

**POLITEKNIK SULTAN SALAHUDDIN ABDUL  
AZIZ SHAH**

**A DESIGN OF STUDY PORTABLE INVOLVING  
THE INTERNET OF THINK**

**MUHAMAD TAJUDIN BIN MUHAMAD RAFI  
(08DKM20F1007)**

**MUHAMMAD FAWWAZ BIN MOHD NOR  
(08DKM20F1009)**

**AINNUR PUTRI BINTI AZLAN  
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**MECHANICAL ENGINEERING DEPARTMENT**

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**This report is submitted to the Department of Mechanical  
Engineering as fulfilling part of the conditions of the award  
Diploma in Mechanical Engineering**

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# STATEMENT OF AUTHENTICITY AND PROPRIETARY RIGHTS

## PRODUCT DESIGN STUDY WHILE REVIEWING LESSONS INVOLVING LEARNING ENVIRONMENTAL FACTORS

1. Kami, AINNUR PUTRI BINTI AZLAN (NO KP; 020424-06-0030), MUHAMAD TAJUDIN MUHAMAD RAFI (NO KP; 020413-03-0039), MUHAMMAD FAWWAZ BIN MOHD NOR (NO KP; 021026-05-0093) adalah pelajar Diploma Kejuruteraan Mekanikal, Politeknik Sultan Salahuddin Abdul Aziz Shah, yang beralamat di Persiaran Usahawan, Seksyen U1, 40150 Shah Alam, Selangor. (Selepas ini dirujuk sebagai 'Politeknik tersebut').
2. Kami mengakui bahawa 'Projek tersebut di atas' dan harta intelek yang ada di dalamnya adalah hasil karya/ reka cipta asli saya tanpa mengambil atau meniru mana-mana harta intelek daripada pihak-pihak lain.
3. Kami bersetuju melepaskan pemilikan harta intelek 'Projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk penganugerahan Diploma Kejuruteraan Mekanikal kepada kami.

Diperbuat dan dengan sebenar-benarnya diakui oleh;

AINNUR PUTRI BINTI AZLAN

(NO.KP; 020424-06-0030)



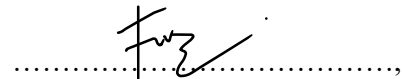
MUHAMAD TAJUDIN BIN MUHAMAD RAFI

(NO.KP; 020413-03-0039)



MUHAMMAD FAWWAZ BIN MOHD NOR

(NO.KP; 021026-05-0093)



Di hadapan saya,

NURAZLINDA BINTI YAHYA@MUHAMMED

(NO. KP; 780301-06-6370)



Sebagai Penyelia projek pada tarikh ...23/12/2022.....



## **APPRECIATION**

Alhamdulillah, be thankful to Allah because with His bounty we were able to complete the report on time. With the blessings, hard work and cooperation of all our team members, the 'Study Portable' project report was successfully completed.

We would like to express our sincere appreciation to our project supervisor, Nurazlinda binti Yahya@Muhammed, who has given us a lot of guidance, advice, encouragement and constructive criticism until we successfully completed this final project report.

Not forgetting to also thank our colleagues who gave us a lot of support and opinions in completing this project. In addition, not to forget all the lecturers who are directly and indirectly involved in the production of this project in providing advice to further strengthen the report of this project.

## **ABSTRACT**

This project is applied from observation based on the comfort of students when reviewing lessons in their own study desk space. The objective of this project produced is to design a project that is able to provide enough comfort for students while revising regardless of time. In addition, there are several scopes of study that have been set in this project that this project can be used in an estimated 2 hours, the use of LED lights only can provide sufficient light and the design of this project can compete with existing products or projects in the market. All this is set to solve some problems that can be detected from these observations such as, poor lighting and dim during the night, odor pollution that fills the room space and relatively hot room temperature. For this project material, it requires special features that are not easily cracked, lighter, stronger and safe to use. Through the studies that have been researched, materials such as plastic are the most suitable for this project based on the special features that need to be present for this project. As for the component formation process, a methodological study is used to plan the production process of this project by using a flow chart as a guide for planning in producing and testing this project. From the findings of the study, it is expected that the project can be used in good conditions, therefore the use of IoT placed in this 'Study Portable' project is effective and easy to use for all users. In addition, the expectation that the possible use of the battery does not reach the planned period. The implementation of the 'Study Portable' project was successfully implemented despite experiencing some technical problems but was able to achieve the desired objectives and was able to overcome the problems faced.

**Keywords:** portable, study portable, multi-function

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## LIST OF SYMBOLS

### SYMBOL

%	
&	Percentage
×	and
	multiply

## LIST OF ABBREVIATIONS

LED	Light-emitting diode
USB	Universal serial bus
mAh	Milliamper/hour
Wifi	Wireless Fidelity
IDE	Integrated development environment
AC	Alternating current
DC	Direct current
MHz	Megahertz
Hz	Hertz
GND	Ground
IC	Integrated circuit
ATMEL	Advanced technology for memory and logic
ICSP	In-circuit serial programming
AVR	Automatic Voice Response
MOSI	Master Out Slave In
SCK	Semi Conductor Kyushu
VCC	Common Collector Voltage
SPI	Serial Peripheral Interface
TX/RX LED	Receiving and Transmitting pins of Arduino
PWM	Pulse-width modulation
AREF	Analog Reference
CFL	Compact fluorescent light bulb
ABS	Acrylonitrile Butadiene Styrene
PP	Polypropylene
TPR	Thermo Plastic Rubber
CAD	computer-aided design
mm	Millimeter
PVC	polyvinyl chloride
IoT	Internet of things
V	Voltan
A	Ampere
W	Watt
kg	Kilogramme
RM	Ringgit Malaysia
IIC	Impact insulation class
LCD	Liquid Crystal Display

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

As students who live far away from their families, they need to be independent either alone or with friends. This situation is usually faced by students who are studying at university and in hostel school. Most students who stay at their universities and hostels will have time for revision of their studies. So the main problem that students always face when doing revision is that they are less comfortable with their place of learning. For example, the table used to do the revision is small and narrow. Also, the temperature when they do the revision is also volatile because it is sometimes hot and sometimes cold. Furthermore, the lighting on their desks is also important to make it easier for them to study. The last problem is the smelly and unpleasant air.

This project created to provide comfort to students while make a revision. However, the project equipped with four types of parts that work and have different abilities such as LED lights, fans, air fresheners and USB charging for electronic use. The focus in this study is on internal wiring to ensure that all the equipment available on this project can function properly. In addition, the design of this project is also produced according to the standard of study table area. Each measurement parameter needs to be emphasized to avoid any problems occurring during the equipment installation process. Once an analysis and survey has been made on the equipment to be incorporated, the most efficient configuration will be selected for producing the project.

## **1.2 PROJECT BACKGROUND**

This project is called Study Portable which is used to provide comfort to users. It is also lightweight and able to carry pipes from one place to another. This Study Portable is also able to function without the need to use an electric plug because there is a battery that can function as a source of energy. The dimensions for this project are 15cmx17cmx17cm. This project is an innovation project because it has been taken from existing products and has been improved from various aspects according to current trends and technologies. Although it is not a newly created product but it is specially designed to attract consumers and most importantly is able to solve problems faced by students. This Portable Study is a product based on several studies and surveys that have been conducted. The main purpose of this portable Study developed is to provide comfort to students without the use of much space. In addition, safety features are very much emphasized in the design of this project.

## **1.3 PROBLEM STATEMENT**

Students nowadays had many problem when it comes to study. Maybe some students need fully comfort to study. Others might just want to study with fresh air include cool temperature and some others maybe likes to study in late night with bright light.

In terms of study desk space that use for single user it has a desk space that is not too spacious. Sometimes it is difficult to put all the study items on the table because it requires a lot of space. So we created this project according to the appropriate size and weight to be placed on different types of tables.

Furthermore, in terms of comfort most students feel uncomfortable while studying. This is because factors such as hot temperatures, dim light, and ventilation systems in their area are lacking or not available directly on their study desks. This greatly interferes with their comfort and makes us to provide the various amenities needed in just one portable.

Finally, in terms of electricity supply. Because nowadays we are very dependent on devices and the internet to get information and knowledge, we also need resources that can support the device. For example, mobile phones need to be charged to function and portable wifi needs to have an electrical source from a USB port to be able to supply internet network to other devices. So we supply a power supply in the form of a USB port that can support various types of power sources via USB.

#### **1.4 OBJECTIVE**

Our objectives is to give students the best experience when using our product while studying. Not just only to give satisfaction to students but it is more to help students to improve their study. These are our objective that we can conclude:

- It is able to reduce the room temperature to be more comfortable, can help to purify the air in the area and to help students to save more space while studying on a desk.
- It can provide adequate light when studying and also able to provide power supply for device.

#### **1.5 PROJECT QUESTION**

1. Is the main purpose of implementing this project, which is to provide comfort to users while reviewing lessons, achievable?
2. Has this project been successful in helping users in overcoming the problems they face?
3. Can this project be implemented according to the actual objectives to be achieved?
4. Does this project meet the needs of users?
5. Is the use of arduino in implementing this project effective and functional?
6. Is the fan speed enough to help reduce the heat around the study room?

7. Is the use of LED lights able to provide enough light when studying?
8. Is the steam fragrance spray that comes out enough during study time?

## 1.6 SCOPE OF THE PROJECT

Table 1.61

Specification	Study Portable
Dimensions	15cm x 8 cm x 17 cm
Weight	1.5 kg
Colour	Red & White
Battery	3000mAh rechargeable (standing for 1 hours from 100% to 0%)
Connectivity	Support Wifi & Mobile Hotspot
Price	RM 170

With the production of this project the boundaries and limitations are something that can be expected before the production of the project is implemented. This is because, taking into account every aspect in a production is very important. With this description we can see how far this project can help students and run smoothly for a while. This 'Portable Study' can be estimated for 3 months to complete and can last for 2 years. With the durability of this project, it is estimated that it can reduce costs to each user and even provide good 'feedback' from the users themselves. For the size of this study portable it takes 15cm diameter and 15cm height so its suitable also for small size table. But it is recommended for medium table size.

However, there are still shortcomings because this product must be charged around 3 hours for full recharging and can only last also for 3 hours but the problem can be overcome with the use of USB installed to recharge in order to provide energy and of course users still use it even if it is charged.



