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Universal Skills Board

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Abstract: COVID-19 has had an impact on university education and has forced students to study online. In order to help the students to learn more deeply about the microcontroller subject, a universal kit which can help student to develop teaching aids specially for learning the basics of microcontroller and IoT. Blynk has three major components such as Blynk app, Blynk server and Blynk libraries. All component is connected together in Universal Skills Board and Proteus has been used to check the connection for the component and run the coding for the simulation. The code gives a command for the NodeMCU to give LED controlled by the Blynk app. The temperature sensor is useful for starting a monitoring system using the Blynk app. By using this universal skill board can help students understand and learn more deeply about the use of microcontrollers. Universal skills board also can be used with the blynk apps for creating IoT concept. By implementing the blynk, training modules has been developed to help students to use the Universal skills board more efficiently. In addition, to improve the performance of the universal skills board, this project can be improved by added a lot type of microcontroller sensor such as smoke and gas sensor, touch sensor and humidity sensor. By implementing the blynk, universal skills board also can develop home student skills to create and modify the coding and programming to connect the components to the blynk applications.

Keywords: IoT, Blynk, Arduino, NodeMCU, Teaching Aid

1. Introduction

Universities are important for many reasons, including long-term financial gain, job stability, career satisfaction and success outside of the workplace. With more and more occupations requiring advanced education, a college degree is critical to ensure success in today's workforce. The significance of software education is becoming increasingly apparent. The government has begun to promote software education in order to boost creativity through computational thinking, and coding education is rapidly

gaining traction in the educational industry [2]. As the world becomes more interconnected, so do the threats we face. The COVID-19 pandemic has crossed national boundaries and it has also affected the field of education. The education sector has changed the way of study from face to face to online learning. This method will affect students' comprehension in learning the subject.

COVID-19 has influenced the field of education in universities and caused students to have to study online. Due to that, students find it difficult to understand subjects that require practical or hands-on skill such as microcontroller and computer programming subjects. Microcontroller and computer programming are considered as important subjects for students because the subjects have a lot of advantages for students in facing the 4.0 industrial revolution. Most IoT devices use some kind of microcontroller. Microcontrollers can be thought of as tiny computers that are added to any physical object or space to give it a 'brain'.

In order to help the students to learn more deeply about the microcontroller and computer programming subjects, a universal kit which can help student to learn the basics of microcontroller and IoT is proposed in this study. This universal kit complements various microcontroller function and it also has IoT capability that allows hardware to be controlled using various IoT platform, for example Blynk applications. Besides that, training modules has been developed to help students to use the Universal Skills Board more efficiently. Hence, students can also master and build their understanding to produce and modify programming using specific applications such as Arduino IDE applications.

2. Materials and Methods
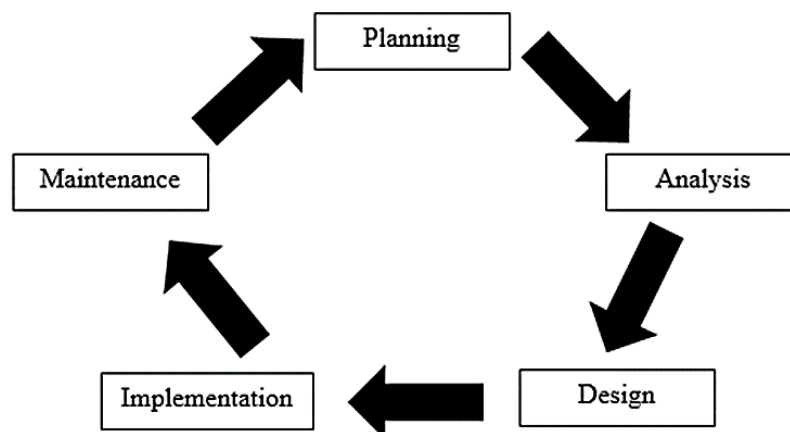
2.1 Design & Development stage

Figure 1: SDLC Phase

Figure 1 shows the methodology used to complete this project. The system development life cycle (SDLC) is a project management model that determines the stages involved in bringing a project from start to finish.

