🏆 A5.1 Learning activity

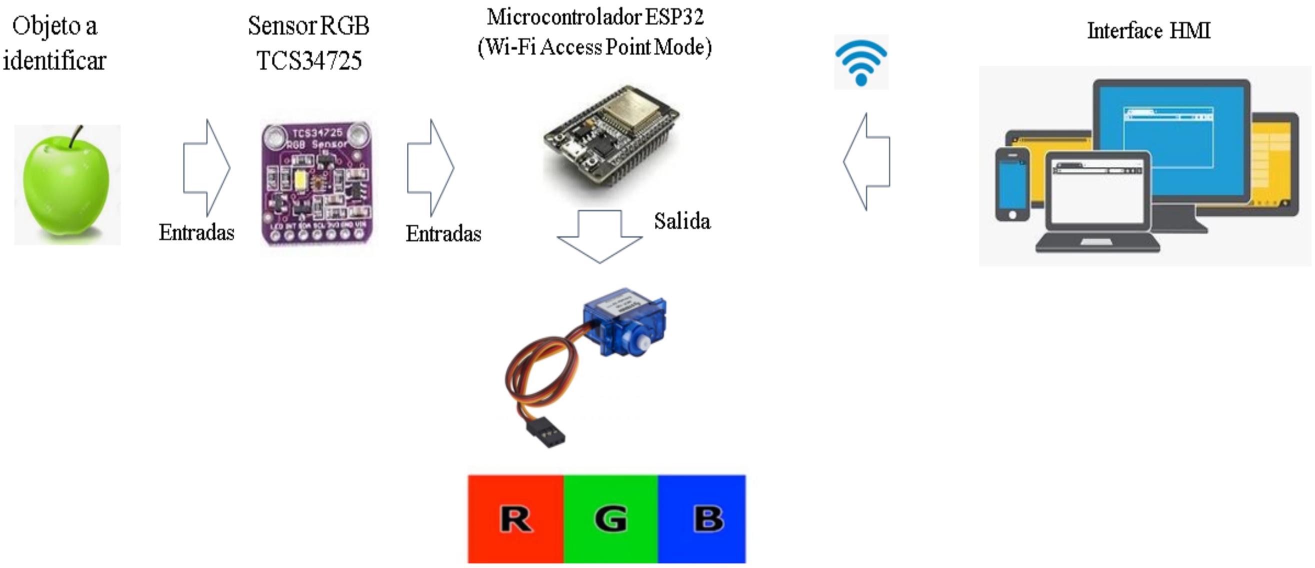
Development

1. Use the following materials for the activity's development.

Quantity	Description
1	RGB Sensor TCS34725
1	Servomotor SG90
1	5v Power supply
1	NodeMCU ESP32
1	BreadBoard
1	Jumpers M/M

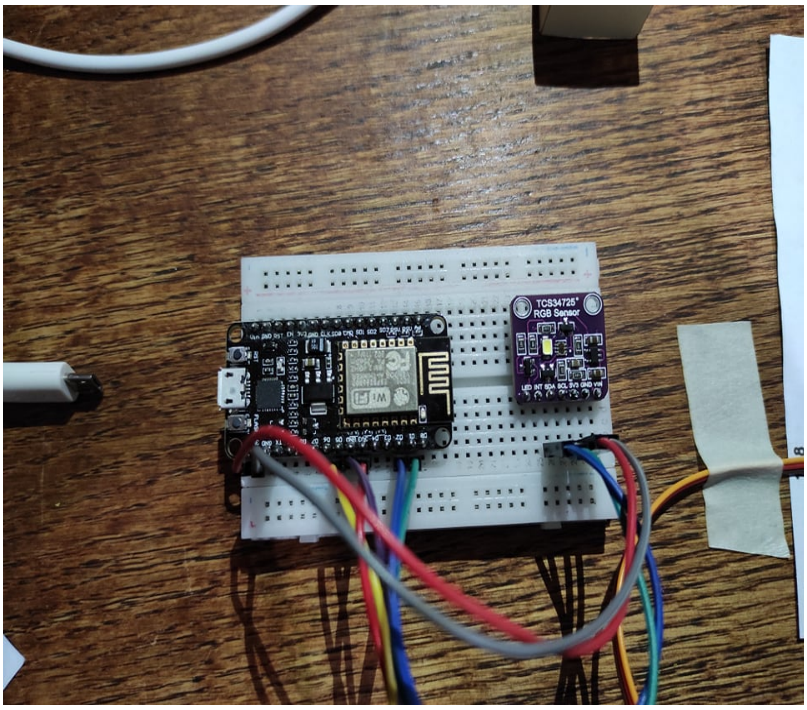
2. Based on the picture shown bellow, assemble a circuit that is able to accomplish the following instructions:
    - The fist stage consists on, when placing an object in front of the sensor, it must be able to identify its color, and show in a visual interface the detected color.
    - The second stage will consist on adding an actuator that with the help of a color strip will point in the direction of the color detected by the sensor.