Among the methods to produce 'Study portable' should be given priority on the materials used such as the installation of 'arduino' which can be controlled using a remote control. In addition, the fan blades are made of plastic for the safety of the user so that no injuries occur. With 24V and 180 degree adjustable it can give satisfying coolness to user. Next, with the USB installation there is a 'rechargeable battery' so that the battery can be recharged when the power source runs out. In addition, the selection of LED lights is better than other lights because LEDs can refract light more brightly and clearly and also it can be bright around study area because of 12V power supply. With the completion of this project, the size and weight are also emphasized because this 'Study Portable' is a mobile product. So the allotted size is 30cm long, 17cm wide and 39cm high and its shape is shaped like a cuboid while it weighs 3kg.

## **1.7 IMPORTANCE OF THE PROJECT**

The importance of this project is to facilitate users, especially students while reviewing lessons. With this project, users do not have to buy table lamps, table fans and steam fragrances separately because this project combines all the products in it. At the same time, this 'Study Portable' can provide comfort to users such as reading a book at night at the study table. In addition, this project helps save space on the study table. The combination of these three products gives a positive impact to its users in overcoming the problems of smelly ambient ventilation, hot room temperature and lack of lighting sources. Furthermore, the project is equipped with an energy source from a battery so it is easy to carry anywhere.

## **1.8 DEFINITION OF TERMS/DEFINITION OF OPERATIONS**

The concept of this project is related to learning situations and making work mobile such as time reviewing lessons, working from home and others. The use of 'portable' in the title of this project describes the atmosphere of a study desk or work that is portable to provide comfort and convenience to users when using this 'Study Portable'. The features on this project especially in terms of its size that can be carried anywhere, greatly facilitate the user when in different places.

## **1.9 PROJECT EXPECTATIONS**

The expectation from this project is that it will provide facilities to all students, especially those who continue their studies in boarding schools as well as in IPTA and IPTS to study at night. So, they don't have to worry about lack of lighting, ventilation and fragrance because before this they need to prepare in advance before starting the revision. This makes them have to take a long time to charge a lot of equipment separately that they will use while doing revision. In addition, this project will also help some parents as they do not have to spend high costs to provide many necessities for their child. Finally, with this project in the future, we are confident that it will give benefit not only for students but including the workers.

## **1.10 SUMMARY**

In this chapter, it has been explained about the emergence of ideas and inspiration. The statement of the problems encountered can be achieved through the objectives that have been stated. Therefore, with 'Portable Study' this can provide benefits to everyone, especially for students when doing school work and reviewing lessons, even in this pandemic phase, many workers who work at home can use it. In conclusion, 'Study Portable' can give an impact to users in terms of comfort, ease of carrying it anywhere and can save desk space from being scattered with various technologies that have only one use on each of them which also takes up space on the table.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **(AINNUR F1020)**

### **2.1 INTRODUCTION**

Nowadays, various advanced technologies are created to facilitate human life to move forward. Therefore, to produce a project it is necessary to go through a more in - depth study to make the project more efficient. Thus, a review of the literature is very important as a reference or guide in producing a project according to the needs of current users and designs that meet engineering specifications. The design corresponding to the engineering aspects of the design is important to prevent unwanted things from happening while in use.

This literature review aims to elaborate on the study of 'Portable Study' whose ideas are designed to be used by students especially when reviewing lessons. The weaknesses that exist in the existing 'Study Portable' related products are the problems that need to be overcome and the relevant supporting theories also need to be obtained in order to achieve the objectives of the study of the project. At the same time, the scope of the project described needs to meet its design features on the project. Therefore, this reference material is very important to ensure the effectiveness in making this project.

## **2.2 CONCEPT/THEORY**

In producing a project, technology plays a role as a work piece to operate smoothly and systematically. With this 'Study Portable', users, especially students can use it only by controlling this project remotely using a remote control because this project is designed with the use of arduino that can control the movement of each function available on this 'Study Portable'. At the same time, users do not have to be upset to see a table scattered with various types of products that have separate functions because this 'Study Portable' is already combined with the functions of steam fragrance, fan and LED lights on it.

The production of this project is based on the problems of students when reviewing lessons. For example, a student is reviewing a lesson in the room but the desk space is too narrow to place a table lamp if reviewing a lesson during the night, put a perfume like a scented candle and put a table fan at the same time. With this 'Study Portable', the narrow desk space is also able to have every element in one product, at the same time, it can also provide comfort to users such as providing lighting that is less painful to the user's eyes at night, avoiding unpleasant ventilation. and can avoid overheating temperatures. So, the process of designing and making project implementation by applying mechanical concepts is especially important when the combination of each element on one product is designed to facilitate the user.

### **2.21 THE CONCEPT OF MECHANICAL MOVEMENT**

When we refer to the Third Edition Hall Dictionary, movement is defined as an act of moving. In the Student Dictionary, the phenomenon of movement is defined as a moving state. Thus, as a whole movement can be defined as a state of moving from one point to another. Mechanical movement is a mechanism or system that allows goods to function, move or rotate automatically or manually. Mechanical movements are used in daily life to facilitate every work done by human beings. Mechanical movement is used to move one source of movement, referred to as input through a process to produce another movement, referred to as output.

## Principles of Mechanical Movement



Figure 2.21 Concept of Mechanical Movement

Mechanical systems used in ordinary daily life combine both linear and rotational movements to produce work. Mechanical movements can be produced manually, by engine or electric motor. Mechanical movement methods can be divided into 3 types, namely manual mechanical movement methods, engine and motor. The method of manual movement uses human energy to move an object such as using a hand drill. This 'Study Portable' uses a more interesting method of movement that is by using a remote control to move each function and element found in this project.

## 2.22 ARDUINO CONCEPT



Figure 2.22 Arduino Concept

Arduino is an open-source hardware and software, project and user community that designs and manufactures single board micro-controllers and micro-controller kits for building digital devices. Arduino boards are available commercially from the official website or through an authorized distributor. The Arduino board design uses a variety of microprocessors and controllers.

The board is equipped with a set of digital and analog input/output (I/O) pins that can be connected to various expansion boards ('shields') or breadboards (for prototypes) and other circuits. The board features a serial communication interface, including a Universal Serial Bus (USB) on some models, which is also used to load programs. The micro-controller can be programmed using the C and C++ programming languages, using a standard API also known as the Arduino language, inspired by the Processing language and used with a modified version of the Processing IDE. In addition to using the traditional compiler tool chain, the Arduino project provides an integrated development environment (IDE) and command line tools developed in Go.

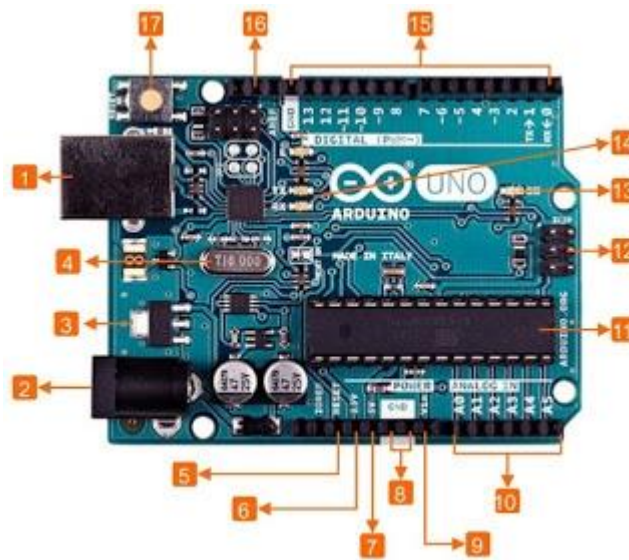


Figure 2.23 Parts on an Arduino Board

#### 1) USB Socket/Power USB

USB Socket/Power USB is used to supply power to the Arduino Board using a USB cable from a computer.

#### 2) Power (Barrel Jack)

The Arduino board can also be plugged in directly from the AC power source by connecting it to the available Barrel Jack. The maximum voltage that can be given to an Arduino is a maximum of 12volts with a maximum current range of 2A (So that the regulator does not heat up).

#### 3) Voltage Regulator

The function of the voltage regulator is to control or lower the voltage applied to the Arduino board and stabilize the DC voltage used by the processor and other elements.

#### 4) Crystal Oscillator

Crystal (quartz crystal oscillator), if the micro-controller is considered a brain, then the crystal is the heart because this component produces pulses that are sent to the micro-controller to perform an operation for each pulse. These crystals are selected that beat 16 million times per second (16MHz). Crystal oscillators help the Arduino in terms of time. How does an Arduino Calculate Time? The answer is, by using a crystal oscillator. The number written on the top of the crystal 16.000H9H means that the frequency of the oscillator is 16,000,000 Hertz or 16 MHz.

#### 5) 5, 17 Arduino Reset

We can reset the arduino board, for example starting a program from scratch. There are two ways to reset an Arduino Uno. First, by using the reset button (17) on the arduino board. Second, by adding an external reset to the Arduino pin labeled RESET (5). Note that this reset button is not for uninstalling programs or emptying the micro-controller.

#### 6) 3.3V (6) - Supply 3.3 output volts



7) 5V (7) - Supply 5 output volts

Most of the components used by Arduino boards work well at voltages of 3.3 volts and 5 volts.

8) GND (8) (Ground) - There are several GND pins on the Arduino, one of which can be used to connect the circuit ground.

9) Vin (9) - This pin can also be used to power the Arduino board from an external power source, such as an AC power source.

10) 10 Analog pins

The Arduino Uno board has six analog input pins A0 to A5. These pins can read voltages and signals generated by analog sensors such as humidity or temperature sensors and convert them into digital values that can be read by a microprocessor. The program can read the value of an input pin between 0 - 1023, where it represents a voltage value of 0 - 5V.

11) Main micro-controller

Each Arduino board has a Micro-controller (11). We can think of it as the brain of an Arduino board. The main IC (integrated circuit) on an Arduino is slightly different from one arduino board to another. The most commonly used micro-controller is ATMEL. We need to know what IC an Arduino board has before starting to program the arduino through the Arduino IDE. Information about the IC is located at the top of the IC. To know the detailed construction of an IC, we can look at the data sheet of the IC in question.

12) 12 pin ICSP

Mostly, ICSP (12) is AVR, a small programming header for Arduino that contains MOSI, MISO, SCK, RESET, VCC, and GND. This is often referred to as SPI (Serial Peripheral Interface), which can be considered as an "expansion" of the output. Actually, we install the output device to the SPI master bus.

In-Circuit Serial Programming (ICSP) The ICSP port allows the user to program the micro-controller directly, without going through the boot loader. Generally Arduino users do not do this so the ICSP is not overly worn even when provided.

13) Power LED indicator

This LED should illuminate when connecting the Arduino to a power source. If the LED does not light up, then there is something wrong with the connection.

14) 14 TX and RX LED's

On the Arduino board, we will find the labels: TX (transmit) and RX (receive). TX and RX appear in two places on the Arduino Uno board. First, in the digital pins 0 and 1, to indicate the pin responsible for serial communication. Second, TX and RX led

(13) The TX led will flash at different speeds when sending serial data. The flashing speed depends on the baud rate used by the arduino board. RX flashes during receiving process.