2.2 Stage 1: Planning

To do research and gather more information from the journal, article and various other reference source from the internet. The simplicity and scalability of the microcontroller board make it an ideal prototype tool, but beginners who lack basic skills must constantly learn. By implementing the kit, beginners and non-engineering students can easily understand coding [2]. Universal skills board has a lot of component that has been connected. This will help students that have problem in doing hardware connection. There is no adequate published laboratory experiment handbook to cover fundamental programming for the Arduino Uno microprocessor [1].

2.3   Stage 2: Analysis

Three types of software must be used to perform the concept of IoT that are Proteus Design Suite, Arduino IDE and apps Blynk. Arduino IDE is used to create the coding for the module. Next, use Blynk apps to create the concept of IoT for the project and it also available for android and iOS user. Blynk has three major components such as Blynk app, Blynk server and Blynk libraries. Proteus Design Suite is used to create schematic diagram for the project. Somehow, Proteus does not have the library for the certain component and must search the library at internet.
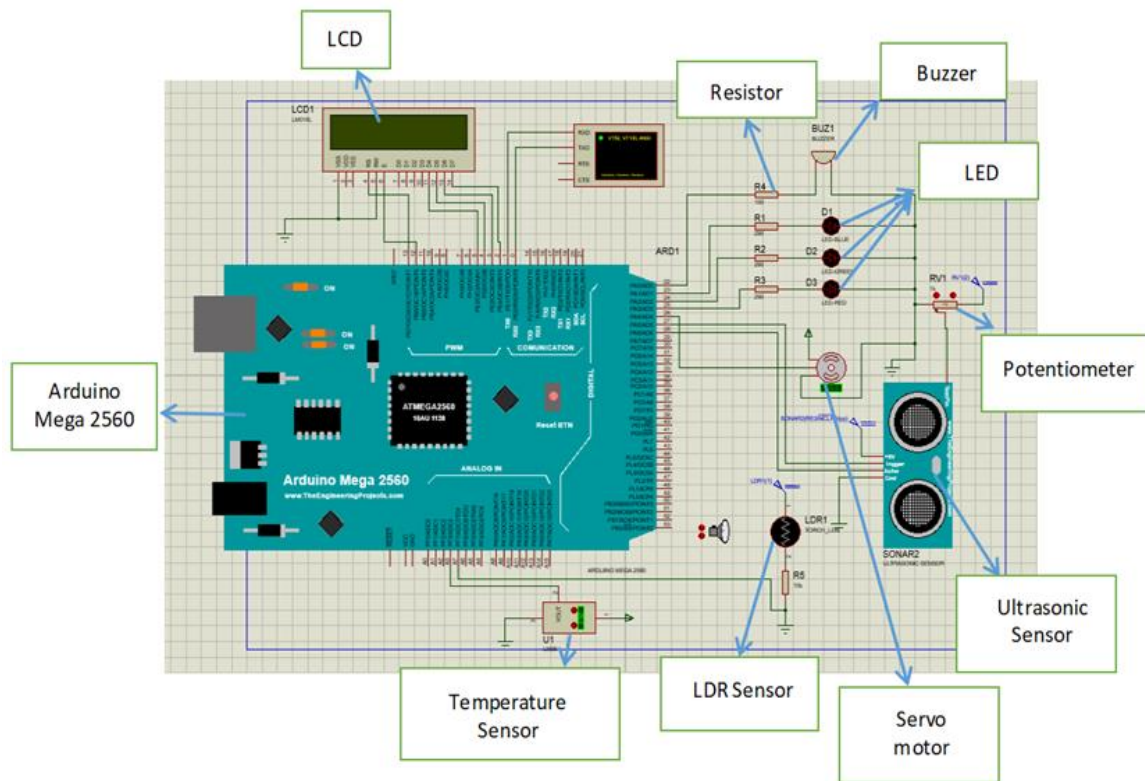
Figure 2: Schematic Diagram

Figure 2 shows the schematic diagram that has been developed in Proteus Design Suite. All components are connected in Universal Skill Board. Proteus has been used to check the connection for the component and run coding for the simulation. Blynk apps is used for wireless connection. The coding for wireless control via Blynk is run directly on the prototype and not on the simulation. The code tested during simulation include the coding from module for offline circuit. All coding use to test for test coding working or not on components like sensor LDR, temperature sensor, ultrasonic sensor, LCD and servo motor. Have coding can't run via simulation because certain reason. In Proteus have certain library is not including on the program so the coding cannot be read by the simulate program.

