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**JOHOR  
INNOVATION  
INVENTION  
COMPETITION  
AND  
SYMPOSIUM  
2023**



"Innovation Inspires a Society  
to be Critical and Creative"

# **JOHOR INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2023**



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**Editors-in-Chief**

**AHMAD KHUDZAIRI KHALID  
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## **Preface**

**In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.**

**This e-book compiles the extended abstracts that submitted to Johor Innovation Invention Competition and Symposium 2023 (JIICaS2023), where JIICaS2023 is a virtual platform for all creative minds to share and present their invention and innovation. The extended abstracts are divided into two categories, which are Category A (Higher Educational Student/ Any Recognized Institutional Students in Malaysia) and Category B (Primary/ Secondary School Students / Special Education School Students in Johor). Each abstract gives a brief background on the innovation or project.**

**We hope that this e-book will help the readers to get to know the innovation done by the students from both categories and get some ideas to develop future innovation products.**



## **NUR MOBILE LAB: A PORTABLE TEACHING AID**

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### **ABSTRACT**

The primary approach of comprehending lighting principles in the classroom is through verbal explanation. Thus, students encounter difficulties in visualizing the concepts and often experience confusion while acquiring knowledge of the fundamental principles of lighting. The Nur Mobile Lab aims to provide a visual demonstration of students' understanding in the fundamental principles of lighting within the classroom setting. The Nur Mobile Lab is a teaching aid constructed from plywood and acrylic Perspex materials. This innovative tool shows the principles of light. The innovation for a lighting box is a light, portable structure that is easy to carry to class to teach about artificial lighting as part of the Environmental Science subject. The objective of this subject is to provide the students with a fundamental knowledge of the methods employed by lighting practitioners for measurement purposes as well as the terminology commonly used in this field. Therefore, students can show their understanding of the subject by designing and calculating sufficient lighting in a space as required by the standards and regulations. The result of the final test also shows an increment in students' grades, and the survey distributed reflects a positive outcome from the use of the tools. The Nur Mobile Lab assists students creative performance in learning through activities in the class.

**Keywords:** lighting principles, built environment, teaching aid, innovation.

### **1.0 INTRODUCTION**

The main approach employed by educators to teach knowledge on lighting principles in the classroom setting is verbal instruction. The conceptualization and comprehension of fundamental lighting principles appear to be challenges for students. Light is a form of energy that can be measured with standard units of energy, but the effect of light on the human environment also depends on how sensitive the human eye is. A distinct quantitative measure is employed to quantify the intensity of lighting. These are some of the topics for the Environmental Technology subject taught to students who study building surveying. Due to the many terminologies, sometimes students struggle to visualise and are often confused about understanding this basic theory of lighting. The Nur Mobile Lab will illustrate the understanding of lighting principles visually to the students in the class. The lighting box demonstrates the seven (7) principles of understanding the basic theory of lighting for effective teaching and learning.

### **2.0 OBJECTIVE**

Nur Mobile Lab was invented to overcome students difficulty in understanding the seven (7) principles of lighting. The seven (7) principles are: solid angle, luminous intensity, luminous flux, inverse square law, cosine law of illuminance and illuminance.

### 3.0 METHODOLOGY

The influence of lighting on the human environment also depends on the sensitivity of the eye. Lighting quantities are thus quantified using a separate set of units. The goal of this topic is to provide a fundamental knowledge of the basic measuring techniques and terminology used in the lighting industry.

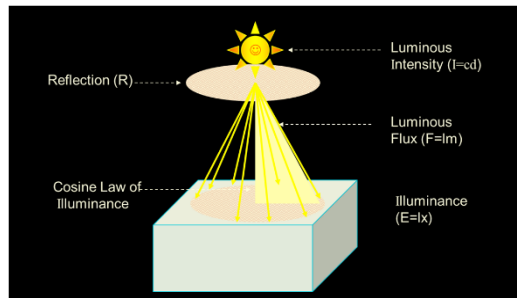


Figure 1: The basic principle of lighting in the human environment

For the enhancement of an understanding of this light theory, the NUR Mobile Lab was constructed using reuse plywood and acrylic Perspex. Visualisation of light is assisted by using modified torch lights, a laser pointer, and body mist that acts as smog. The NUR Mobile Lab will be brought to the lecture class to explain the topic of lighting.