Figure 1 ESP32 Color Sensor and servomotor circuit



3. Place here the picture of the assembled circuit.

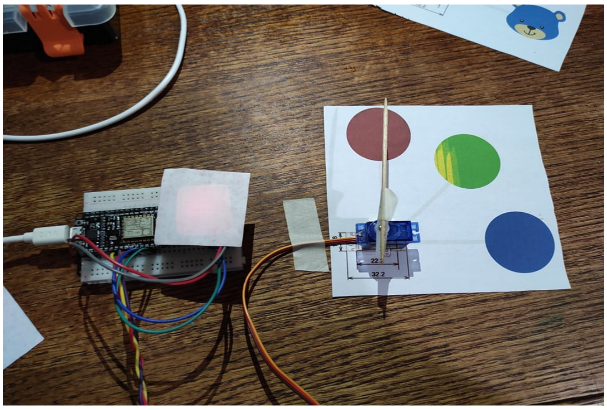
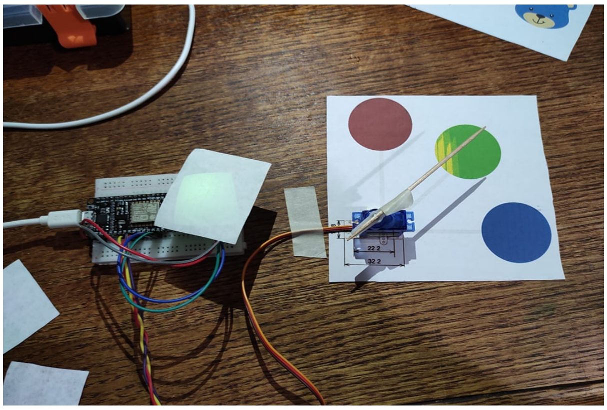
Assembled Circuit