2.4   Stage 3: Design

2.4.1   Hardware components

Table 1 shows the list of the components and materials that are used in making Universal Skills Board. Total cost for the project is RM139.90. This is due to the fact that the total cost of this project is determined by the cost of the prototype, hardware, and components.

Table 1: List of hardware components

No.	Component	Quantity	Price per unit (RM)
1	Arduino Mega 2560	1	55.00
2	NodeMCU V3 ESP8266 WIFI	1	15.90
3	Liquid Crystal Display (LCD)	1	10.90
4	Buzzer	1	3.90
5	Light Emitting Diode (LED) - Red LED - Yellow LED - Green LED	3	0.30
6	Temperature sensor	1	5.90
7	Light Dependent sensor (LDR)	1	2.50
8	Ultrasonic Distance sensor	1	13.50
9	Servo Motor	1	10.20
10	Resistor 0.25Watt 330 Ohm	10	1.00
11	Arduino 40P Breadboard male to female Jumper Wire (20cm)	1	2.50
12	Arduino 40P Breadboard male to male Jumper Wire (20cm)	1	2.50
13	Arduino 40P Breadboard Female to Female Jumper Wire (20cm)	1	2.50
14	Breadboard	1	3.90

2.4.2   Components Layout
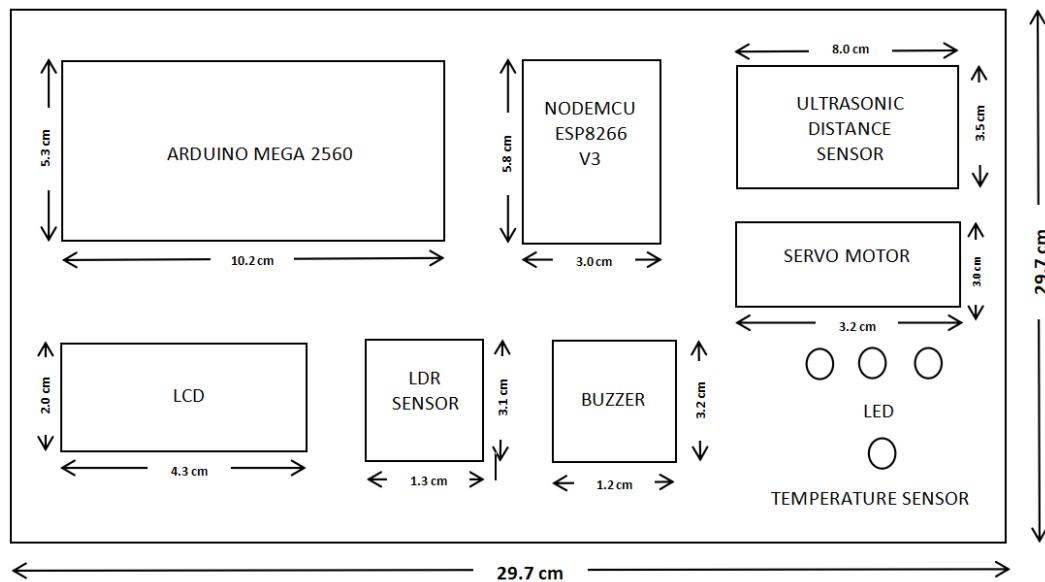
Figure 3: Components Layout

Figure 3 shows the layout for the component. The position of the components on the layout is determined based on the size and space of the board to allow the wires between the components to be connected properly.
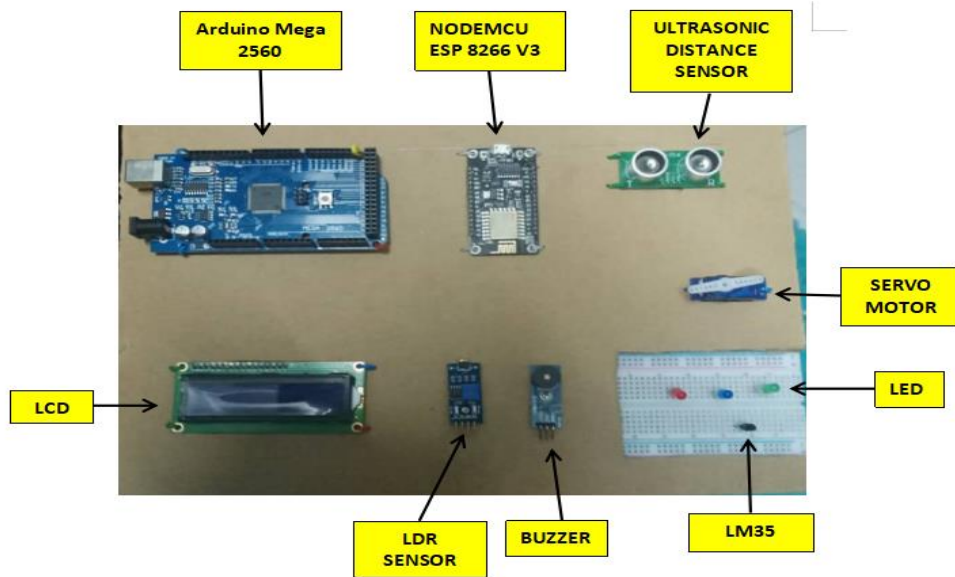
2.5   Stage 4: Implementation

Figure 4: Prototype Layout

Figure 4 show the prototype layout for this project. Mounting board has been used as the base for all the component. The layout for the prototype is based on the component layout at **Figure 3**.