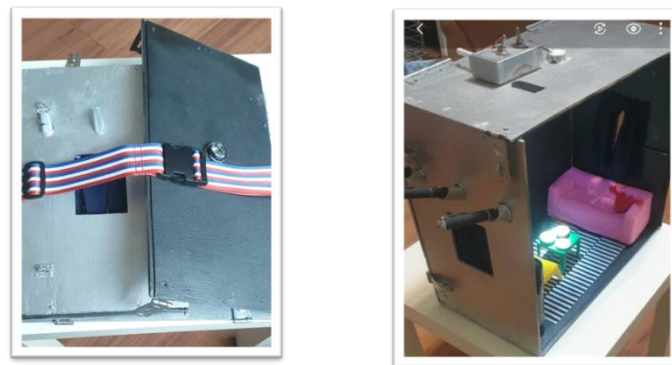


Figure 2: Portable teaching aid - Nur Mobile Lab

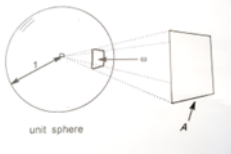
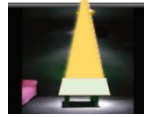
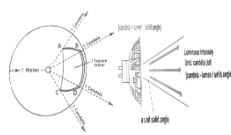




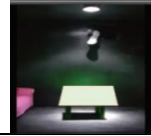
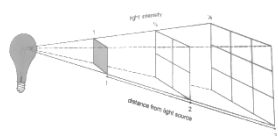

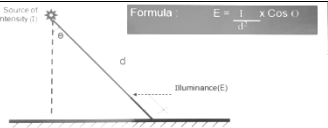
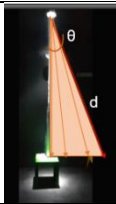
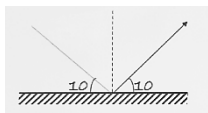

This lighting box is a very light structure and easy to bring along during class sessions to teach artificial lighting under the Environmental Science subject. The lighting box demonstrates the seven (7) principles in understanding the basic theory of lighting for effective teaching and learning. The principles are solid angle, luminous intensity, luminous flux, illuminance, inverse square law, cosine law of illuminance and reflection.



Figure 3: Setting of the lighting box with the actual interior of the human environment

The lighting box is finished with the real setting of a human environment, and a transparent perspex sheet allowed students to see the effect of the light source as the laser pointer flashed through the box.

Table 1: Visualization of the lighting theory in the Nur Mobile Lab.

Principle	Theory	Visualizing in the Nur Mobile Lab
1. Solid angle		
2. Luminous intensity		
3. Luminous flux		
4. Illuminance		
5. Inverse Square Law		
6. Cosine law of illumination		
7. Reflection		

#### 4.0 RESULTS/NOVELTY

The implementation of the Nur Mobile Lab will provide students in the lesson with a tangible means of studying the principles and mechanisms governing lighting. The lighting box visually presents the fundamental principles of lighting theory, encompassing seven (7) key elements

that hold significance in the discipline of education. Through the acquisition of theoretical knowledge, students can illustrate their understanding by formulating a lighting design and conducting simulations that ensure enough illumination in each space, in accordance with the related guidelines and regulations. A comparison study was conducted on the testing outcomes of two consecutive semesters to ascertain whether there was any apparent enhancement in students' comprehension levels when responding to queries that related to the subject matter. A questionnaire survey was conducted to collect responses from students. The results indicate an encouraging reaction, with students demonstrating enhanced comprehension of lighting concepts through the utilisation of the Nur Mobile Lab, facilitating visual representation. A questionnaire survey was administered to students who had completed the subject, and the findings reveal multiple beneficial results associated with this teaching and learning innovation. The implementation of various classroom activities by Nur Mobile Lab aims to facilitate students' acquisition of knowledge through innovative and imaginative approaches. Students gain lessons on the usage of this and apply their knowledge during classroom activities. The utilisation of this mobile laboratory is conducive to the transfer of fundamental knowledge related to lighting among students in elementary and middle schools. The application of light as a means of illuminating objects involves an investigation of their composition and motion characteristics. This will foster an increased interest in science among students.

## **5.0 CONCLUSION**

The most typical way to understand lighting principles in class is through verbal explanation. As a result, students struggle to visualise and frequently become confused when learning the fundamental principle of lighting. The above-mentioned problem was solved by the development of this new teaching aid, which helps students use visualisation skills to further improve their knowledge. Future exploration will expand this portable teaching aid's functionality with additional features related to fundamental environmental technology course material that are appropriate for all students. The initiative for continuous innovation in teaching and learning methods will increase the efficiency of educational activities.