

# ENGINE

Teaching online electronics, microcontrollers and programming in Higher Education

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## Output 2: Online Course for Microcontrollers: syllabus, open educational resources

Quick start Guide: Tinkercad

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# Declaration

This report has been prepared in the context of the ENGINE project. Where other published and unpublished source materials have been used, these have been acknowledged.

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## Funding Disclaimer

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# Executive summary

This document serves as a Quick Start Guide for [Tinkercad](#).

# Chapter 1: Get start with Tinkercad

## 1.1 Create an account

To use the services of [Tinkercad](https://www.tinkercad.com) you must create an account, following the required steps. Figure 1 and Figure 2 show the initial steps to create an account.

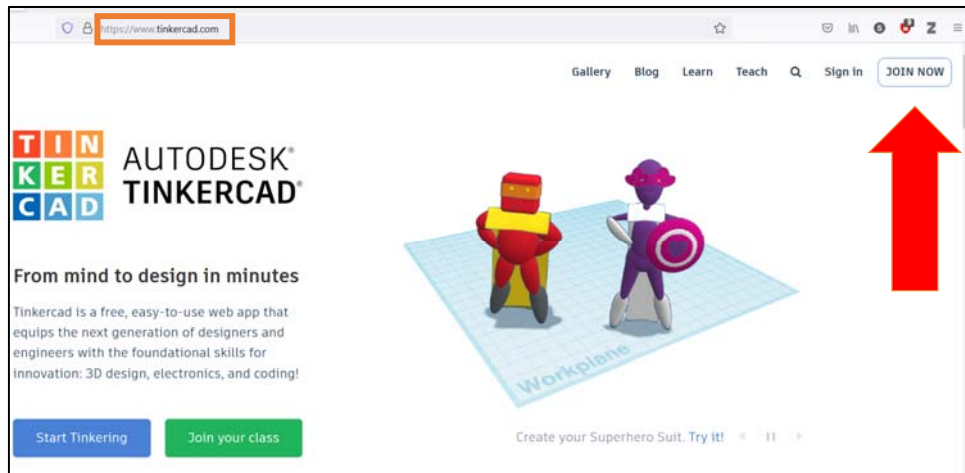


Figure 1. Start page

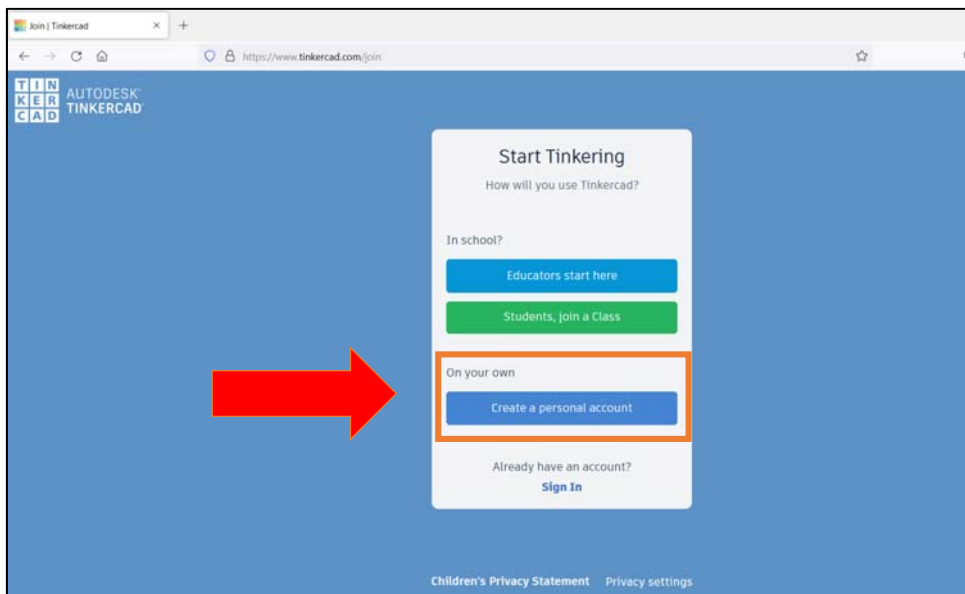


Figure 2. Create an account

Once the account creation is complete, the user has access to his dashboard, as shown in Figure 3.