3.   Results and Discussion

In this chapter, authors will discuss the results obtained by using specific codes for each of the different components in the modules that have been created and designed specifically for students. The purpose of this learning module is to be a guide for students to know more about IoT and also little by little learn about programming. Here are four results that can be shown in the image. Result here have use code from learning module also the hardware used from the kit.

3.1   LED blinking using Blynk

Figure 5 and Figure 6 show the result of the code made for the students. The code gives a command for the NodeMCU to give LED controlled by the Blynk app. The LED will turn ON and turn OFF if the button on the Blynk app is press. It will give the students idea to make a project using the internet of things by the activities made on the module.
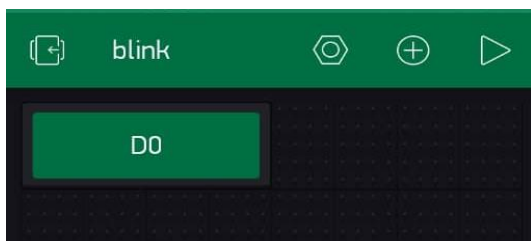

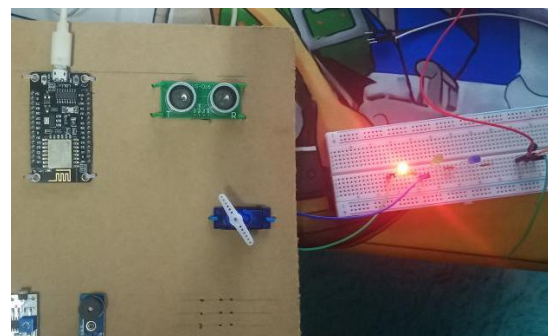**Figure 5: Blink the LED use Blynk app**

Figure 6: LED ON after switch in Blynk app is press

3.2   Using host network to control LED

Base on module has include the steps and how to use local network host using a command in Arduino IDE, this method useful in local networking in house, the host can access and control everything in the local network. It will easier for the host to control the house by using one web server. After run the code in serial print will give the link to control the web server as shown in Figure 7 and Figure 8.
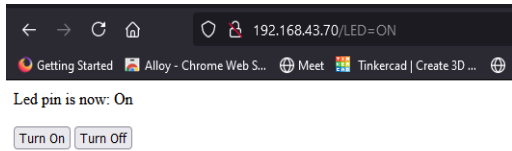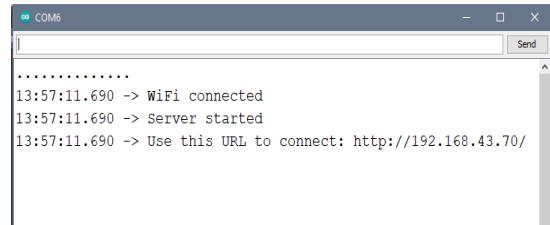

