# Quality Of Lighting In Regular And Fullday Class Tsanawiyah Miftahul Huda Tayu Pati

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| Article Info | Abstract |
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| | An analysis of the quality of the lighting level in the classroom needs to be carried out to determine the existing lighting level. If the level of lighting is below the specified standard, it can cause eye damage. Meanwhile, if the level of lighting is above the standard, the classroom will be too bright. The purpose of this study was to determine the level of lighting in the Regular and Full Day classroom of MTs. Miftahul Huda Tayu. The tools and materials used in this experiment are lux meter, roller meter and thermohygro. The experiment was carried out in the Regular class school building and the Full Day classroom building with a sample of three rooms per building with each room representing each floor. The experiment was carried out during the day for three consecutive days. There are two types of the intensity measured in this experiment, namely natural intensity (lights off) and natural & artificial intensity (lights on). In each room, 9 points were taken. The floor area and window area were measured using a roller meter. From the experiments that have been carried out, it can be concluded that the lighting in the Regular class (17-73 lux) and Full Day class (97-181 lux) buildings do not meet Indonesian National standards (Standar Nasional Indonesia, SNI). |

## INTRODUCTION

In educational institutions, the classroom is the room that is most often used compared to other rooms, so that the classroom needs adequate lighting to support learning activities (Yusvita, 2021). A classroom is required to have windows that allow adequate lighting for reading books and to provide a view to the outside (Permendiknas, 2007)(Permenkeu, 2021). The classroom as a place for learning activities should be a place that is comfortable, healthy, as well as efficient in energy utilization. The learning process requires high concentration. A comfortable place and learning environment make it easier for students to concentrate. By preparing the right environment, students will get better results and can enjoy the learning process. The school environment must be designed as well as possible to facilitate students in the implementation of teaching and learning.

The impact of poor lighting cannot be separated from poor room design. The space designed must allow people who occupy it to see objects. Without being able to see objects clearly, activities in the room will be disturbed. On the other hand, too bright light can also interfere with vision, which may causing glare (Sukawi & Dwiyanto, 2013). Lighting can be divided into two, namely natural lighting and artificial lighting. Natural lighting can be in the form of sunlight. Meanwhile, artificial lighting is lighting which used man-made light source such as lamps.

Good lighting is indicated by which eyes can see objects clearly and comfortably. In other words, lighting must be able to meet functional requirements and safety requirements. Lack of light received or excess light captured by the eye is a deviation from lighting (Sri Handayani Abdullah & Kabuhung, 2018).

Light is an absolute part of our life because human life is very dependent on light. Research shows that about 80% of all information received by our brains is through the eyes. This process can only occur when there is light, both natural light, namely direct sunlight (daylight) / sunlight reflected by the moon (moon light) or artificial light (artificial light) (Darmasetiawan, Christian; Puspakesuma, 1991). However, vision does not get better just from the amount or quantity of light but also from its quality. The quantity and quality of good lighting is determined by the level of light reflection and the level of lighting ratio in the room (Irianto, 2006).

In classrooms that use blackboard, the lighting for the media must be considered. This is to ensure that light reflections do not cause vision problems for students, especially for those sitting near the blackboard. For whiteboard media, the recommended lighting strength is 250 lux. Meanwhile, for blackboards whose reflectivity is not more than 0.1, the recommended lighting strength is 500 lux. While classrooms that use LCD media, the recommended general lighting is 250-300 lux by providing a dimmer to overcome the lighting problems (glare) that arise (Gunawan et al., 2018).

Research on lighting in the previous classroom has been carried out previously which shows that the average lighting strength in the lecture hall at the Jember University physics building did not meet the standards set by SNI, which is 250 lux (Cahyantari, 2016). Most of the natural light intensity of elementary school classrooms in Makassar City was below the SNI standard (Idrus et al., 2016). In addition, there are studies that show that the light intensity in the dormitory did not meet SNI both at night and during the day (Natsir, 2021). Choosing a light color on the walls can increase the illumination of the classroom, especially for small class sizes in addition to adding to the impression of a spacious room. Showing the result that the highest lighting power is 143.8 lux in room 304 and the lowest is 103.4 lux in room 314. Research showed that the use of window openings is appropriate for visual comfort in the A zone (Widiyantoro et al., 2017). For open curtain room, the SNI standard is 350 lux (± 15 lux). The average illuminance can be greatly improved by using LED technology to meet the UNE 12464-1 standard (Samani, 2011). Lighting has a very strong and important role in student learning performance in the learning place (Alcala-gonzalez & Alfonso-corcuera, 2020). Therefore, in this work, measurement of light illumination in classrooms in MTs. Miftahul Huda Tayu were conducted.