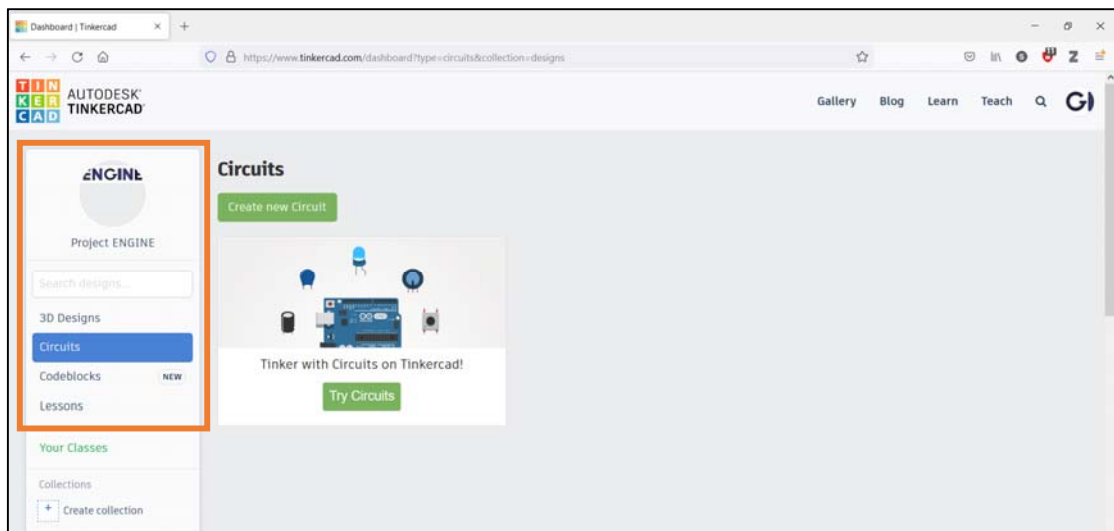


Figure 3. Dashboard

# Chapter 2: Circuits

## 2.1 New circuit

To create a new circuit (or edit an older one) the user must select “Circuits” from the dashboard, as shown in Figure 4. Then select “Create new Circuit” as shown in Figure 5.