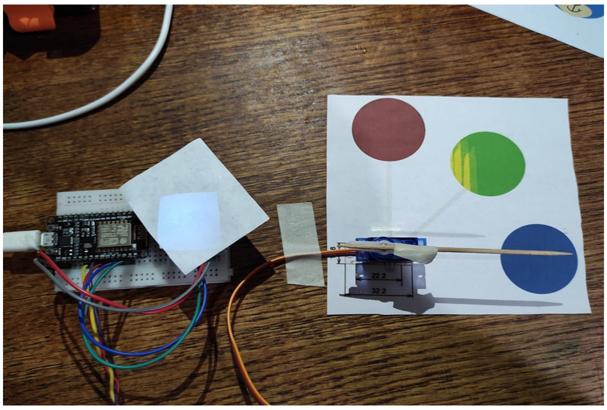


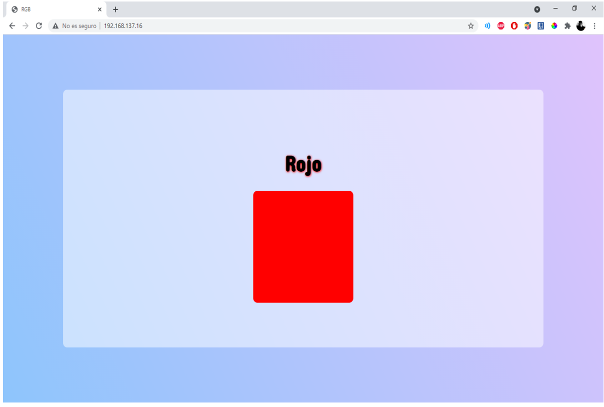
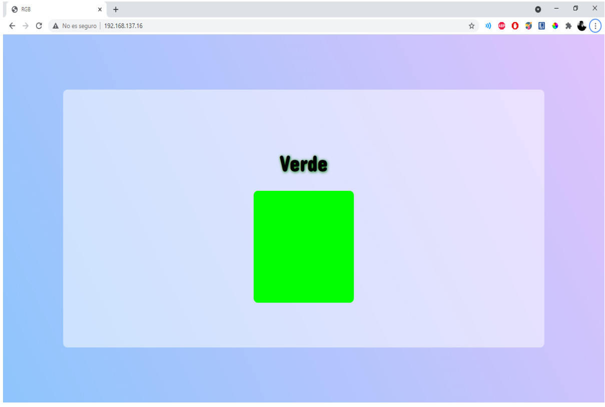
4. Place here the code created in the Arduino IDE.

```
// Librerias para sensor RGB
#include <Wire.h>
#include "Adafruit_TCS34725.h"
#include "ColorConverterLib.h"

//Librerias para servidor web
#include <WebSocketsServer.h>
#include <ESP8266WiFi.h>
#include <ESP8266WebServer.h>
#include <FS.h>

// Libreria para el motor
#include <Servo.h>

Adafruit_TCS34725 Sensor = Adafruit_TCS34725(TCS34725_INTEGRATIONTIME_50MS,
TCS34725_GAIN_4X); // Instancia del sensor RGB
WebSocketsServer webSocket = WebSocketsServer(81); // Instancia del WebSocket y
puerto

Servo servo; // Instancia del motor

// Configuracion Wifi
const char* Red = "BLANK PROOF";
const char* Contrasenia = "buz1297.";

ESP8266WebServer server(80); // Define el puerto del server

void setup() {
  Serial.begin(115200); // Inicia conexion serial
  // Inicializa el sensor RGB
  if (Sensor.begin()) {
    Serial.println("Sensor encontrado");
  } else {
    Serial.println("No se encuentra el sensor");
    while (1);
  }

  WiFi.begin(Red, Contrasenia); // Comienza la conexion Wifi
  // Comprueba si se realiza la conexion
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("Ahora estas conectado a Wifi!");

  // Comienza el sistema de archivos
  if (!SPIFFS.begin()) {
    Serial.println("Error al conectar con el sistema de archivos");
    return;
  }
 // Establece ruta del servidor
  server.serveStatic("/", SPIFFS, "/Index.html"); // (Ruta, Sistema de archivos,
Archivo)

  server.begin(); // Inicia el servidor
  Serial.print("Servidor iniciado en: ");
  Serial.println(WiFi.localIP());  // Muestra la direccion IP del dispositivo

  webSocket.begin(); // Inicia el Socket
  servo.attach(14); //D5
  servo.write(0); // Posicion 0
}

void loop() {
  webSocket.loop(); // Garantiza su ejecucion repetitiva
  server.handleClient(); // Escucha al cliente

  uint16_t rojo, verde, azul, clear; // Número entero sin signo de 2 bytes
  Sensor.getRawData(&rojo, &verde, &azul, &clear); // Obtiene los datos de los
colores
  Serial.println("---- VARIABLES TOMADAS DEL GET RAW DATA ----");
  Serial.print("R: ");
  Serial.println(rojo);
  Serial.print("G: ");
  Serial.println(verde);
  Serial.print("B: ");
  Serial.println(azul);
  Serial.print("C: ");
  Serial.println(clear);


  uint32_t sum = clear;
  float r, g, b;
  // Hacer rgb medición aproximada
  r = rojo; r /= sum;
  g = verde; g /= sum;
  b = azul; b /= sum;

  // Transformar rgb a bytes
  r *= 256; g *= 256; b *= 256;

  Serial.println("---- VARIABLES TOMADAS DESPUES DE OPERACIONES ----");
  Serial.print("R: ");
  Serial.println(r);
  Serial.print("G: ");
  Serial.println(g);
  Serial.print("B: ");
  Serial.println(b);
  Serial.print("C: ");
  Serial.println(sum);


  // Convertir a hue, saturation, value
  double hue, saturacion, valor;
  ColorConverter::RgbToHsv(static_cast<uint8_t>(r), static_cast<uint8_t>(g), static_cast<uint8_t>(b), hue, saturacion, valor);
  hue = hue * 360;
  Serial.println("---- VARIABLES CONVERTIDAS EN HSV ----");
  Serial.print("Hue: ");
  Serial.println(hue);
  Serial.print("Saturacion: ");
  Serial.println(saturacion);
  Serial.print("Valor: ");
  Serial.println(valor);

  // Comprobacion de los colores
  if (hue < 15 ) {
    servo.write(180);
    Serial.println("Rojo");
    webSocket.broadcastTXT("Rojo"); // Transmision de datos al server
  } else if (hue > 89 && hue < 140) {
    servo.write(90);
    Serial.println("Verde");
    webSocket.broadcastTXT("Verde");
  } else if (hue > 190 && hue < 251) {
    servo.write(0);
    Serial.println("Azul");
    webSocket.broadcastTXT("Azul");
  } else {
    servo.write(45);
    Serial.println("Otro");
    webSocket.broadcastTXT("Otro");
  }
  delay(1000);
}
```

