ANALYSIS OF LIGHT INTENSITY IN MICROTEACHING ROOMS USING THE ANDROID-BASED LUXMETER APPLICATION

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ABSTRAK
Pencahayaan dalam ruang *microteaching* sangat penting untuk diperhatikan karena dengan minimnya intensitas cahaya menyebabkan mata mudah lelah, kerusakan pada mata, dan ketidaknyamanan pada saat melakukan aktivitas belajar mengajar. Dalam suatu ruangan terutamanya ruang *microteaching* harus memiliki cahaya yang memadai sesuai dengan standar yang telah di tentukan. Analisis pengukuran intensitas cahaya dengan menggunakan aplikasi lux meter berbasis android untuk mengetahui nilai intensitas cahaya, percobaan ini dilakukan untuk mengetahui apakah intensitas cahaya di dalam ruang *microteaching* sudah atau belum memenuhi standart SNI 6197:2011. Luxmeter berbasis android yang digunakan dapat mengukur besar intensitas cahaya yang dihasilkan dari ruangan yang sudah di siapkan dengan menggunakan lampu Philips TL 36 Watt dengan ukuran ruangan 5×4,5 meter. Pengambilan data dilakukan dengan cara meletakkan luxmeter berbasis android di empat sudut ruangan pada jarak yang sama antara sumber cahaya dengan luxmeter yaitu 3,4 meter. Untuk mengetahui efektivitas intensitas cahaya di ruangan tersebut maka hasil pengukuran dengan lux meter berbasis android dibandingkan dengan SNI. Data hasil percobaan yang telah dilakukan belum memenuhi syarat SNI untuk penerangan di ruang microteaching, besar nilai rata- rata intensitasnya yaitu 135,75 Lux.
Kata kunci *:* Intensitas Cahaya, Ruang *Microteaching*, Luxmeter berbasis android.

ABSTRACT
Lighting in the microteaching room is very important to note because withminimal light intensity causes easy eyes, damage to the eyes, and discomfort when carrying out teaching and learning activities. In nature, a room,especially a microteaching room , must have adequate light in accordance with predetermined standards. An eyebrows light intensity measurement using an android-based lux meter application to determine the value of light intensity, this experiment was conducted to find out whether the light intensity in the microteaching room has or has not met SNI 6197:2011 standards. The android-based Luxmeter used can measure the intensity of light produced from a room thathas been prepared using a 36 Watt Philips TL lamp with a room size of 5×4.5 meters. Data collection is done by placing an android-based luxmeter in four corners of the room at the same distance between the light source and the luxmeter, which is 3.4 meters. To

determine the effectiveness of light intensity in the room, the measurement results with an android-based lux meter are compared with SNI. The experimental data that has been carried out has not met the SNI requirements for lighting in the microteaching room, the average value of intensity is 135,75 Lux.
Keywords: *light intensity, microteaching room, The android-based Luxmeter.*

INTRODUCTION

Light is an electromagnetic wave that propagates in all directions as distinguished by wavelength and frequency from other electromagnetic waves(Hasanah & Murtiani, 2018). The amount of light energy emitted in a certain direction is called light intensity (Guntur & Putro, 2017a). The magnitude is expressed by candela which comes from the word candle which according to history was the first artificial source of light. So it is expressed as a unit of light intensity (Matematika et al., 2019).

Human life is highly dependent on light because light is an absolute part of life and without light life on earth cannot thrive. Lighting in the room is an absolute thing to make a healthy room. The intensity of sunlight is the amount of energyi received on a surface per unit area and time(Myori et al., 2019). The unit of time that measures solar intensity means the irradiation when the sun begins to shine during the day(Sadewo et al., 2015). The amount of radiation intensity on the earth's surface is influenced by the latitude of the location, cloud thickness, topography and season(S & Bastomi, 2019).