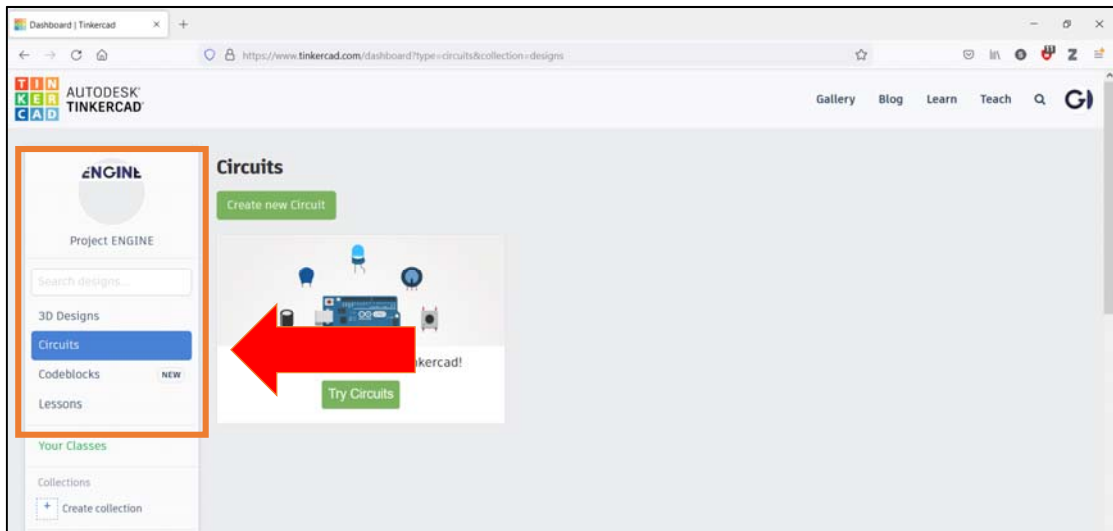


Figure 4. Circuits

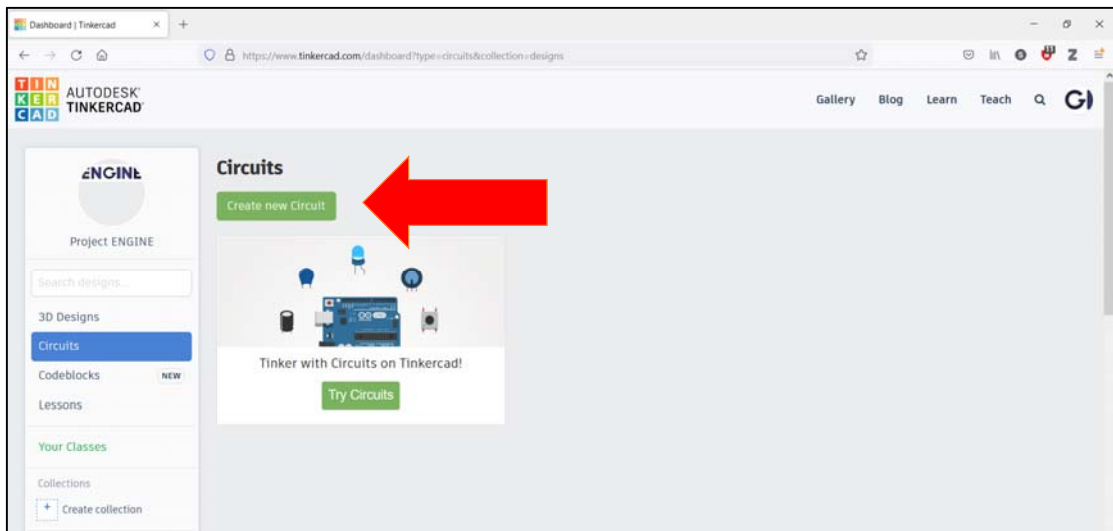


Figure 5. Create new circuit

## 2.2 Creating a circuit

After the user chooses to create a new circuit, a page will appear as shown in Figure 6, where he can build circuits and run simulations.



Figure 6. Circuit page

The top left shows the name of the circuit, which can be modified by clicking on it, as shown in Figure 7.



Figure 7. Name of the Circuit

To the right of the page is the components tab, where the user can find and select components as shown in Figure 8.

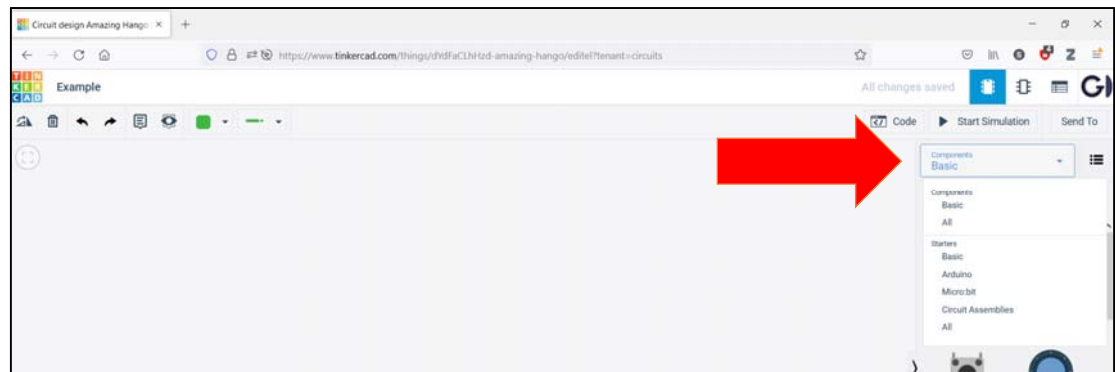


Figure 8. Components

Just below is the component search, as shown in Figure 9. The components are placed on the schematic by drag and drop.