15) Digital I/O

The Arduino Uno board has 14 digital I/O pins (15), 6 output pins provide PWM (Pulse Width Modulation). These pins can be configured as digital input pins to read logic values (0 or 1) or as digital output pins to control modules such as LEDs, relays, and others. Pins labeled “~” can be used to generate PWM.

16) AREF

AREF stands for Analog Reference. AREF is sometimes used to set the external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pin.

### **2.3 PREVIOUS STUDIES/COMMENTS/INVESTIGATIONS**

Based on this project which is 'Study Portable', it seems that there is no other project similar to it except a project created separately. So, every element on this project i.e. fans, LED lights and steam fragrances are widely sold in the market with various attractive shapes. There are some agents who sell it at a reasonable price and also not as well as some of it does not work well no matter how much it costs.

Therefore, research in producing a project must be done carefully for the sake of each user who uses it. However, the production of a product is not as easy as expected

because apart from the factors that facilitate and speed up the work, quality factors must be taken into account. This is to prevent nothing bad from happening to the user while using the product. From that, the initiative was taken to develop this 'Study Portable' project by considering all these factors.

### 2.31 Portable Fan



Figure 2.311 Portable Fan

A portable fan is a fan that is not permanently attached to a wall or ceiling. Portable fans come in a variety of shapes and sizes from small, battery -powered fans that can be held in the hand to large box fans that aim to ventilate the entire room. By using a portable fan, it can be a great way to keep the air moving, moderate the room temperature and increase the use of air conditioning to save power. There are several different types of portable fans for example personal fans, box fans, window fans, pedestal fans and floor fans, among others.

Apart from that, this portable fan is also specially designed to be taken anywhere with its suitable size and light weight. Due to that, this portable fan has become an attraction for consumers to buy it in the market due to its usage function especially with the hot weather now. Therefore, this 'Study Portable' is equipped with a portable fan that has a special design on it.

## 2.32 Air Humidifier



Figure 2.321 Air Humidifier

Humidifier therapy adds moisture to the air to prevent dryness that can cause irritation in many parts of the body. Humidifiers can be particularly effective for treating dryness of the skin, nose, throat, and lips. They can also ease some of the symptoms caused by the flu or common cold. Humidity acts as a natural moisturizing agent that can relieve dryness.

For this reason, humidifiers are often used for relieving such as dry skin, sinus congestion/headache, dry throat, nose irritation, bloody noses, irritated vocal cords, dry cough and cracked lips. You may be prone to these discomforts when the air in your home is dry. This is especially common during winter months or when an air conditioner is being used during the summer.

Therefore, this water humidifier is applied into this 'Study Portable' project to provide comfort to users and can even treat dryness on the skin, especially when users, especially students, use it to review lessons no matter the day or night.

### 2.33 LED Lights



Figure 2.331 LED Lights



LED stands for light emitting diode. LED lighting products produce light up to 90% more efficiently than incandescent light bulbs. To avoid performance problems, the heat generated by the LED's will be absorbed into the heat sink. LED products use a variety of unique heat sink designs and configurations to manage heat.

An LED is a “directional” light source, which means it will emit light in a specific direction, unlike incandescent and CFL, for which it emits light and heat in all directions. This means LED's can use light and energy more efficiently in a variety of applications.

Therefore, the lighting from these LED lights is included in this project to provide comfort to users especially students to review lessons at night instead of using pendaflour lights which are very bright and can hurt the eyes.

## 2.4 ADVANTAGES AND DISADVANTAGES

### 2.41 PRODUCT

Product	Manufacturer	Material	Advantage	Disadvantage
	KL City,  Kuala Lumpur	ABS Plastic	<ul style="list-style-type: none"> <li>● Designed with LED light which has 3 brightness, which can be used for emergency light or night light.</li> <li>● Lightweight PC fan blade, super strong winds.</li> <li>● 270 degrees angle adjustable.</li> </ul>	<ul style="list-style-type: none"> <li>● Its low melting point makes it unsuitable for high temperature applications.</li> <li>● The fan diameter area is too large and the diffused wind is too strong for students to review the lesson.</li> </ul>
	KL City,  Kuala Lumpur	ABS + PP + Electronic original	<ul style="list-style-type: none"> <li>● With water tank-also can mist.</li> <li>● Double cool in summer.</li> <li>● <input type="checkbox"/> Low noise during operation.</li> </ul>	<ul style="list-style-type: none"> <li>● The available lights are insufficient to illuminate the table space.</li> <li>● Water storage can overflow if the water is poured incorrectly.</li> </ul>


	<p>KL City, Kuala Lumpur</p>	<p>ABS+PC +TPR</p>	<ul style="list-style-type: none"> <li>● Low noise during operation.</li> <li>● Adjustable 3 level wind power, low, medium and high.</li> <li>● USB charging, can be rechargeable</li> </ul>	<ul style="list-style-type: none"> <li>● The available lights are not enough to illuminate the entire space of the table.</li> <li>● The water tank is too small and can cause water to run out quickly.</li> </ul>
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Table 2.411

## 2.42 MY PRODUCT

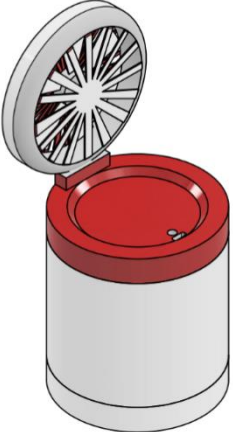
Product	Materials	Advantages	Disadvantages
	<p>Plastic</p>	<ul style="list-style-type: none"> <li>● Can be used for 1 hour.</li> <li>● The light of the lamp can illuminate the entire study table.</li> <li>● The size of the project corresponds to the size of the study desk space.</li> </ul>	<ul style="list-style-type: none"> <li>● Multiple economic costs could result from plastic pollution.</li> <li>● In order to recycle goods, we must use energy to clean plastic.</li> </ul>

Table 2.421



## 2.421 Conclusion

Based on the above research, we are confident that the project we are working on is able to provide more benefits and comfort to users to use it comfortably. Thus it can make it easier for users to review lessons or do work at the study desk with our project that is already complete to meet the comfort of users.

The material used is plastic. This is because plastic are durable, low cost, water-resistant, lower energy and heavy chemicals and are lightweight than glass. Plastic production is good, solid and also cheap. Plastics are very durable and will not stain or change color. These substances do not exist in nature, therefore, no natural organism can break them down at all. Chemical bonds in plastic materials cannot allow bacteria in nature. These substances are referred to as "xenobiotics."

## 2.43 INVOLVED BOOKS

Title	Author	Advantage	Disadvantage	Recommendation
OHA Portable Fan	-MR. BRYAN HEE TZE KEON - MOHAMMED AIMAN BIN ASRAF, OSAMALADEN BIN ZAINAL ABIDDIN -	<ul style="list-style-type: none"> <li>● With a fan speed that can provide coolness to users</li> <li>● power bank</li> <li>● sound sensor</li> <li>● LED lights.</li> </ul>	<ul style="list-style-type: none"> <li>● Just focus on camping activities.</li> <li>● Battery life is likely to run out quickly because there is a function as a power bank on it.</li> </ul>	<ul style="list-style-type: none"> <li>● Adds more charging on the power bank for mobile devices carried while camping.</li> </ul>

	MUHAMMAD HAZIQ BIN HUSAINI			
Re-design of a portable fan	- Erica Ivegren - Karin Gustafsson	<ul style="list-style-type: none"> <li>● Table fan owns the values of Scandinavian design.</li> <li>● Concepts were refined with methods like mock-up models, CAD and computer renderings.</li> </ul>	<ul style="list-style-type: none"> <li>● Only reserved for users from Scandinavia only in terms of its design that follows the interior design of their home.</li> </ul>	<ul style="list-style-type: none"> <li>● Make a variety of designs to better adapt the conditions around the user other than the interior design of the house.</li> </ul>
A portable fan-based device for evaluating lung function in horses by the forced oscillation technique	-Davide Bizzotto -Stefano Paganini -Luca Stucchi -Matteo Palmisano -Avallone -Esther Millares Ramire -Pasquale P	<ul style="list-style-type: none"> <li>● A small micro-controller-based electronic board for controlling the fan and measuring flow and pressure.</li> <li>● An optimized data processing algorithm.</li> </ul>	<ul style="list-style-type: none"> <li>● Using a servo-controlled ducted fan.</li> <li>● It is very large and not suitable for a study desk.</li> </ul>	<ul style="list-style-type: none"> <li>● Use a smaller fan or one that is more suitable for the area where the fan is to be placed.</li> </ul>

	Pompilio			
	-Francesco Ferrucci			
	-Jean-Pierre Lavoie			
	-Raffaele L Dellacà			

Table 2.431

### 2.431 Conclusion

In conclusion, we get suggestions from previous project-related studies to improve our implemented projects to provide full better benefits and be able to outperform other products.

## 2.5 SUMMARY

In conclusion, this chapter tells about previous studies and investigations on this 'Portable Study' project. Through previous studies, there are three types of elements found in this 'Study Portable' project that have different concepts and mechanisms. From the reference, the functions of each of these elements are not only used to facilitate and provide comfort to the user but can also help in terms of less painful lighting, clean ventilation and reduce hot temperatures. However, more research and testing is needed to gain a better understanding to produce this project. It is important to conduct more research on the results and reasons why previous projects were created for community use.