Besides being applied at home, light intensity measurement was also applied in the workspace and microteaching room. The application of light intensity level rules in the microteaching room aims to ensure that students can learn well and maintain their eye health. A lecture room will not be able to pass the feasibility test, the intensity of lighting in the microteaching room must be in accordance with the Indonesian National Standard (SNI). The main purpose of measuring light intensity is to find out whether the measured area has a light intensity that is in accordance with the standards set by the government, if the results obtained are not in accordance with SNI standards then the light bulb must be replaced with a different type and wattage in order to get ideal results and in accordance with what is desired. To carry out all learning activities in the lecture room, an adequate lighting intensity is needed, so that lectures can be carried out optimally, especially those related to teaching practices carried out by students in the microteaching room. Accuracy

is needed in the lighting planning process such as the selection of the type of lamp, the number of lights in the room and the power used to illuminate the space (N, 2016).

The difference in sunlight intensity at 12.00 WITA is greater when compared to 08.00 WITA and 16.00 WITA, so it can cause a difference in the amount of sunlight intensity. In addition to sunlight that can affect different light intensities, namely the area of the study room, the distance of lux meters to the light source and the lamp power used. The wider the rangeused but the fixed lamp power and the distance of the lux meter at the solar source, the farther away, the smaller the intensity(Septiady et al., 2021).

Light flux is the light emitted from a light source every one second, the unit is lumen/lux(Natasaputra & Sutiyatno, 2021). The flux of light in each corner of the room that is emitted in a certain direction is called light intensity. While luminance is a measure of brightness on an object, both a light source and on a surface(Muharom, 2017). This is very important to know because it is the characteristic of the lighting we want, the level of comfort.

There are two kinds lighting, namely natural (sun) and artificial (lamp) light sources. Man-made light must be viewed in terms of its quality and quantity, because the light produced greatly affects our comfort somewhere(Telleng et al., 2020). Humans can carry out their activities well and can achieve maximum results if the environment is supportive. One of the most important supporting factors is lighting. Good lighting is lighting that we can see objects quickly, clearly and without tools(Atmadi, 2021). Things thatrequire good illumination are 1) the division of lumencies in the field of vision. 2) prevention of glare 3) heat of illumination to environmental conditions4) awah of light and color(Akhmad Fajar Ubaidillah et al., 2022).

Faktor lighting is the most important thing that must be considered because if it does not meet SNI 6197:2011 standards. Then it will be able to endanger the eye health of its inhabitants(Fahmi Al Gadri et al., 2022). Other factorsthat can affect light intensity are changes in temperature, time, lamp power used, distance of lux meters to the light source, and area of the room used(Suwarti, 2019).

Table 1. Increaselighting and power density to room function SNI 6197:2011 (SNI 6197, 2011)

Number	Room Functions	SNI 6197:2011	
		Luminous level (lux)	Power density (w/m^2)
1	Office workspace	350	12
2	Classroom	350	15
3	School laboratory	500	13
4	Library	350	11
5	Operating Room	1000	10
6	Middle-industry jobs	500	15
7	Hotel lobby	200	12

To determine the coefficient of discharging when viewed from the ceiling reflectance, walls and floors can be affected by the reflection of each color. The percentage of this light reflection can be seen in Table 2.

Table 2. Percentage of Light Reflection(Guntur & Putro, 2017b)

Paint Color	Percentage of Light Reflection
White	85
Yellow	75
Light Grey	75
Light Blue	55
Dark Blue	10
Maple	7
Mahogany	12
Walnut	16

The utilization of light intensity in a place varies depending on what kind of activity will be carried out using that place and how large the place is supaya good lighting level for an office workspace or classroom is 350 lux(Vicky Prasetia et al., 2022).

The spread of light from a light depends on the light source used. Most light captured by the eye is not a direct source of the light source being seen. However, it comes from a light source. For general information, there are 3 types of dissemination, namely direct spread, indirect dissemination and campuran dissemination (Suwarlan, 2021).

The spread of light can be determined by the direction of lighting and the effect of the lamp holder can be seen in Table 3 below:

Table 3. Types of Light Distribution(Parera et al., 2018)

Light Distribution	Information
Immediately	90% - 100% downward rays and 0% - 10% upward rays
Semi Direct	60% - 90% downward rays and 0% - 40% upward rays
Indirect	90% - 100% upward rays and 0% - 10% downward rays
Semi Indirect	60% - 90% upward rays and 0% - 40% downward rays
Blend Directly	Indirect lighting with armature/luminar of translucent materials evenly

There is no information about the condition of the lighting level in the FTIK Microteaching Room of UIN Datokarama Palu, Campus 2, Sigi Regency. The conditions indicated that the lighting design in the learning room including the Microteaching Room has not been able to provide visual comfort that meets the standards for the learning building. Therefore, a study is needed on the level of natural lighting in the study room to find out how much the level of lighting in the FTIK Microteaching Room UIN Datokarama Palu, Campus 2, Sigi Regency.