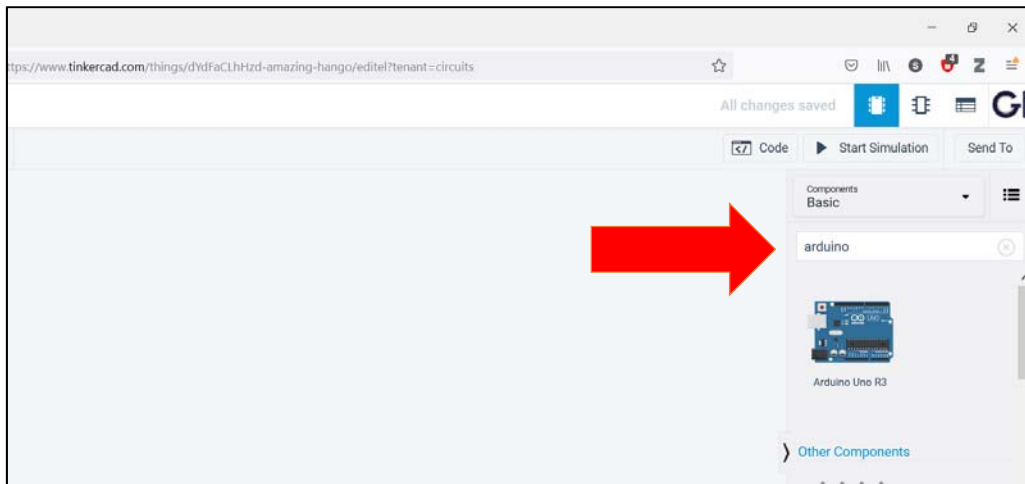


Figure 9. Search field

Some components, such as resistors, are configurable. That is, the user can click on them to adjust their value, as shown in Figure 10. In addition, the components can be rotated by pressing “r”.

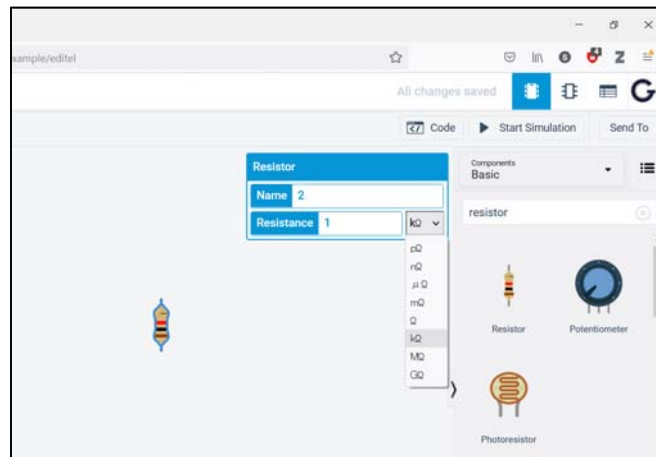


Figure 10. Component configuration

An important feature is the change of wire color from the toolbar, as shown in Figure 11.

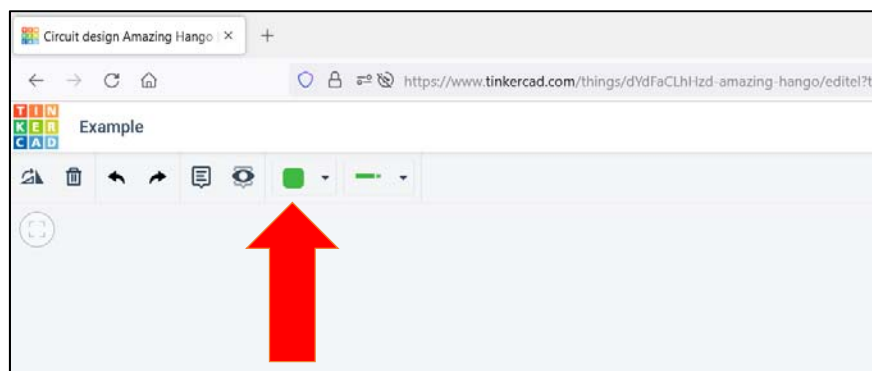


Figure 11. Wire color

Finally, the circuits are saved automatically. When the user returns to the dashboard he can see the circuits he has created. In addition, among other things, it can delete a circuit or duplicate it, as shown in Figure 12.