## **CHAPTER 3**

### **METHODOLOGY**

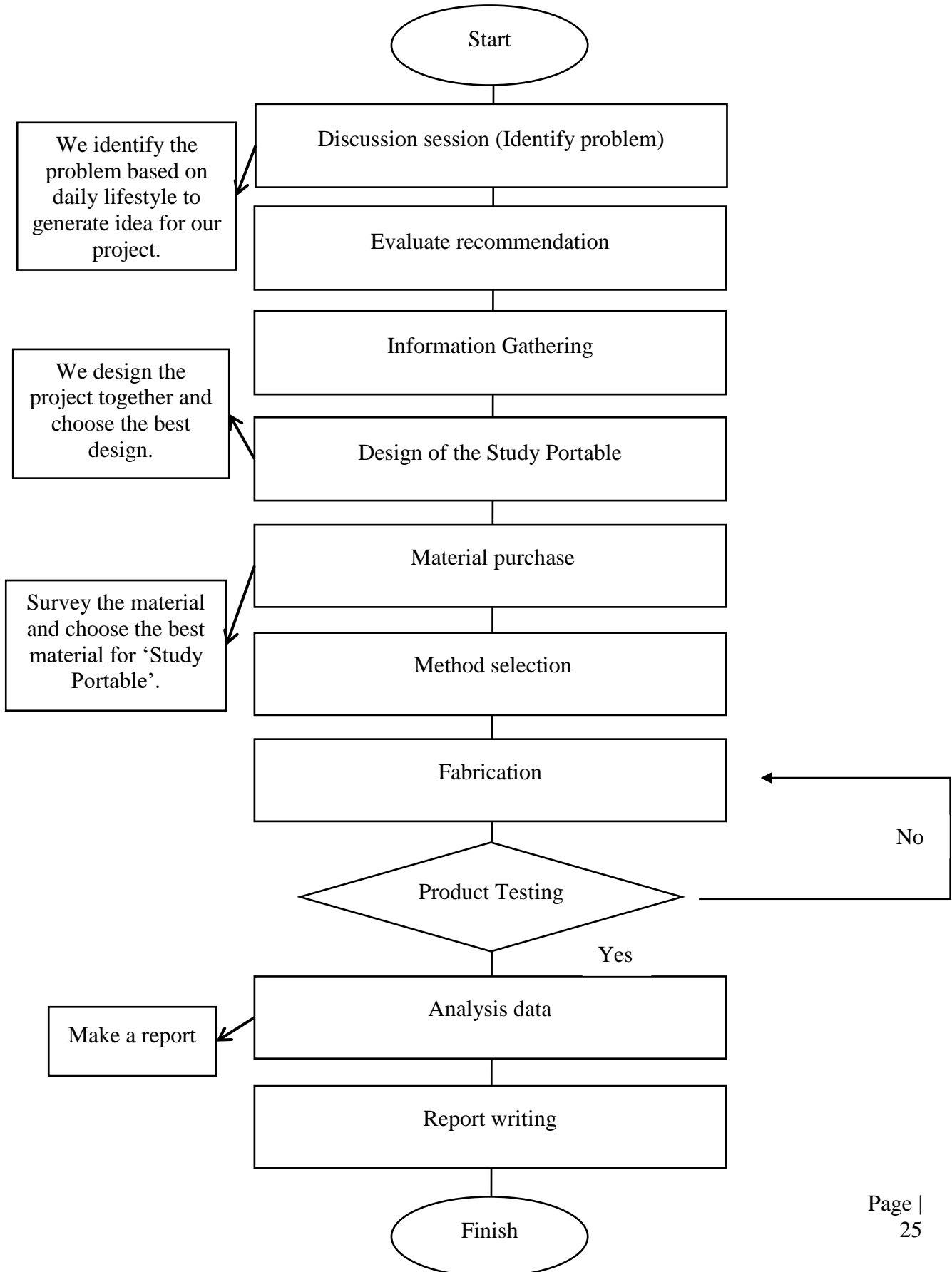
#### **3.1 INTRODUCTION**

In this section there is information on the study design concepts used in this project. In addition, the project production method is also described step by step. There are problems that will be encountered when producing this project and there are also techniques that can be used to overcome those problems. In addition, the engineering drawings along with the project size, materials used, component parts and functions are described in detail and are easy to understand. Next, we also provide a table for the estimated costs that will be spent to produce this project.

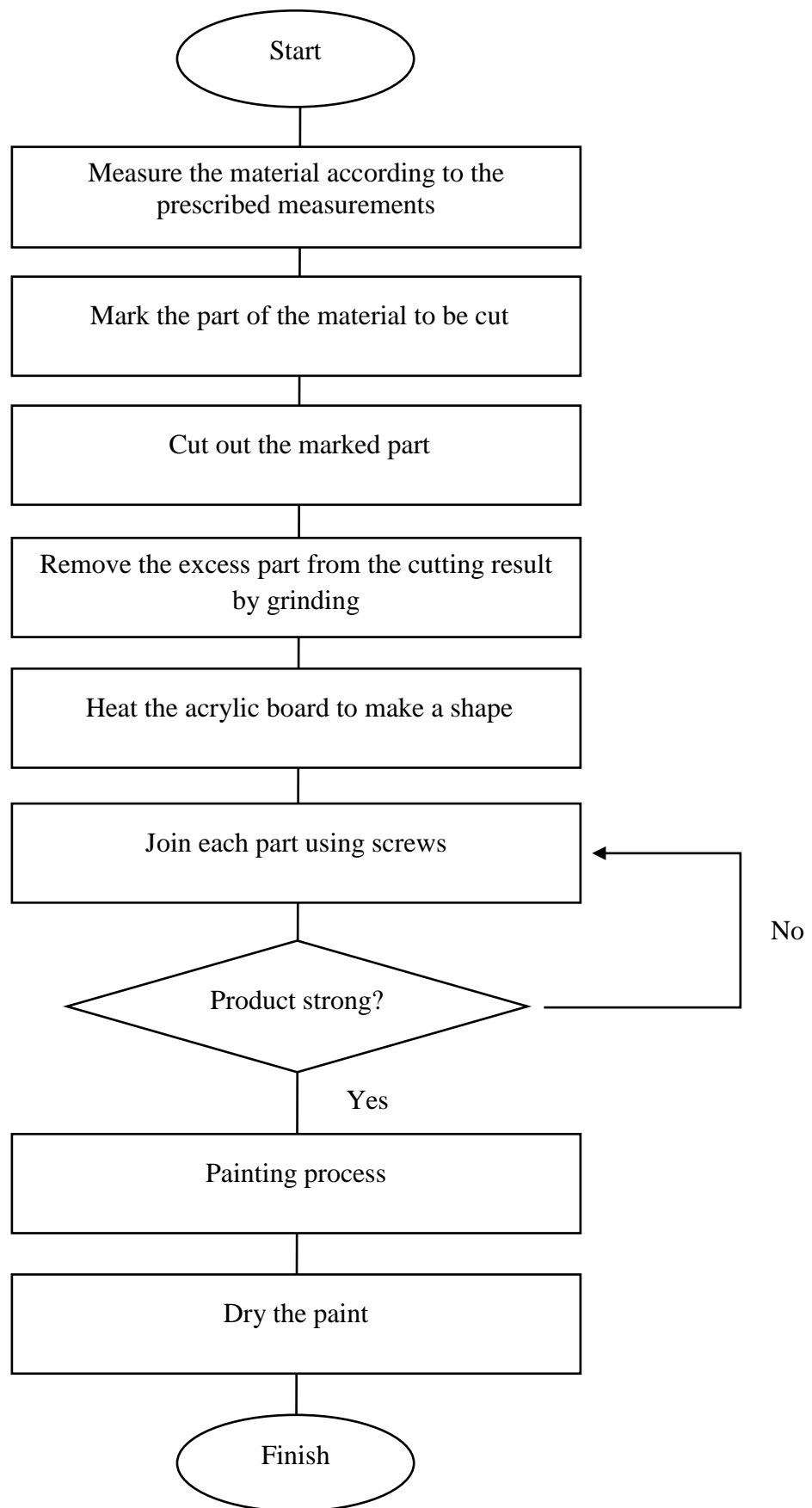
There will be a lot of information about the process and journey through out the making of our final project. There will be flow chart showing the process of us making the whole project. Our project flowchart will explain the processes we took.