Based on the research background that has been described, the author will analyze the quality of lighting and the level of lighting that occurs in the Microteaching Classroom of UIN Datokarama Palu Campus 2 Sigi Regency. Thus, a problem statement can be concluded in this study, namely; "What is the level of lighting that occurs in the Microteaching room of FTIK UIN Datokarama Palu, Campus 2, Sigi Regency?".

This research was conducted with the main objective of knowing the level of lighting in the Microteaching room of FTIK UIN Datokarama Palu, Campus 2 Sigi Regency and compliance with SNI 6197:2011. While the benefits that can be obtained; Knowing the level of lighting that occurs in the Microteaching room of FTIK UIN Datokarama Palu, Campus 2, Sigi Regency. The scope of this research is the level of lighting in the Microteaching room. While the object studied is the Microteaching room of FTIK UIN Datokarama Palu, Campus 2, Sigi Regency which is located on the 3rd floor of the PPG Building.

This type of research is descriptive research. The observation location was carried out in the Microteaching room which is usually used for lecture rooms for students of the Faculty of Tarbiyah and Teacher Training UIN Datokarama Palu with a size of 5 m x 4.5 m; Check the feasibility of two TL Philips light bulbs in the Microteching Room, then turn on two TL Philips light bulbs, then install the Lux Meter application on your mobile phone, then measure with the Lux Meter application at four corners of the room, thencreenshoot the measured results and record the results.

DISCUSSION

This experiment was conducted to find out whether the light intensity in the room has or has not met the SNI 6197:2011 standard. Android-based Lux meters are used to measure the intensity of light produced from a room that has been prepared using a 36 Watt Philips TL lamp with a room size of 5 m x 4.5 m. Data collection is done by placing an Android-based lux meter in every corner of the room at the same distance between the light source and the luxmeter, which is 3.4 meters. The results of measuring the strength of lighting in each corner of the room can be seen in Table 4.

Table 4. Measurement Results in Every Corner of the Room Light Intensity

No	Point/Corner of Room	Average Light Intensity (lux)
1	First	173
2	Second	123
3	Third	128
4	Fourth	119

The picture of the measurement results in each corner of the microteaching room using the android luxmeter is in the following picture.
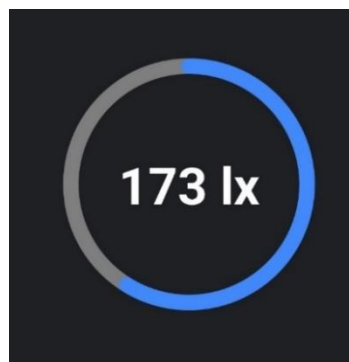

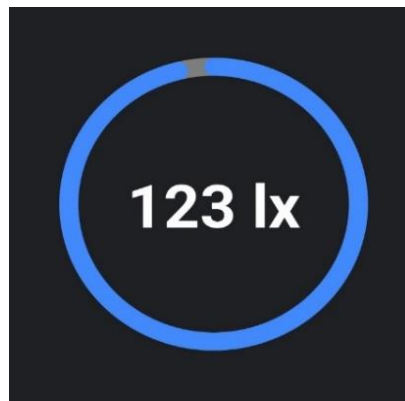Figure 1. Results of the First Angle Measurement in Spacen

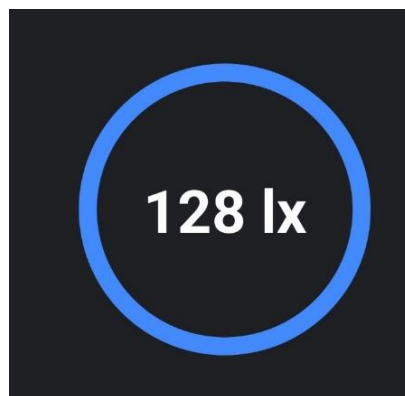Figure 2. Results of measuring the second angle in the room