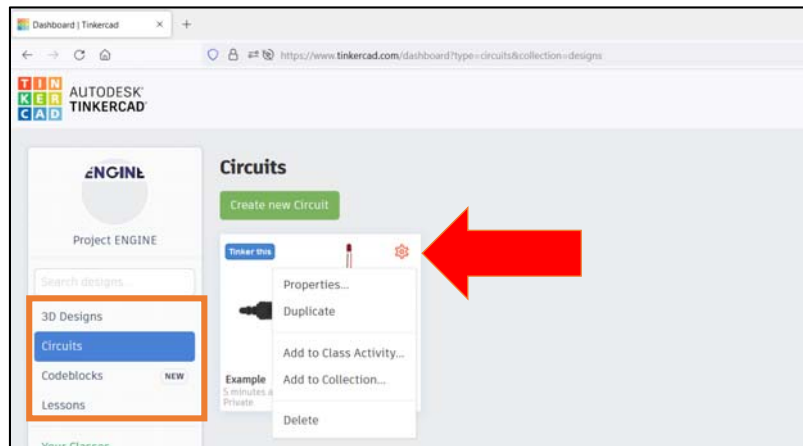


Figure 12. Circuits in the dashboard

# Chapter 3: Example

## 3.1 Selection of components

The example will use an Arduino Uno to flash an LED every second. First, search for the Arduino Uno, as shown in Figure 13.

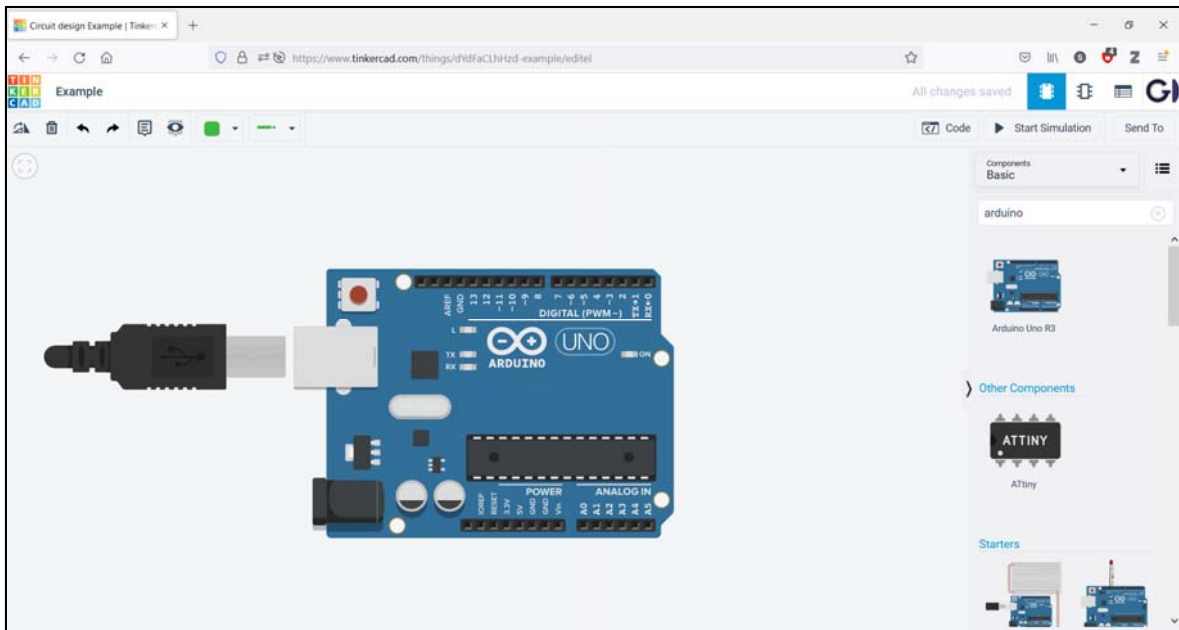


Figure 13. Search and place an Arduino Uno

A resistor is then inserted and adjusted to 330Ω, as shown in Figure 14.