## 3.2 FLOWCHART

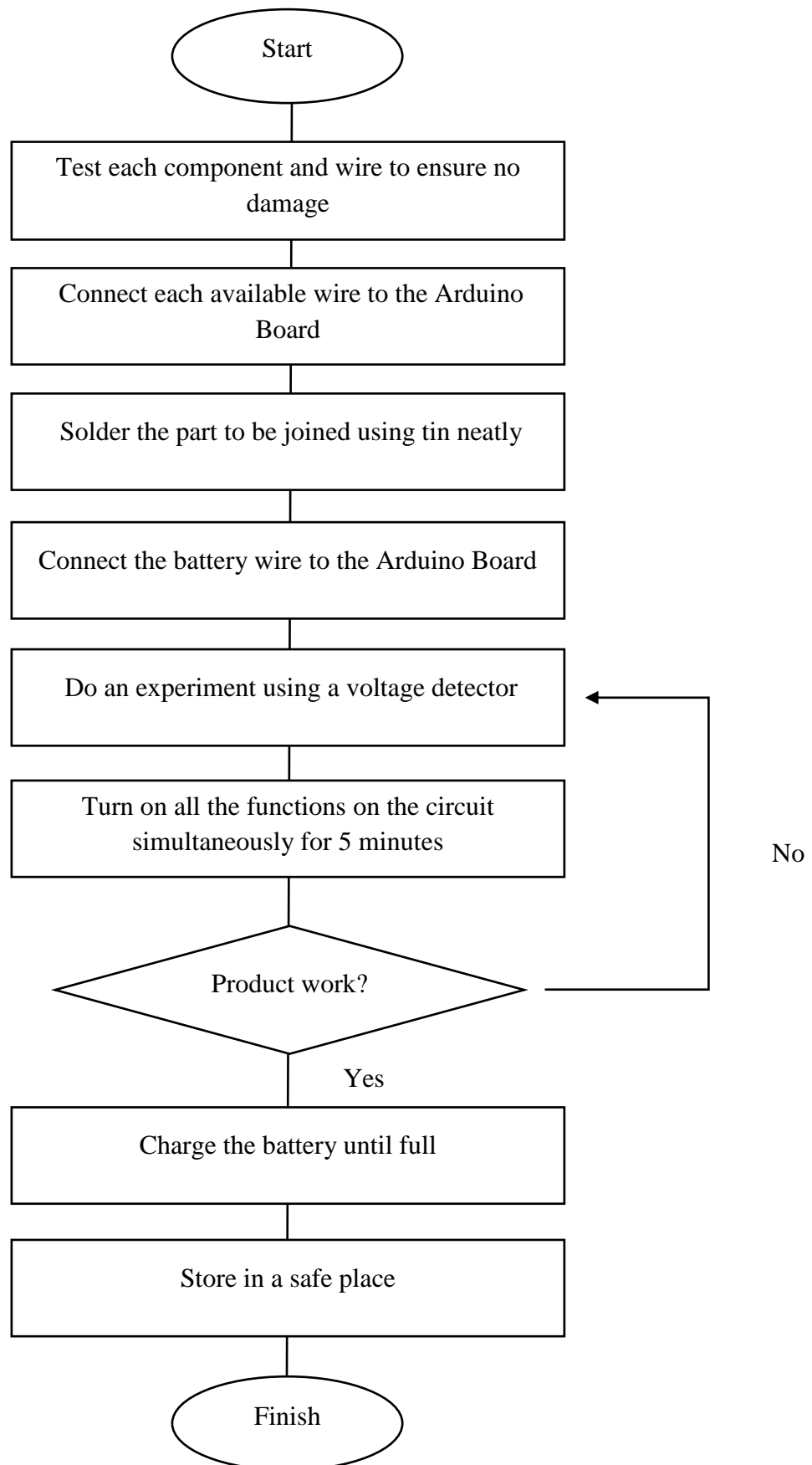
### 3.2.1 Project Flowchart



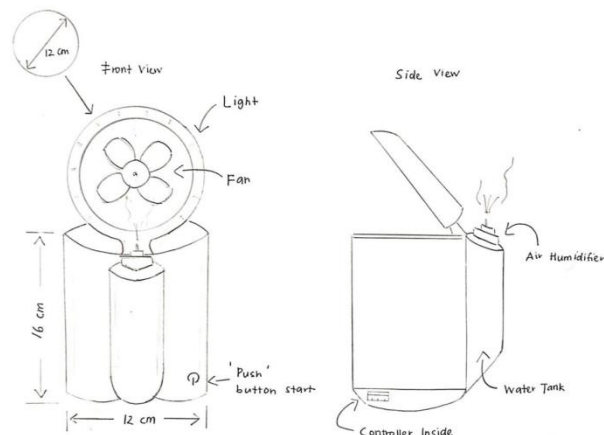
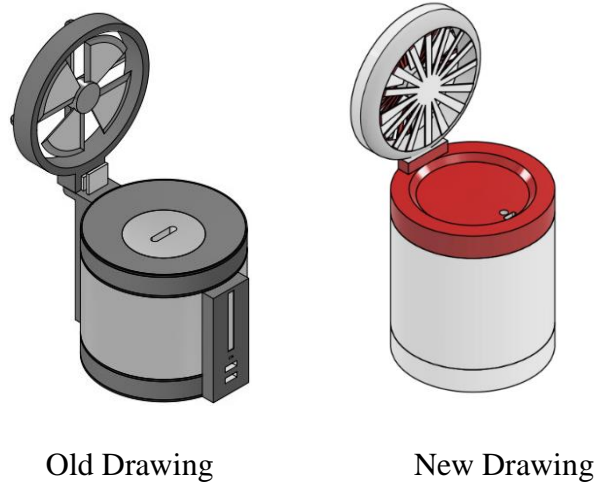
### 3.22 Mechanical Flowchart



### 3.23 Electrical Flowchart



### 3.3 PROJECT DESIGN



#### Sketching

Figure 3.31 Drawing and Sketching

This study was carried out using a quantitative design. We have distributed various types of questionnaires in the form of soft copy and hard copy especially to students living in hostels or rental houses. This is to help us to gather information about the problems that are often faced by each student when reviewing lessons. Most of the answers we got from the questionnaire were the lack of space to place various portables on the study table and there were also those who said they were less comfortable when



reviewing lessons. With the findings from this study we have discussed to produce a project that can overcome the problem with the creation of a portable study.

### **3.31 METHODS/PROCESSES/TECHNIQUES OF PROJECT PRODUCTION**

#### **3.311 Body Process**

1. Measure the area of the acrylic board using an iron ruler before making markings to ensure that the area of the board is sufficient for use. By using this method we can reduce the material used because we can estimate each board area used.
2. Mark the acrylic board using a brightly colored permanent marker pen so that the marked effect is not easily lost and easy to see during the cutting process.
3. Cut the acrylic board using a fine saw according to the marked lines. Leave a distance of 3-5mm from the actual line distance to prevent the cut from hitting the marked part.
4. Remove the excess portion that has been left using a flat grinder until it touches the marker line. This process is to ensure that we get the correct board measurements without any defects.
5. Heat the acrylic board that has been cut using fire to facilitate the formation of the board into a cylindrical shape. Be sure to use a mold during the molding process.
6. Leave the formed board for 10 minutes for the process of cooling and re - hardening.
7. Paste each part of the project that has been cut and shaped based on the project sketch

### 3.312 Electric Process

1. Test all electrical components to be used using a voltage detector
2. Assemble all electronic components
3. Test all electrical components to be used using a voltage detector
4. If all the electrical components are working properly start the process of cutting the ends of the wires to be connected to the components
5. Provide 3 positive wires to be connected on the Arduino board with all the components of the lamp, fan and water humidifier.
6. For the negative wire for each lamp component, the fan and water humidifier need to be connected to the breadboard.
7. Then take the male-to-male jumper pin wire and connect it directly between the Arduino board and the Arduino Bluetooth Module
8. Connect the power supply wire from the Arduino board to the battery to ensure that the circuit and components work properly.

### 3.4 MATERIALS AND EQUIPMENT

#### 3.4.1 Engineering Drawing

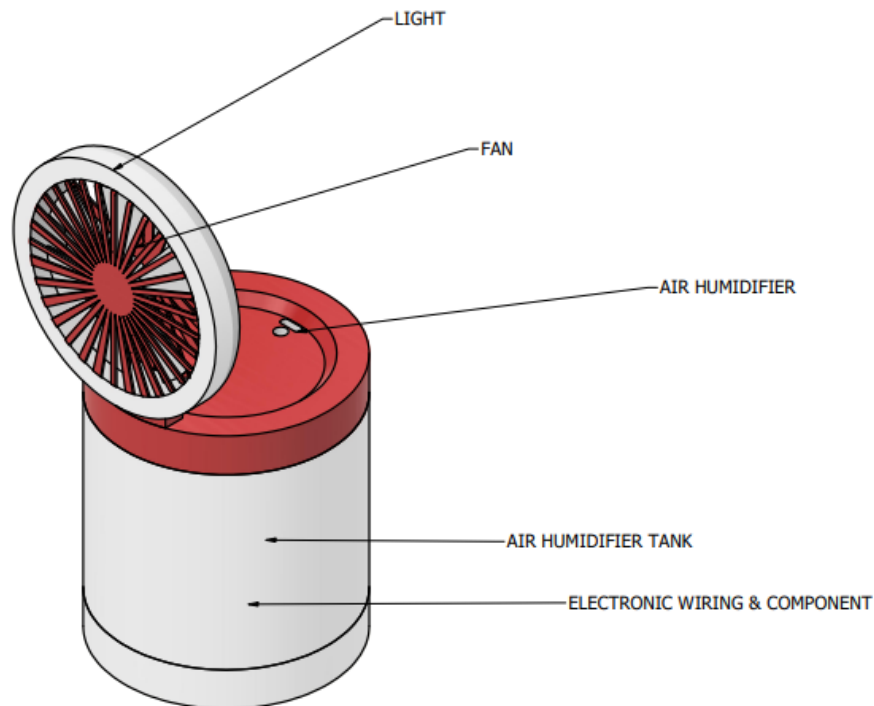


Figure 3.411 Product Design

The new design for the project was made after getting advice and suggestions from project experts, especially in relation to the 'Study Portable' project. New design changes on this project with the old design are not too many.

Among the changes made is on the fan frame. The fan frame can be seen differently from the old design fan frame. In addition, the new design on the fan can be seen where the fan part is directly connected to the part where there is a water space for the humidifier, while the old design shows the fan connected to a frame located on the side of the project body.

In other parts, there are not many changes except the changes made at the end of the time when creating the project and testing the project. Apart from that, there are no other changes between the old design and the new one.

3.42 Product Size

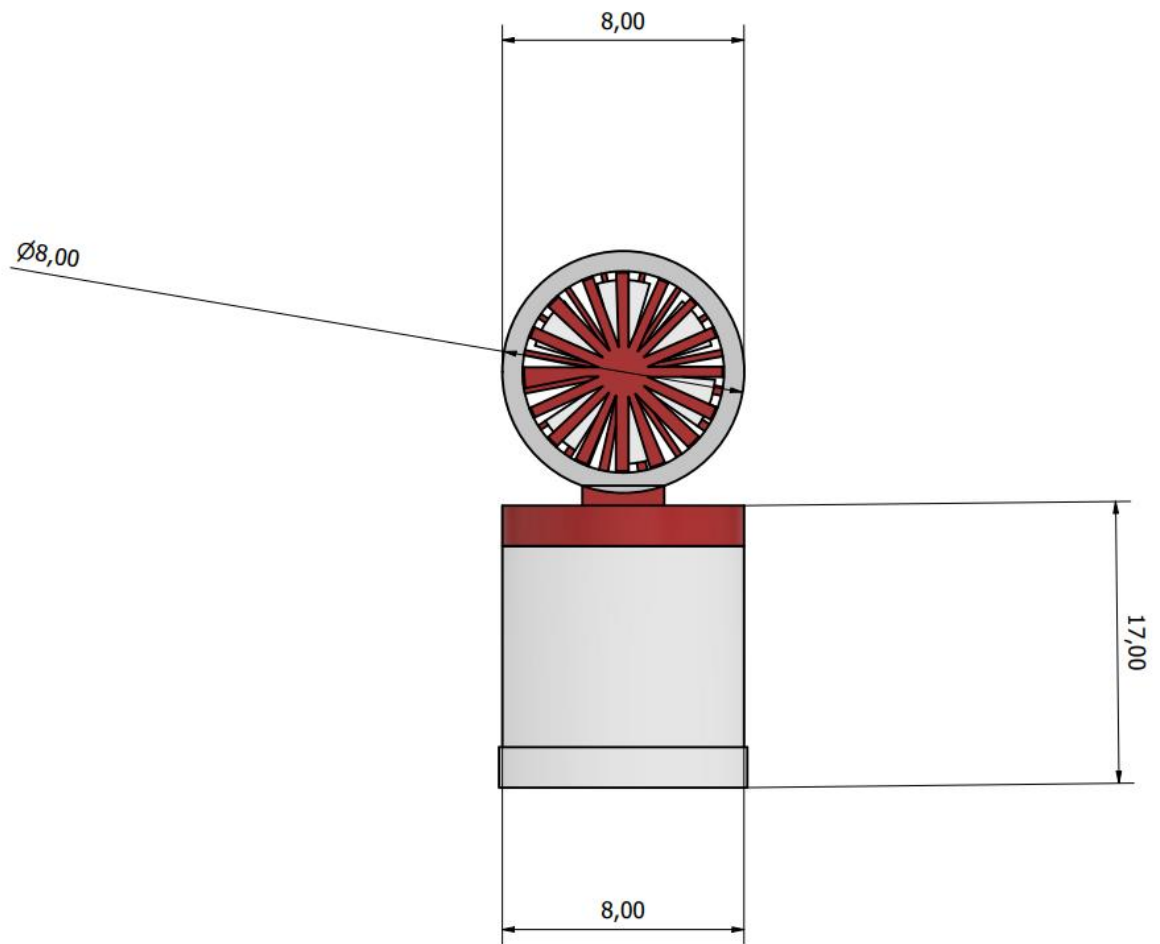


Figure 3.421 Size of Product

3.43 Function

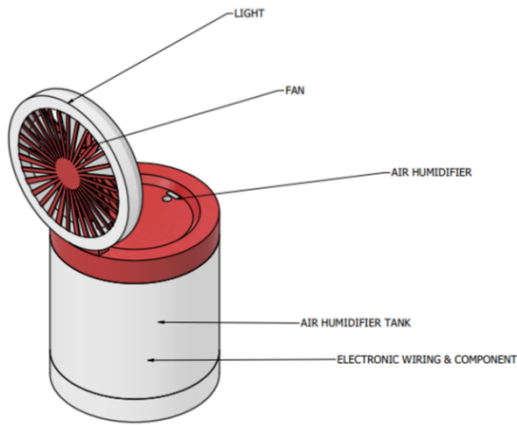


Figure 3.431 Project

Table 3.431

<b>FUNCTION</b>
This fan is a device that has blades that can rotate to move the wind so that the room feels comfortable and cool.
Air Humidifier is an air deodorizer and humidifier that sprays water vapor into the air. The use of a humidifier not only keeps the air humidified, but can also help overcome the irritation triggered by dry air.
This section has a port to recharge this portable study. In addition, there is also a USB port that can supply electricity for the use of gadgets and items that provide USB wire as a source of electricity.
For this part we will use LED lights that will surround the project so that light can be emitted at every corner.