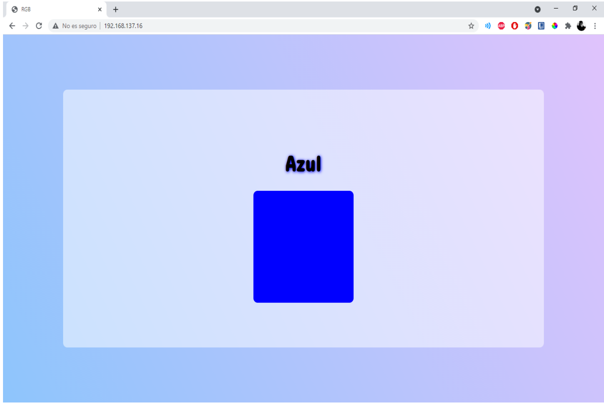
5. Place here any important evidence.

Case : Red detected	Case : Green detected
	

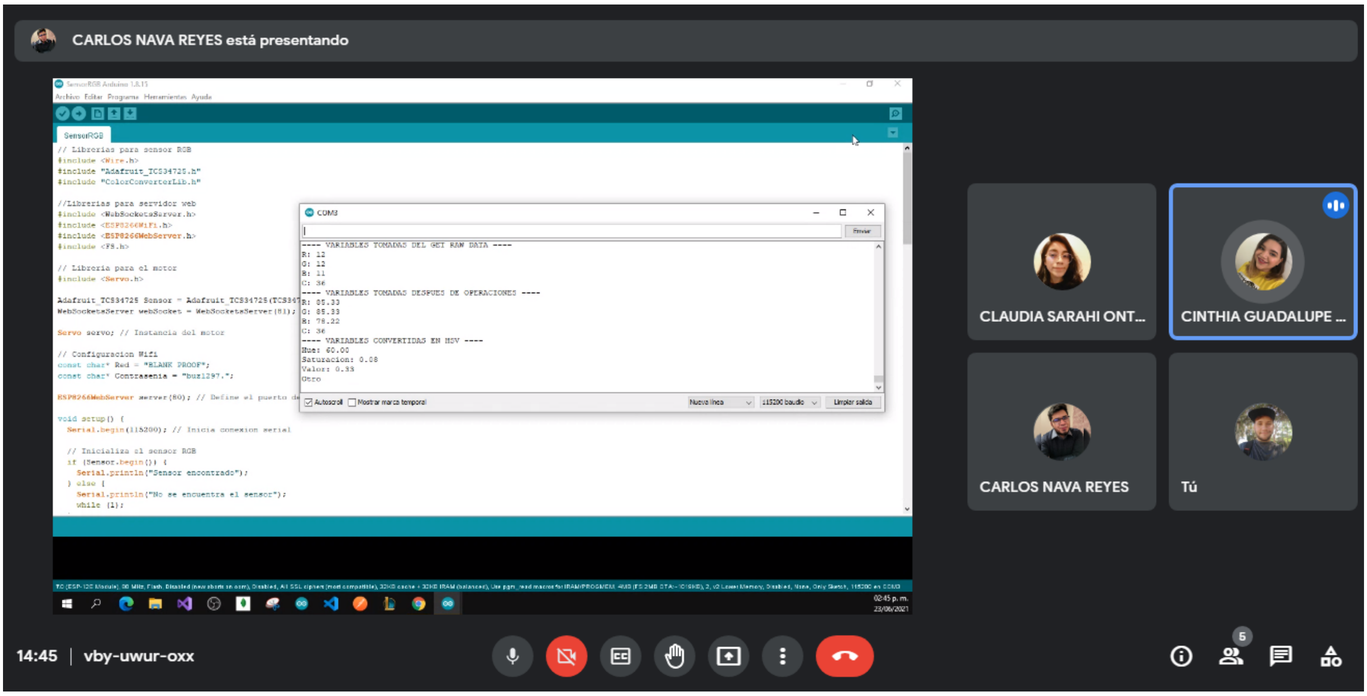
Case : Blue detected


Case : Red detected	Case : Green detected
 RGB No es seguro | 192.168.137.16 Rojo	 RGB No es seguro | 192.168.137.16 Verde

