C – 27°C 31°C	60 %

This research provides the benefits that have been obtained from evaluating the level of thermal comfort in classrooms D1509 and D1510 of Universitas Multimedia Nusantara. Thermal comfort has a positive impact on the learning process. This research aims to determine the level of thermal comfort in classrooms and determine the aspects that can influence thermal comfort in classrooms.

1.2. Problem Formulation

The problem formulation for working on the MBKM report is:

- 1) Are the indoor thermal conditions at Universitas Multimedia Nusantara classrooms D1509 and D1510 meeting the standards' requirements?
- 2) What variables affect the classroom's thermal comfort level?

- 3) What distinguishes the two classes significantly in terms of thermal comfort?
- 4) What suggestions are there to enhance the thermal comfort in the classrooms D1509 and D1510?

1.3. Research Objectives

The objectives of the MBKM research report are:

- 1) Evaluate thermal comfort conditions in classrooms D1509 and D1510, Universitas Multimedia Nusantara
- 2) Identify factors that influence the level of thermal comfort in classrooms D1509 and D1510 Universitas Multimedia Nusantara.
- 3) Analyze the differences that occur in the level of thermal comfort in classrooms D1509 and D1510 Universitas Multimedia Nusantara.
- 4) Provide a recommendation that is relevant and effective in improving thermal comfort in classrooms D1509 and D1510 Universitas Multimedia Nusantara

1.4. Research Urgency

The research urgency of working on the MBKM research is:

The Indonesian government is taking action to reduce excessive energy use. The action taken by the Indonesian Government regarding energy consumption in buildings is to issue Ministry of Health Regulation Number Regulation of the Minister of Health of the Republic of Indonesia Number 02 of 2023. Concerning Implementing Regulations of Government Regulation Number 66 of 2014 concerning Environmental Health. This regulation was created to prioritize health and comfort for room occupants by maintaining indoor air, such as: temperature, humidity and CO₂ content [8].

The Indonesian government has made PUPR Ministerial Regulation Number 21 of 2021 concerning Green Building Performance Assessment. This regulation states that you always pay attention to the comfort of the room and the level of

carbon emissions produced in the building. This regulation carries out building construction by paying attention to the comfort of the occupants of the room. The steps taken are to regulate the temperature according to standards, regulate the humidity in the room to existing standards, and pay attention to the CO₂ level in the room to maintain comfort. [9].

This research is related to sustainable development goals (SDGs) 11 (Sustainable Community Cities) and 13 (Climate Action). The strategy used in thermal control in classrooms at Multimedia Nusantara University is providing Central AC as an air conditioner, as well as making double facades in the rooms so that sunlight does not directly enter the classrooms and carrying out greenery which makes the campus environment environmentally friendly (SGD 11). This creation was carried out to help reduce carbon emissions and overcome climate change (SGD 13) [10].

This classroom applies the green building concept. Where this green building concept can reduce the use of fossil energy which can be applied to building design, orientation, selection of building construction materials, natural lighting and natural ventilation. This research can be expected to provide changes in reducing the consumption of electrical energy originating from fossils [11].

1.5. Research Outputs

A journal is the product of this research.

1.6. Research Benefits

The benefits of this MBKM report are:

- 1) For Universities: To enhance student welfare and comfort when using classrooms for instruction and study. In addition to giving teachers and students satisfaction.
- 2) For the Community: To identify variables that can improve energy efficiency and affect thermal comfort levels.
- 3) For the Country: Particularly for the Education Department, as a guide for enhancing classroom thermal comfort and encouraging a feeling of concern for students.