### 3.44 Equipment Cost

No.	Equipment	Quantity	Price (RM)
1.	Soldering iron set 240v 60w solder	1	22.00
2.	Cutter	1	2.00
3.	Hot glue gun	1	15.00
4.	Steel ruler	1	2.80
5.	Sand paper	1	3.00
6.	Steel file	1	10.00
7.	Voltage detector electric Non-contact pen tester	1	7.99
			<b>TOTAL: 62.79</b>




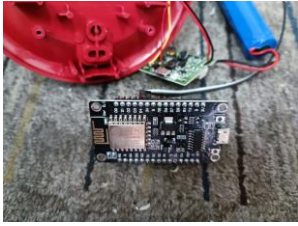
Table 3.441

### 3.45 Material Cost

No.	Material	Quantity	Price (RM)
1.	18w Battery	1	10.90
2.	Bluetooth Module HC-05 HC05 Arduino Wireless Serial Port	1	13.80
3.	Dupont 40 Pin Jumper Wire Male to Male	1	2.80
4.	Half-Size Breadboard	1	2.40
5.	Arduino Serial IIC Liquid Crystal Display Module LCD 2004	1	22.50
6.	ARDUINO UNO REV3 R3 Compatible ATMEGA328 16U2 CH340 USB	1	39.90
7.	Soldering Wire Lead	1	8.00
8.	Portable Cooling Fan	1	11.50
9.	Air humidifier	1	8.99
10.	Led Strip Light 220V	1	9.81
11.	A3 Size Acrylic Sheet	1	12.00
12.	PVC Rigid Sheet	1	6.90
13.	PVC Model Board	1	16.90
			<b>TOTAL: RM 166.40</b>

Table 3.451

### 3.5 FABRICATE

No.	Part	Step
1	<p>Fan</p> 	<ol style="list-style-type: none"> <li>1. Measure the fan cover</li> <li>2. Buy a fan blade that fits the size of the casing</li> <li>3. Punch the fan cover to place the fan motor.</li> <li>4. Install the fan motor on the back of the fan cover.</li> <li>5. Inserting the fan blade on the motor shaft.</li> <li>6. Glue the fan blade to the motor shaft to make it stronger.</li> <li>7. Install the negative and positive wires on the motor</li> </ol>
2	<p>Light</p> 	<ol style="list-style-type: none"> <li>1. Arrange each LED bulb on the board.</li> <li>2. Solder each leg of the LED on the board.</li> <li>3. Connecting the wires on the board</li> </ol>
3	<p>Air Humidifier</p> 	<ol style="list-style-type: none"> <li>1. Provide a cylindrical water tank in the body of the project</li> <li>2. Glue the base of the tank to the bottom of the project so that it does not move</li> <li>3. Insert the suction pipe into the water and attach it to the water sprayer.</li> </ol>
4	<p>Port Charge</p> 	<ol style="list-style-type: none"> <li>1. Stick the charge port on the front of the project.</li> <li>2. Connect the LED light to the wire between the battery and the charge port to detect whether the battery capacity is full or low.</li> <li>3. Connect the charge port circuit on the Arduino board.</li> </ol>

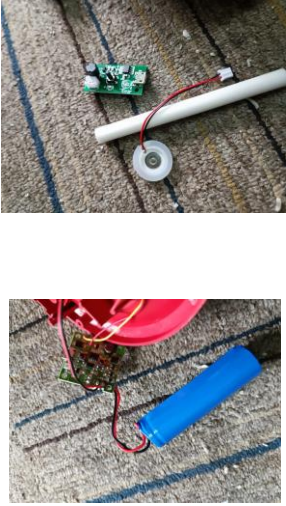

		
5	<p style="text-align: center;">Body</p> 	<ol style="list-style-type: none"> <li>1. Drawing the shape of the project according to the measurements that have been set using Cura software.</li> <li>2. Install the drawing on the 3D printing machine.</li>   <li>3. Join the parts that have been printed to make a body.</li> <li>4. Color the project using a spray.</li> </ol>

Table 3.51

### 3.6 DATA ANALYSIS METHODS

Every project that is implemented and done must have its own advantages and disadvantages. After completing the manufacturing process and testing on this project, it was found that this Portable Study With IoT has several advantages and disadvantages. Among the advantages of Study Portable With IoT is as stated in the objective that Study Portable With IoT can help and facilitate students to study more comfortably with good ventilation and sufficient light assistance to study in the dark because it supplies LED light, water humidifier , mini fan and powerbank. As noted during the testing of Study Portable With IoT with other learning aids, it was found that Study Portable With IoT provides many necessary requirements when studying. In addition, Study Portable With IoT is also easy to maintain because its design makes there are parts that can be opened and reassembled easily. Next, this Study portable With IoT also has space at the top to open and fill with water and fragrance for the humidifier water function. Furthermore, with the design featured the mini fan design



designed at the top is to give good fan orientation to the user. While the design of the lamp with a wide size provides good lighting in dark environments. The disadvantage of Study Portable With IoT is the battery. This is because it has an 18v powered battery which will cause difficulty for the user to recharge within 4 hours for a full charge so that it can be used again. But this problem can be achieved because the project can also be used during recharging.

### **3.7 SUMMARY**

In this conclusion, the statement of the problems encountered can be achieved through the objectives that have been stated. Therefore, with this 'Portable Study' can provide benefits to everyone, especially for students when doing school work. After researching the study methodology, a lot of information can be gathered about the Portable Study. This information provides a reference on the design concept, dimensions and cost estimates that will be used in the production of the project.

## **CHAPTER 4**

### **RESEARCH AND DISCUSSION**

#### **4.1 INTRODUCTION (FAWWAZ F1009)**

This chapter will address the benefits and standards used, as well as research recommendations for the Portable Study. The test findings of the experimental design have shown a favorable effect on users. In addition, to see whether the selected material is suitable and successfully meets the goals we set, so that the project is successful and get positive feedback from users.

#### **4.2 RESEARCH (AINNUR F1020)**

After completing the questionnaire using google form and then given to the public, through the questions asked, it is proven that many students in particular who experience discomfort while studying and reviewing lessons at their desks. Therefore, the creation of this project that is 'Study Portable' is able to help students in overcoming problems encountered while studying. The response given was also satisfactory enough to assist in implementing this project. So, the questions related to this implemented project are as follows:

1. Pernahkah anda mengalami masalah ruang sempit di meja belajar anda dengan peralatan elektrik?  
26 responses

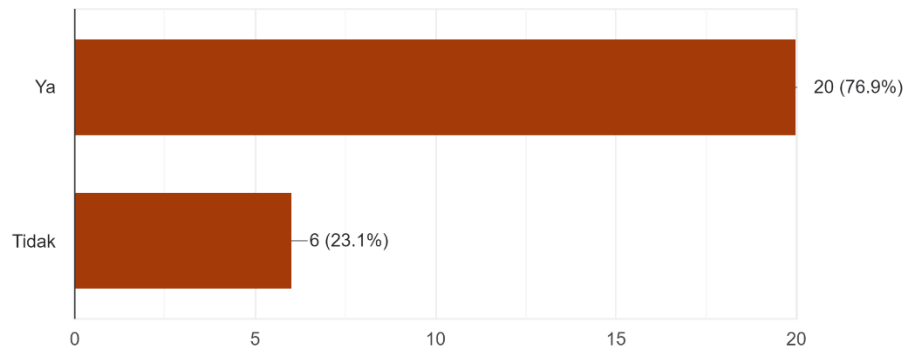


Figure 4.21

The data obtained above shows that more consumers are experiencing the problem of narrow desk space due to numerous electrical appliances.

2. Adakah anda mengalami masalah ketidakselesaan semasa belajar dalam suhu bilik?  
26 responses

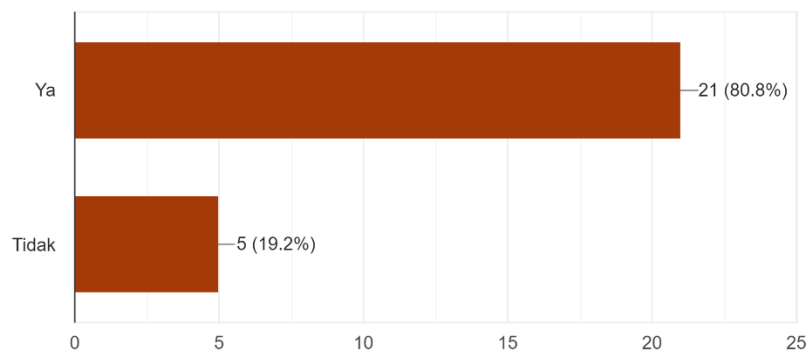


Figure 4.22

These data suggest that many have difficulty learning in hot ambient temperatures. This is because the room environment has a slightly warmer temperature unless there is air conditioning installed.