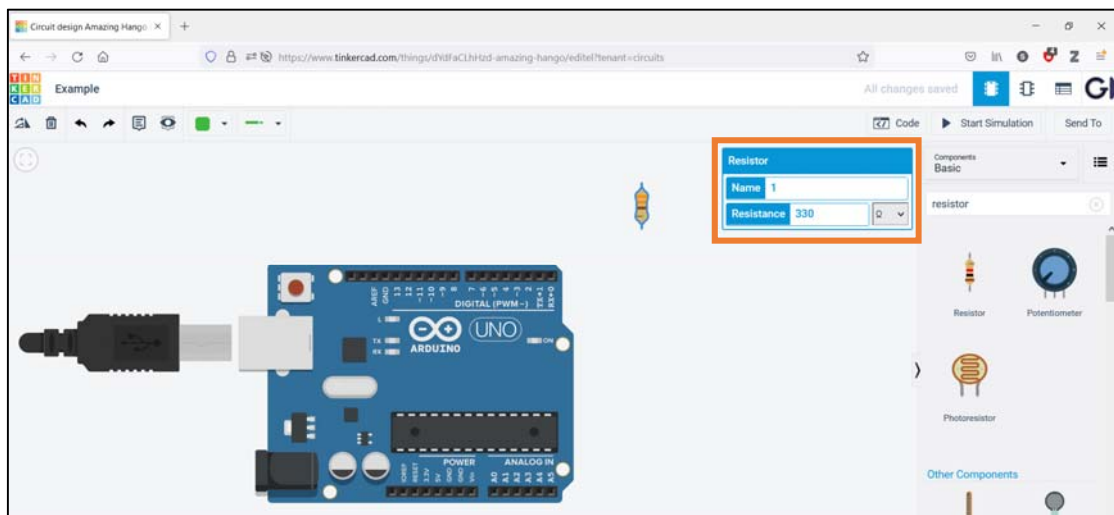


Figure 14. Insert and adjust the resistor value

Finally, an LED is placed, as shown in Figure 15. Note that the LEDs have polarity.



Figure 15. LED

### 3.2 Circuit connections

First, the components are placed as shown in Figure 16.

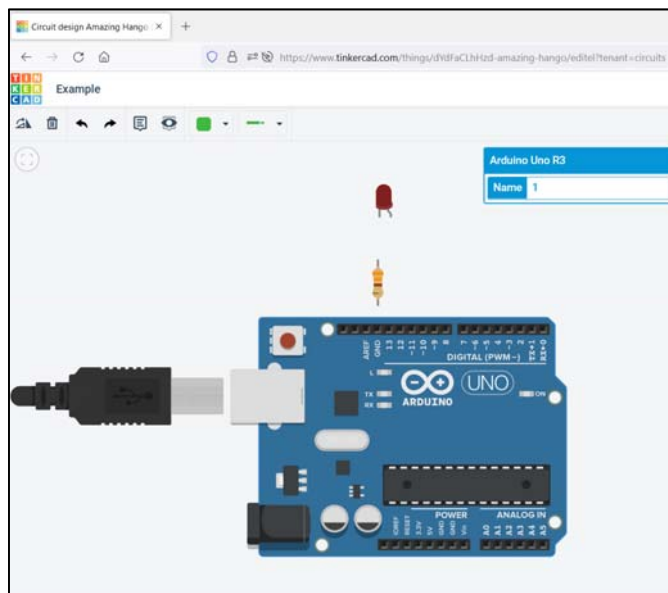


Figure 16. Placed the components in a suitable position

Next, select the color of the wire you want, as shown in Figure 17.