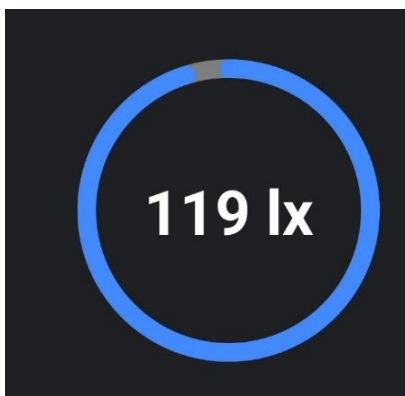Figure 3. Results of measuring the third angle in the room

Figure 4. Results of measuring the fourth angle in the room

To determine the effectiveness of light intensity in the room, the measurement results with a lux meter are compared with SNI. The data from the experiments that have been carried out have not met the SNI requirements for lighting in the microteaching room, the

average value of intensity is 135.75 Lux. Comparison of Android-based Luxmeter measurement results with SNI 6197:20Recommendation Standard 11 in Table 5.

Table 5. Comparison Table of Measurement Results with Standard Recommendation SNI 6197:2011

Corner of the Room	Lighting Intensity		Lux Difference	Information
	Measurement	Standard		
First	173	350	-177	Not yet compliant
Second	123	350	-227	Not yet compliant
Third	128	350	-222	Not yet compliant
Fourth	119	350	-231	Not yet compliant

Analysis of equal distribution of lighting in each corner of the microteaching room is presented in Table 6.

Table 6. Lighting Equalization Analysis

Area	Average / Minimum	Information
First corner of the room	0,49	Not evenly distributed yet
Second corner of the room	0,35	Not evenly distributed yet
Third corner of the room	0,37	Not evenly distributed yet
Corner of the room Quarter	0,34	Not evenly distributed yet

The intensity of lighting is the most important aspect and must be prioritized, especially in the microteaching room. In the microteaching room must have a light intensity that is in accordance with a predetermined standard of 350 lux. This light intensity must be considered because if it does not meet the standards it will cause easy eyes, damage to the eyes, and discomfort when doing teaching and learning activities in the room.

Measurement of the intensity of the microteaching room which covers an area of 22.5 m^2 using the help of an android lux meter. The measurement was made at 14.00 WITA.

The measurement was carried out in every corner of the microteaching room using an android lux meter which was placed as far as 3.4 meters from the light source. The results of lighting measurements in the microteaching room are; Room area 22.5 m2, Types of lamps Philips TL, Power 36 Watt, Lumen 2500 lm and 220-240v / 50-60 Hz.

In the table of measurement results in each corner of the microteaching room, it can be seen that it still does not meet SNI Standard 6197:2011. Factors that can affect the small intensity of light obtained are the color of the wall paint that is less bright, the TL lampshade that blocks light, lamp power used is too small and insufficient number of TL lamps. So it is necessary to add lights and increase electrical power so that when doing activities in the microteaching room it feels more comfortable, and does not damage vision.

In Table 5 about the comparison of measurement results with SNI 6197:2011 recommendation standards, the results of even distribution of the average lighting measurement divided by the recommended value are obtained using the formula:

$$\text{Equalization Analysis} = \frac{\text{Average Measurement}}{\text{Recommended Intensity}}$$

It can be seen in Table 6. After analyzing the distribution of light, it turns out that the distribution of light in the microteaching room has not been evenly distributed due to several factors, namely the location of the lamp is not in the middle of the microteaching room and the TL lampshade that blocks light, so that the spread of light from the lamp in each corner is different.

CONCLUSION

Calculation of light intensity in the microteaching room can be done using the android-based luxmeter application. The results of measuring light intensity in four corners of the microteaching room in a row, namely: 173 Lux, 123 Lux, 128 Lux and 119 Lux . According to SNI 6197:2011 standards, these results have not met because of the minimum light intensity in the microteaching room, which is 119 Lux. The result of the analysis of the spread of light in the microteaching room was 0,49; 0,35; 0,37 and 0.34. From the measurement data, it still does not meet the SNI 6197:2011 standard that

has been determined, because the distribution of light in the microteaching room is still uneven.

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