7. Adakah penglihatan murid sedikit kabur semasa belajar kerana kekurangan pencahayaan?  
26 responses

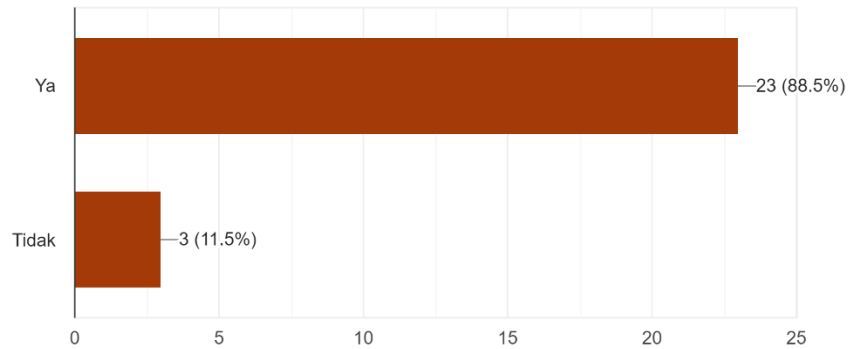


Figure 4.23

Based on the above data proves the lighting faced by students every time they study is not bright enough for the size of their study desk. Apart from that, the students' eyes will also be more blurred due to less light.

9. Adakah pencahayaan daripada lampu LED mampu memberikan cahaya yang mencukupi untuk digunakan semasa belajar pada waktu malam?  
26 responses

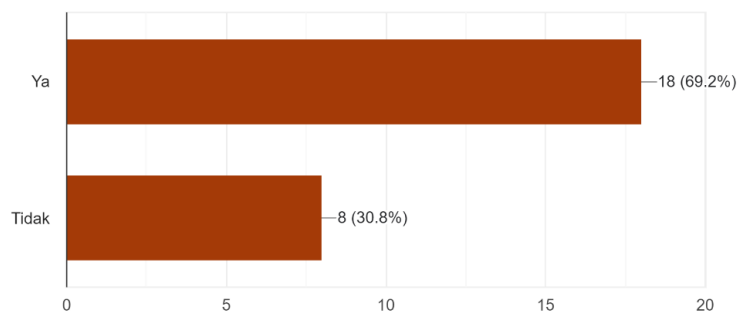


Figure 4.24

The above data shows that LED lights are able to provide adequate illumination while studying and reduce the problem of blurring in the eyes while studying at night.

10. Jika 'Study Portable' ini dikeluarkan di pasaran, adakah anda akan membelinya?  
26 responses

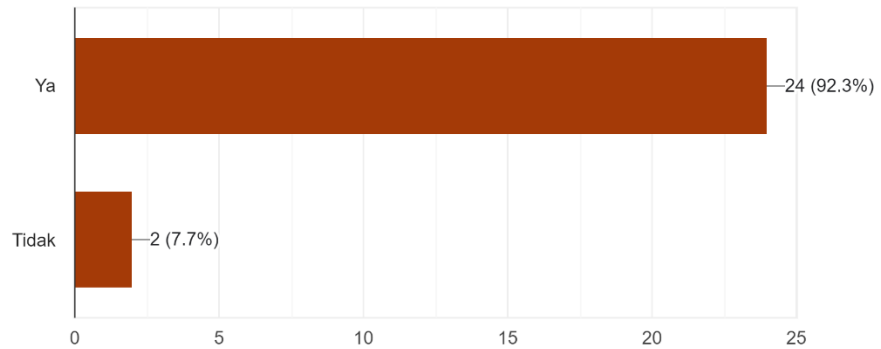


Figure 4.25


Based on the feedback that has been collected, the implementation of this 'Study Portable' project is likely to get a warm response if this project is marketed because it meets the desired characteristics and can get a lot of demand if marketed.


#### 4.3 PRELIMINARY DATA (AINNUR F1020)

Product	 Product A	 Product B	Selection
Level Speed Fan	1 speed control 2 Fan	3 wind speed	Product A because there is only one level speed fan hat is suitable for use when studying.

Material	Acrylic ABS	Plastic	Product A because acrylic is suitable for products that are light but easy to scratch, but product B is easy to break and crack.
Power Source	Micro USB	Battery, USB, Vehicle Power Supply	Product B because it has a long-lasting battery, USB to charge easily and can be charged in the car.
Volt & Battery & Charging	5V (USB Charging in car) 24V 1200mAh	5V 2400mAh	Product A because the voltage can support its use for a long time.
Level Brightness	1 Level	No Light	Product A because it has light just not bright enough.
Product Size	105 x 220 x 160 mm	105 x 130 x 225 mm	Product A because the size is suitable for the study table area.
Suitable for study time and study desk environment.	The size is suitable but it is too small because there are 2 fan and no air humidifier.	The size is suitable, there is no light and it has an air humidifier.	Product B because it has a fan and air humidifier which is suitable for studying but no light.

Table 4.31

<b>4.4 TESTING (FAWWAZ F1009) Body Part</b>	<b>Testing</b>	<b>Result</b>
<p>Mini Fan</p>	<ul style="list-style-type: none"> <li>- using phone control by Blynk application this fan has 3 level.</li> <li>- Level 1 can be felt around table area but unable to provide maximum cooling.</li> <li>- Level 2 offers a medium fan speed and its suitable for used to study on the desk. Cover about (1 meter) in the area</li> <li>- Level 3 has the highest speed of fan level and it can cooling the study area. Cover around (1-2 meter) in the area.</li> <li>- using too much battery if turn on to level 3 and only last about 2 hours 15 minutes (if this is the only function that been used).</li> </ul>	

<p>LED Light</p>	<ul style="list-style-type: none"><li>- same method as mini fan to control this light and has 2 level to provide the brightness.</li><li>- Level 1 the light is bright enough to study because it can cover all the study desk area.</li><li>- Level 2 more bright than level 1 and it can cover between 1-3 meter in the study area.</li><li>- also using too much battery and only last for 2 hour 15 minutes if this is the only functions that been using.</li></ul>	
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<p>Air Humidifier</p>	<ul style="list-style-type: none"> <li>- still using the same method to control this air humidifier but no level that provided.</li> <li>- About less than 5 minutes it can provide freshness on the study desk area.</li> <li>- After more than 10 minutes it can provide the persistent freshness in the room if it still on working but if it not it takes 1 hours before the freshness is gone.</li> <li>- The water tank takes 24 hour before running out of water.</li> <li>- Not using too much battery and it can be last more than 3 hours. (if just this functions that been used.)</li> </ul>	
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Table 4.41

From the observations we got after undergoing testing on this 'Study Portable' project, this proved that the desired objective was achieved and even functioned well despite experiencing some shortcomings.

#### **4.5 RECOMMENDATION (FAWWAZ F1009)**

A suggestion that can be obtained is to find a more suitable design method such as medium and light size so that it can be easily carried anywhere. Another suggestion is that the Study Portable design can be combined with a gps tracker to facilitate the search if lost due to theft. This can improve the security system and solve the problem of loss.

#### **4.6 SUMMARY (FAWWAZ F1009)**

Based on the chart, we can conclude that there is a large percentage of people that receiving our products. Furthermore, they gave a good response about the importance of producing this product. This can develop our product with more confidence and improve in terms of the shortcomings found in this product. As a result, if this product is successfully marketed, not only it could satisfy especially consumers but it can develop a new innovation to the future.

## **CHAPTER 5 CONCLUSION**

### **5.1 INTRODUCTION**

This chapter will display the conclusion of the study as a whole and state the recommendations that can be implemented in the future in relation to how to continue the study results on this 'Portable Study' project. The focus of this study is to provide full comfort to users, especially students who want to review lessons.

This project is also specially created in terms of the environment aspect of the learning desk space which also has an impact on the creation of the design on this project. Among the functions found in this 'Study Portable' project is having an LED lamp, which is able to provide lighting with a brightness level that can be selected by the user according to the suitability when studying.

In addition, there is a fan measuring 5cm in diameter, which helps to provide a comfortable breeze to the user rather than experiencing a hot room temperature and even reduces the feeling of sweating when studying. Next is the air humidifier which is able to refresh the learning space and even provide comfort to the user's sense of smell when studying and there is also a USB rechargeable that helps recharging this project and at the same time makes it easier for the user to use it.

## 5.2 CONCLUSION

The conclusion that can be highlighted is that this project was well received by all users who tried this 'Study Portable' project even though there were some problems that occurred at the end of time when presenting this project to the panel and the public where the problem that occurred was the humidifier water that was not can be closed tightly due to several factors involving the circuit connected to the humidifier water cover and the unevenness of the cover.

After doing research on this project through evaluation from the public, it turns out that this project can help solve the problems faced by students who experience problems when studying in their own study room in terms of a slightly strong wind that provides comfort to reduce the room temperature, lighting that is not painful to the user's eyes and also a pleasant smell.

The original objective that was released can be said to have been successfully achieved because it was able to implement this project by observing all aspects of the project, therefore answering the objectives that we wanted when implementing this project.

### **5.3 IMPROVEMENT SUGGESTION**

The suggested improvement that can be implemented in this project is to modify the humidifier water cover in a more creative way that is able to cover the water hole so that it is not easily detached or come out when in use. Next is the part of the bottom of the project where it is less strong and easy to detach and where the part of the connecting circuits is on that part. The part can be changed by making a design from stronger materials or making 3D printing according to the appropriate size of the project site to look more attractive and most importantly strong.

Apart from that, polytechnic students who want to continue improving this project as their final year project in the future can also rework some parts of this 'Study Portable' project. Among them are making an interesting pattern or design on the body of the project to make it look interesting, making new coding which can change the level of speed, light and vapor fragrance that comes out on the project, changing the size of the project to be a little bigger and the shape of the project different from the others to large designed study table space for many users and add new functions that can attract users to buy it if in the market.

## 5.4 SUMMARY

In this chapter, the main reasons, objectives, problems and scope of the 'Study Portable' project have been told during the implementation process. However, everything should be entered with security. Every mechanical and electrical project needs to have a safety aspect before being marketed to users by doing a thorough study or getting advice from experts. This is to prevent accidents to users and quick damage to the project.

Each project developed has its own importance and objectives, as is the case with our 'Study Portable' project. Although there were some shortcomings in the beginning, we have succeeded in achieving the original objective. Based on the above conclusions, this project can be well received by the users who try it. This is because, their need to review lessons in their study desk space has already been fulfilled by us and even helped lighten their burden from experiencing too many electronic items at one time on their study desk.

Therefore, we hope that this project can be continued by the upcoming mechanical major students to rework and improve this project so that it can be accepted by all users and get commercialized widely. At the same time, we can contribute and help in terms of developing the Malaysian economy with the production of greater innovation.