## METHOD

The research was conducted in junior high school MTs. Miftahul Huda Tayu Pati. The tools and materials used were 3 lux meters, 2 roller meters and 3 thermohygro meters. Measurement of the level of natural lighting was done using a luxmeter at an area of 1x1 $m^2$ at the high of 0.8 m from the floor. The measurement was carried out every day

for 3 days on October 5-8, 2021. Each measurement was carried out 3 times, namely at 10.00-11.00 WIB, in the afternoon (11.00-12.00 WIB) and afternoon (14.00.00-15.00) when the weather was sunny. Measurements were also designed to follow the standard of indoor lighting measurements as stated in SNI 16-7062-2004 for the general lighting category. The calibrated lux meter was turned on and then the sensor cover was opened. The lux meter was brought to a predetermined measurement point. In this experiment there were 9 points in each classroom. Measurements were made by taking samples of 3 classes for each of the Regular class and Full Day class buildings.

The data obtained were then averaged for each line of research points and then compared with the standard value of classroom lighting in SNI. The measurement data that has been averaged were then classified into 4 categories as shown in Table 1. The measurement results were also confirmed by three standards, namely SNI, Minister of Health and UNEP as shown in Table 2.

**Table 1.** Light intensity level

| Lighting Intensity (lux) | Category |
|---|---|
| < 100 | Bad |
| 100-249 | Not good |
| = 250 | Good |
| > 250 | Very Good |

**Table 2.** SNI Recommended lighting level

| Room Type | Light intensity (lux) |
|---|---|
| Classroom | 250 |
| Bedroom | 150 |
| Workspace | 250 |
| Living room | 250 |
| Drawing space | 750 |
| Laboratory | 250 |
| Worship place | 200 |
| Library | 300 |
| Archive warehouse | 150 |
| Factory/industry | 1000 |
| Supermarket | 750 |

## RESULTS AND DISCUSSION

The lighting quality of rooms depends on the window area where the light may enter the room. To provide a good quality of lighting, the window area should meet the standard requirement which is 20% of the room's area. Table 3 shows the window area of the classrooms. It is shown that all classrooms did not meet the requirement.

**Table 3.** The measurement of the area of the classroom and the area of the window

| Class | Room Area | Window area requirements (20% of the room area) | Actual Window Area | Result |
|---|---|---|---|---|
| Regular 1 | 105.40 | 21.08 | 14.26 | Beyond national standart |
| Regular 2 | 84.16 | 16.83 | 12.56 | Beyond national standart |
| Regular 3 | 87.08 | 17.41 | 10.65 | Beyond national standart |
| Full Day 1 | 92.70 | 18.54 | 11.61 | Beyond national standart |
| Full Day 2 | 92.85 | 18.57 | 12.35 | Beyond national standart |
| Full Day 3 | 91.55 | 18.31 | 12.28 | Beyond national standart |

Lighting is very influential on teaching and learning activities in the classroom (Prakoso & Hisjam, 2018). Adequate lighting can prevent asthenopia (WHO: subjective visual complaints or fatigue or complaints a person experiences from using his eyes) and improve reading speed and

efficiency. The direction of light that is not right at the reading or writing position will cause glare. The data from the measurement of lighting intensity in the Regular and Full Day classrooms obtained from the measurements can be seen in Table 4.

**Table 4.** Illumination Intensity and Illumination Quality in the room

| Class room | Average Natural Illumination Intensity (lux) | Quality | Average Natural + Artificial Illumination Intensity (lux) | Quality |
|---|---|---|---|---|
| Regular 1 | 31,09 | Bad | 62,19 | Bad |
| Regular 2 | 14,33 | Bad | 45,85 | Bad |
| Regular 3 | 49,57 | Bad | 73,48 | Bad |
| Full Day 1 | 97,92 | Bad | 131,44 | Bad |
| Full Day 2 | 133,88 | Bad | 160,07 | Bad |
| Full Day 3 | 164,90 | Bad | 181,22 | Bad |

It can be seen that the range of light intensity in the Regular class building is between 17 to 73 lux. While the range of light intensity in the Full Day class building is between 97 to 181 lux. The average lighting in the Regular and Full Day classes were at a level below the standard determined by SNI (250 Lux). Meanwhile, the lighting in the classroom Full Day was better than the lighting in the Regular classroom. This is due to the position of the Regular class building which is right between the big trees in front of the class yard which causes less sunlight entering the classroom building. Meanwhile, the position of the Full Day class building is on a spacious ground where there are no large trees in the classroom yard. Therefore, it is possible for more sunlight to enter the classroom.

**CONCLUSION**

From the obtained results, it can be concluded that the intensity of natural and artificial lighting in the Regular and Full Day Classrooms at MTs. Miftahul Huda Tayu Pati is at a level beyond the National Standard which were less than 250 lux. Full-Day class lighting was better than Regular classroom lighting. This is because the position of the Regular class building is right between the big trees in front of the class yard which causes less sunlight to enter the classroom building, while the position of the Full Day class building is on a spacious ground.

**ACKNOWLEDGEMENT**

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