Figure 7: Host network to control LED

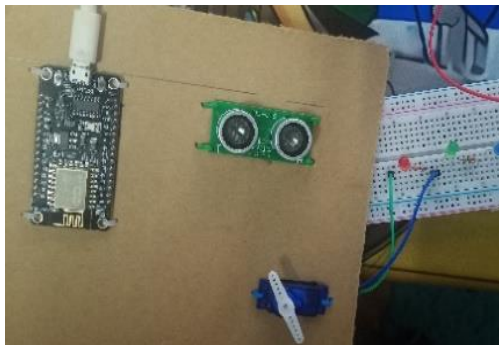**Figure 8: Link from serial monitor use to control LED**

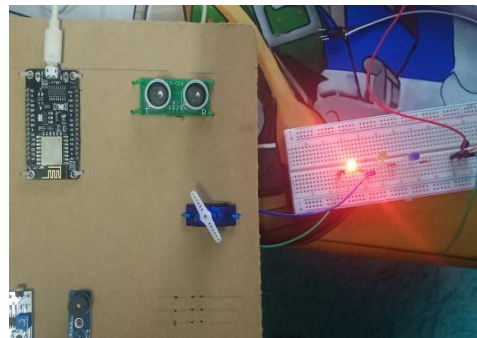**Figure 9: LED turn OFF if button turn off is press**

Figure 10: LED blink after button turn ON is press

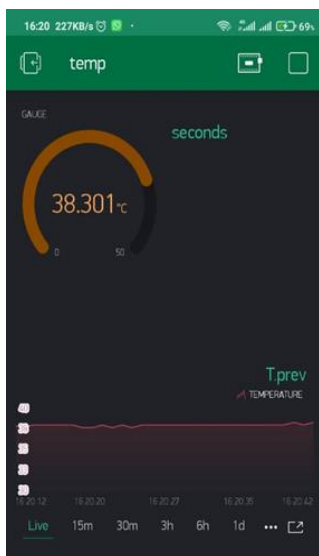## 3.3   Using Blynk to monitor the temperature

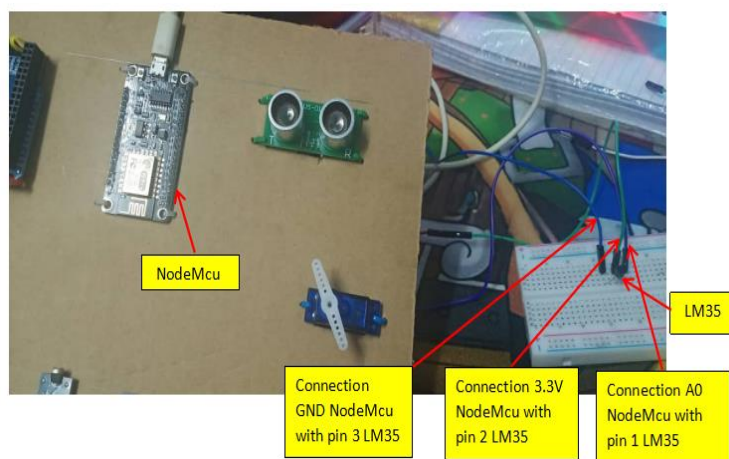**Figure 11: Monitor the temperature**

Figure 12: Connection LM35 with NodeMCU

In **Figure 10** this is result in Blynk app of monitoring the temperature live, 15 minutes, 30 minutes, 3 hours and 1 day. In **Figure 11** is the connection using universal skill board. The temperature sensor

is useful for starting a monitoring system using the Blynk app. Students can monitor the room temperature or ambient temperature as in **Figure 10**. The kit model uses LM35 temperature sensor. This temperature sensor is often used in academic syllabus because they are easy for students to understand. The LM35 is a temperature sensor that measures precise Celsius temperature.