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## **ATTACHMENT**

ATTACHMENT I	Gantt Chart FYP 1
ATTACHMENT II	Gantt Chart FYP 2
ATTACHMENT III	Project Cost Estimates
ATTACHMENT IV	Drawing
ATTACHMENT V	Project Picture
ATTACHMENT VI	Flowchart



## GANTT CHART FYP 1

WEEK/ PROJECT ACTIVITY	S T A T U S	M	M	M	M	M	M	M	M	M	M	M	M	M	M
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Project briefing.	P	█	█												
	A	█	█												
Brainstorming.	P	█	█	█											
	A	█	█	█											
Presentation of ideas.	P				█										
Project title selection.	A				█										
Introduction of the project  - Define Problem Statement. - Identify project objectives - Project scopes and limitations - Identify project title	P					█	█	█							
	A					█	█	█							
Organize and write the project proposal.	P					█	█	█	█	█	█	█	█	█	█
	A					█	█	█	█	█	█	█	█	█	█
Preparation of Chapter 1.  Introduction.	P						█	█							
	A						█	█							
	P						█	█	█						

Preparation of Chapter 2. Literature Review.  - Include at least 5 cases. - Citation from references.	A																		
Preparation of Chapter 3. Project Methodology.  - Define specific research and method used - Able to specify the project scope and the significance to mankind - Design and develop product	P																		
	A																		
Project proposal presentation.	P																		
	A																		
Propose solutions through logbook and planning for Project 2.	P																		
	A																		

Legend:

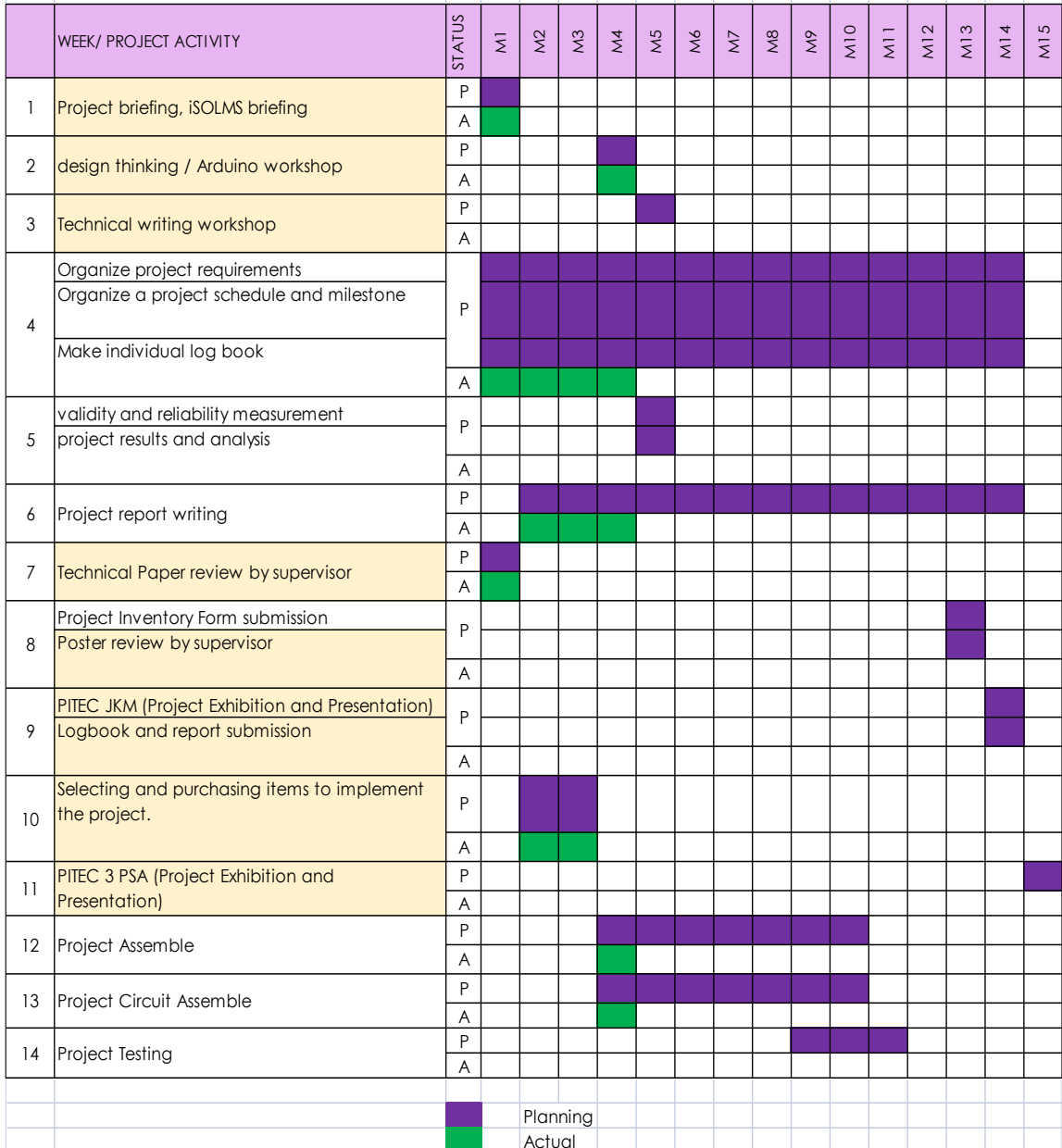


## GANTT CHART FYP 2



GANTT CHART

SESSION : 1:2022/2023  
 DEPARTMENT : MECHANICAL ENGINEERING  
 CODE/COURSE : DJJ50193 PROJECT 2

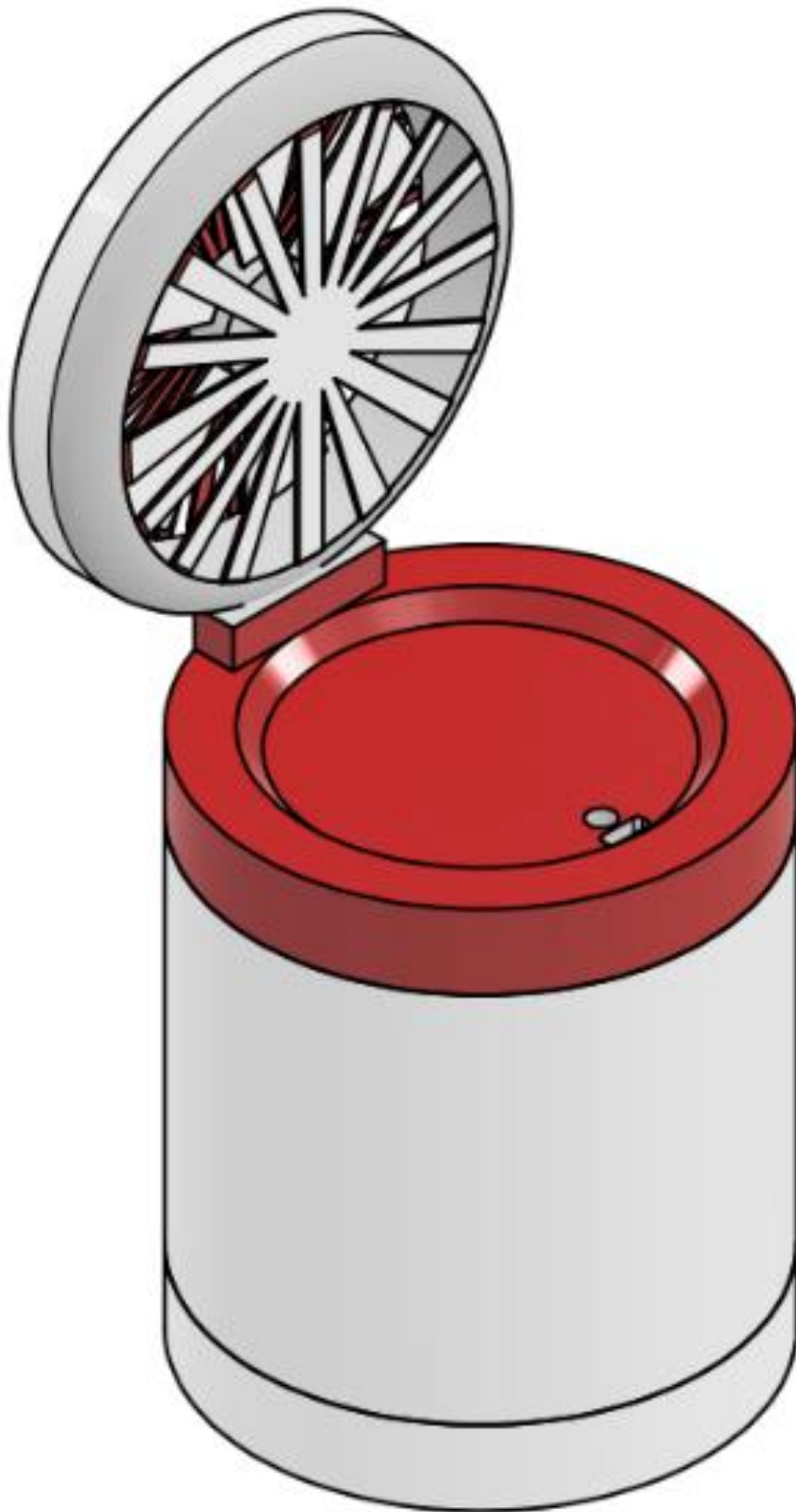


## PROJECT COST ESTIMATES

NO	NAME	COST (RM)
1	Material <ul style="list-style-type: none"> <li>– 18w Power Bank Fast Charge Module Two-Way Support</li> <li>– Bluetooth Module HC-05 HC05 Arduino Wireless Serial Port</li> <li>– Dupont 40 Pin Jumper Wire Male to Male</li> <li>– Half-Size Breadboard</li> <li>– Arduino Serial IIC Liquid Crystal Display Module LCD 2004</li> <li>– ARDUINO UNO REV3 R3 Compatible ATMEGA328 16U2 CH340 USB</li> <li>– Soldering Wire Lead</li> <li>– Portable Cooling Fan</li> <li>– Air humidifier</li> <li>– Led Strip Light 220V</li> <li>– A3 Size Acrylic Sheet</li> <li>– PVC Rigid Sheet</li> <li>– PVC Model Board</li> </ul>	166.40
2	Equipment <ul style="list-style-type: none"> <li>– Soldering iron set 240v 60w solder</li> <li>– Cutter</li> <li>– Hot glue gun</li> <li>– Steel ruler</li> <li>– Sand paper</li> <li>– Steel file</li> <li>– Voltage detector electric Non-contact pen tester</li> </ul>	6.30
3	Machine <ul style="list-style-type: none"> <li>– Grinding machine</li> <li>– Welding machine</li> </ul>	2.50
4	Electric	30.00

5	Workers' wages (3 People)	20.00
6	Rent place	16.00
7	Delivery Item	15.00
		<b>TOTAL: RM 256.20</b>

**DRAWING**



## PROJECT PICTURE



# FLOWCHART