Case : Blue detected



6. Insert picture **evidence** from the team meetings while developing the activity.



```
// Librerias para sensor RGB
#include <Wire.h>
#include "Adafruit_TCS34725.h"
#include "ColorConverterLib.h"

//Librerias para servidor web
#include <WebSocketsServer.h>
#include <ESP8266WiFi.h>
#include <ESP8266WebServer.h>
#include <FS.h>

// Libreria para el motor
#include <Servo.h>

Adafruit_TCS34725 Sensor = Adafruit_TCS34725(TCS347
WebSocketsServer webSocket = WebSocketsServer(81);

Servo servo; // Instancia del motor

// Configuracion Wifi
const char* Red = "BLANK PROOF";
const char* Contrasenia = "buz1297.";

ESP8266WebServer server(80); // Define el puerto de

void setup() {
  Serial.begin(115200); // Inicia conexion serial

  // Inicializa el sensor RGB
  if (Sensor.begin()) {
    Serial.println("Sensor encontrado");
  } else {
    Serial.println("No se encuentra el sensor");
    while (1);
```

```
---- VARIABLES TOMADAS DEL GET RAW DATA ----
R: 12
G: 12
B: 11
C: 36
---- VARIABLES TOMADAS DESPUES DE OPERACIONES ----
R: 85.33
G: 85.33
B: 78.22
C: 36
---- VARIABLES CONVERTIDAS EN HSV ----
Hue: 60.00
Saturacion: 0.08
Valor: 0.33
Otro
```

7. For the demonstration at least one object must be used so that its able to cover three colors.

Los grumosos 🐻 Conclusions.

Nava Reyes Carlos

```
In this practice a circuit was made that allowed the detection of the colors of an
object, Once the sample was taken by means of a web page, the captured color of
the object would be shown, as well as with the help of a servo motor which would
position itself in a box with the color, making the practice more interactive and
dynamic. It was made with a sg90 servo motor, esp8266 and the main component was a
tcs34725.

We had difficulties when integrating the different components into the same
circuit by not knowing the physical characteristics of each, as well as their
voltages and working modes, Among the problems that were presented is the desire
to work the samples in real time without updating the page, was solved with the
help of WebSockets which allowed us to create a communication point to point.
```

Olivas Calderon Cinthia Guadalupe

```
The practice was to make a circuit for identification of RGB colors, using as
materials a sensor RGB TCS34725, a nodeMCU ESP32, a servomotor SG90, and apart we
use a visual interface.
For encoding on Arduino IDE, we use different libraries like
"Adafruit_TCS34725.h" and "ColorConverterLib. h" which we used to capture sensor
values and convert them to HSV. For the visual interface we used HTML and
WebServer that helped us to update the page.
We had to investigate the conversion from RGB to HSV, as operations have to be
performed to obtain more accurate values.
For the servomotor we coded it taking into account the rotation it has which is
180°  and rotated depending on the color range in which it was.
We had difficulty not knowing well the characteristics of the components, but when
we realized the errors generated we were able to perform the practice correctly.
```

Ontiveros Lara Claudia Sarahi

```
This practice consists of using a TCS34725 RGB sensor to recognize colors (in this
case, red, green, blue and white), basically the operation is that when
approaching an object of a color the RGB sensor detects it, the servomotor moves
indicating which color detects the sensor and raise a server to reaffirm the
detected color. Initially it was somewhat conflicting the realization of this
practice, because circumstances do not help to work so well in team, so only one
member could assemble it, one of the main problems was the issue that had to weld
the sensor RGB, Another big problem was when the ESP32 burned and when it was
believed that the other components as well.
For the implementation of the graphical interface a socket was used to update the
sensor sample without needing to restart the server. A library was also used to
make a color conversion from RGB to HSV, so as not to have so limited the range of
color recognition.
```

Valdés Fuchs Agustín

```
For this practice we had to create a circuit capable of displaying information of
a color detected by an RGB sensor, the information had to be displayed or conveyed
in two separate ways, first, a web server with a visual interface had to display
the color detected, and second, using a motor we had to point to the color
detected.
The first issues we had were with the sensor, asi it wasn't getting the correct
colors, we experimented and ended up using a different color format which is HSV
this allowed us to only focus on one of the values and create ranges based on it.
There were also some issues with the lightning of the room the circuit was in, as
it acted as an interference when detecting the value.
The second issue we had was when adding the motor to the circuit, as most of the
```

```
documentation showed the connection with arduino, we solved this by searching for
the references of the equivalent pins for the ESP.
```

🐙 Github links

⛪ **Carlos Nava**

👸 **Cinthia Olivas**

Claudia Ontiveros

👽 **Agustin Valdés**