As shown in Figure 18, we select:

- red to connect pin 13 to the LED anode
- black to connect the LED cathode to the resistor, and the resistor to the Arduino Uno GND

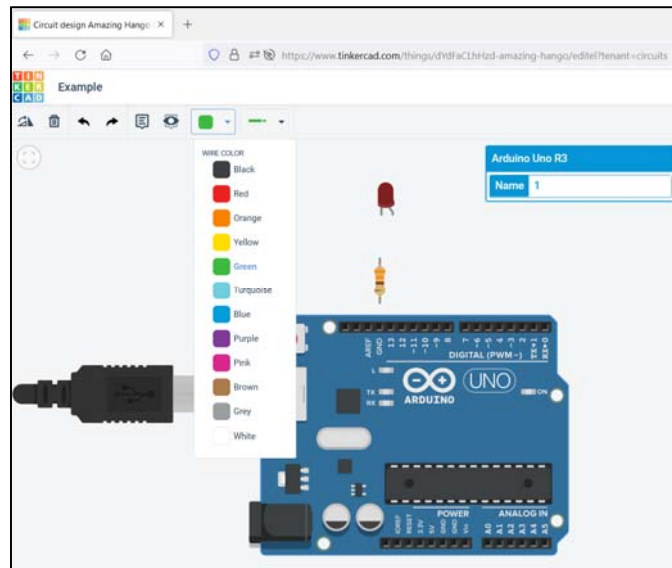


Figure 17. Wire color selection

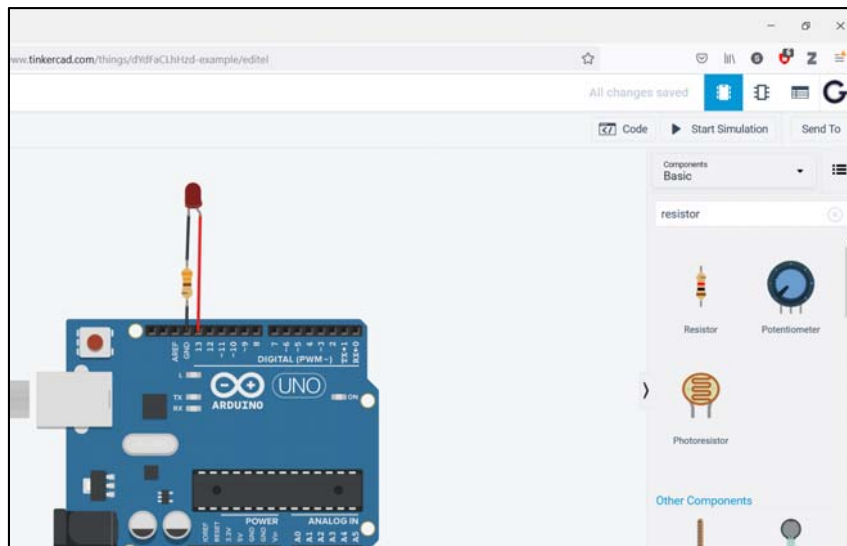


Figure 18. Complete circuit

### 3.3 Code

To access the code of the Arduino Uno, we have to press the "Code", as shown in Figure 19.

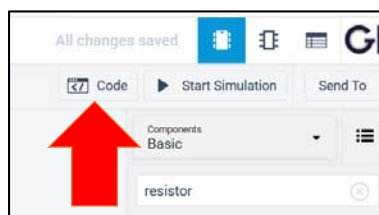


Figure 19. Code for the Arduino Uno

From the tab that appears, select "Text", as shown in Figure 20.