3.4   Control LED using Light Dependent Resistor (LDR)

Figure 12 shows code manipulate the LDR, the integer sensorValue is analog read of ldrpin. It will write on Blynk because of the command "Blynk.virtualWrite(V5, sensorValue)". if the value sensorValue is more than 400 LED turn ON, else value sensorValue is less than 400 LED turn OFF as shown in Figure 13 and Figure 14.

```
void sendSensor()
{
  int sensorValue = analogRead(ldrPin);
  Blynk.virtualWrite(V5, sensorValue);
  if(sensorValue > 400){
    digitalWrite(ledPin1, HIGH);

  }else{
    digitalWrite(ledPin1, LOW);

  }
}
```

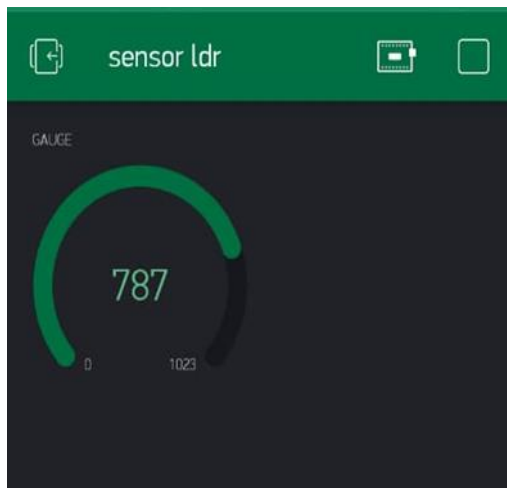**Figure 13: Command has control LDR to blink**

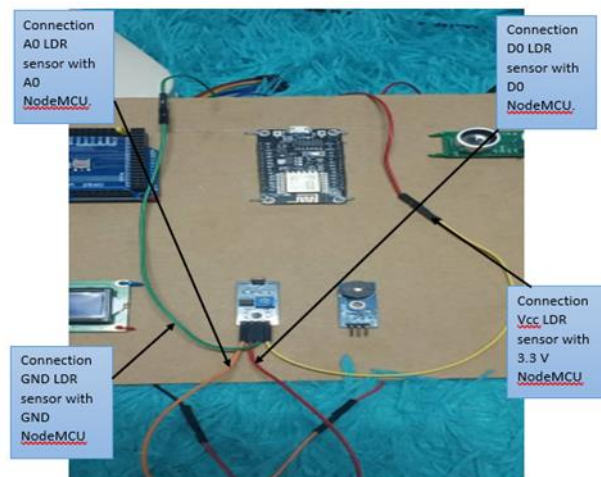**Figure 14: Control LED using Light Dependent Resistor (LDR)**

Figure 15: Connection LDR and NodeMCU on prototype

4. Conclusion

As conclusion, through the development of this project. Universal skill board can help students understand and learn more deeply about the use of microcontrollers. In addition, this universal skills board can also develop specialized teaching aids to learn the basics of microcontrollers, computer programming and IoT. Universal skills board also can be used with the Blynk apps for creating IoT

concept. Blynk has ability to manage hardware remotely, show sensor data, store data, visualise it, and perform a variety of other fascinating things. By implementing the Blynk, training modules has been developed to help students to use the Universal skills board more efficiently. The training module can increase student ability to learn systematically. Students can use the kit during online learning and also practice on their own at home or anywhere. This can cultivate the attitude of students to strive to learn something and solve problems on their own. Electrical Engineering students in Centre for diploma studies can use this kit in microcontroller and computer programming subject.-In addition, to improve the performance of the universal skills board, this project can be improved by added a lot type of microcontroller sensor such as smoke and gas sensor, touch sensor and humidity sensor. Gas sensor are used to detects the presence of gas in the atmosphere, the touch sensor also known as tactile sensor used in detecting and recording physical touch and humidity sensor used to measure the temperature of the air. By implementing the blynk, universal skills board also can improve their ability in create and modify the coding and programming to connect the components to the blynk applications.

Acknowledgement

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