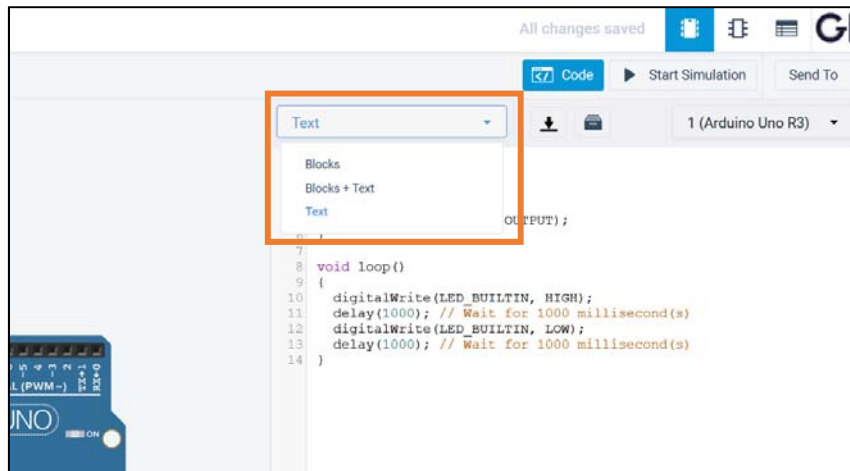


Figure 20. Code display selection

By default, [Tinkercad](#) uses the following code in the Arduino Uno:

```
// C++ code
//
void setup()
{
  pinMode(LED_BUILTIN, OUTPUT);
}

void loop()
{
  digitalWrite(LED_BUILTIN, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(LED_BUILTIN, LOW);
  delay(1000); // Wait for 1000 millisecond(s)
}
```

This code is used to flash an LED connected to pin 13 every second.

### 3.4 Simulation

In [Tinkercad](#) we can run a simulation to check if the circuit is working properly. To perform the simulation, we must click on "Start Simulation", as shown in Figure 21.

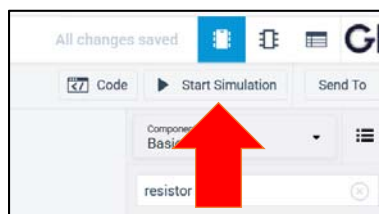


Figure 21. Start simulation

In Figure 22 we can see that the LED is ON.

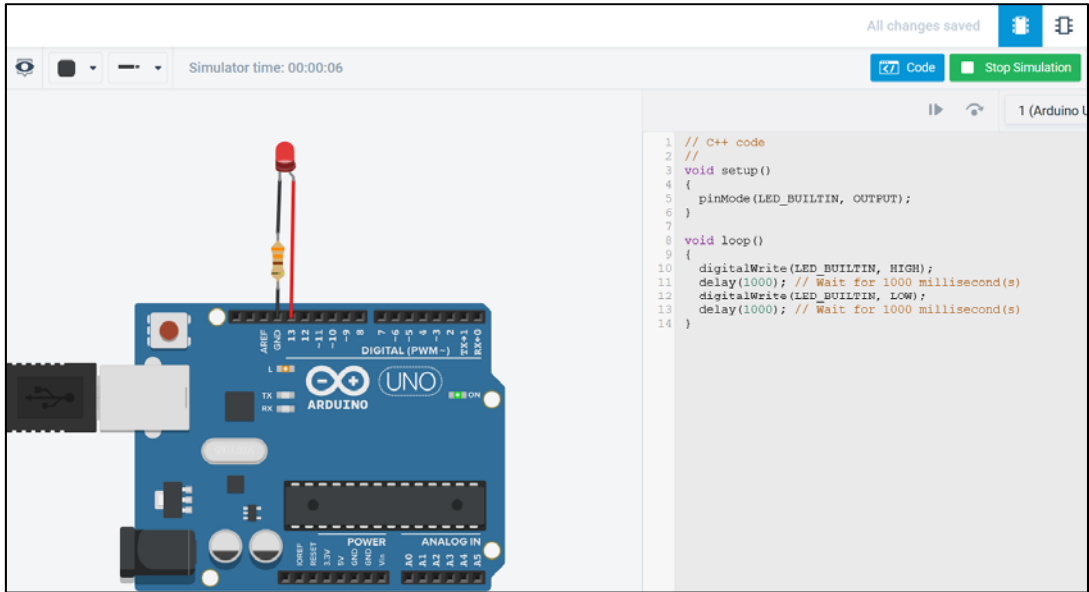


Figure 22. Perform simulation

