Control systems

- Control systems and robotics
- Sensors and actuators
- Controller: Arduino board
- Programming Arduino board with Arduinoblocks
- Log in with Arduinoblocks as a Student and joining a project

Control systems and robotics

An **automated process** continuously repeats the action that it is designed to carry out. A set of interconnected elements which allow the automation of a process is called a **control system.**

Some automated systems only carry out the same action. Other can modify this action by changing their programs. They are **intelligent control systems.**

Intelligent control systems work in a similar way to a human being. That means, we receive information from the outside world thanks to our senses (sight, hearing, smell, taste and touch) our brain processes this information and through our muscles or our voice we perform different actions. Intelligent control systems: they receive information from the environment thanks to different **sensors**, they process this information in **controller boards** (like Arduino) and give a response using different **actuators**.

A **robot** is an **intelligent automated system** capable of:

- **sensing** its environment,
- carrying out **operations** to make decisions
- performing **actions** in the real world.

So the main elements in every robot, as we learned in programming, will be:

- **Input**: information received by **sensors**
- **Process**: to perform operations/ make decisions with this input. This is made by the **controller** board.
- **Output**: response produced by **actuators** that can be mechanical, electric, pneumatic....

The task of a robot can be modified by changing its program.

Information extracted from:

- https://robotsguide.com/learn/what-is-a-robot

Sensors and actuators

Sensors

A **sensor** is an object capable of **detecting physical or chemical quantities** and transforming them **into electrical signals.**
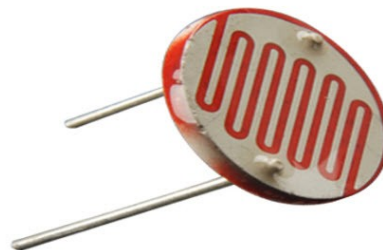
Depending on the type of the electrical signal produced they can be **DIGITAL, ANALOG or DATA.**

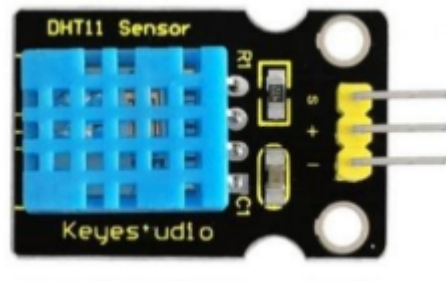- **DIGITAL**: a digital sensor only has two   ed, ON/OFF, 1/0, High/Low. E.g: An electronic pushbutt   l sensor with two

  possible states: pushed or not pushed.

- **ANALOG**: This sensor can provide a range of values, normally a variable voltage or current value, depending on the signal detecte   e of its

  resistance with an increment of light detected.

- **DATA**: the sensor offers its information throu   DHT11

  sensor measures temperature and humidity.   There are

  lots of different sensors. To get further information click on here.

Actuators

An **actuator** is any device capable of **performing actions** in the physical world that we **can control** from a processor board (like Arduino)

Depending on the type of action produced they can be:

- **LIGHT**: The most common is the **normal LED**, but there is also RGB LED's, neopixel lightsaber, laser or LCD displays

- **SOUND**: There are active and passive **buzzers**. Active buzzers play a tone of a frequency determined when they receive a digital "1" whereas a passive buzzer only plays the wave that receives.

- **MOTION**: There are different types of motors depending on their properties. They usually need auxiliary elements to be controlled by processor boards, because of the voltage they require.
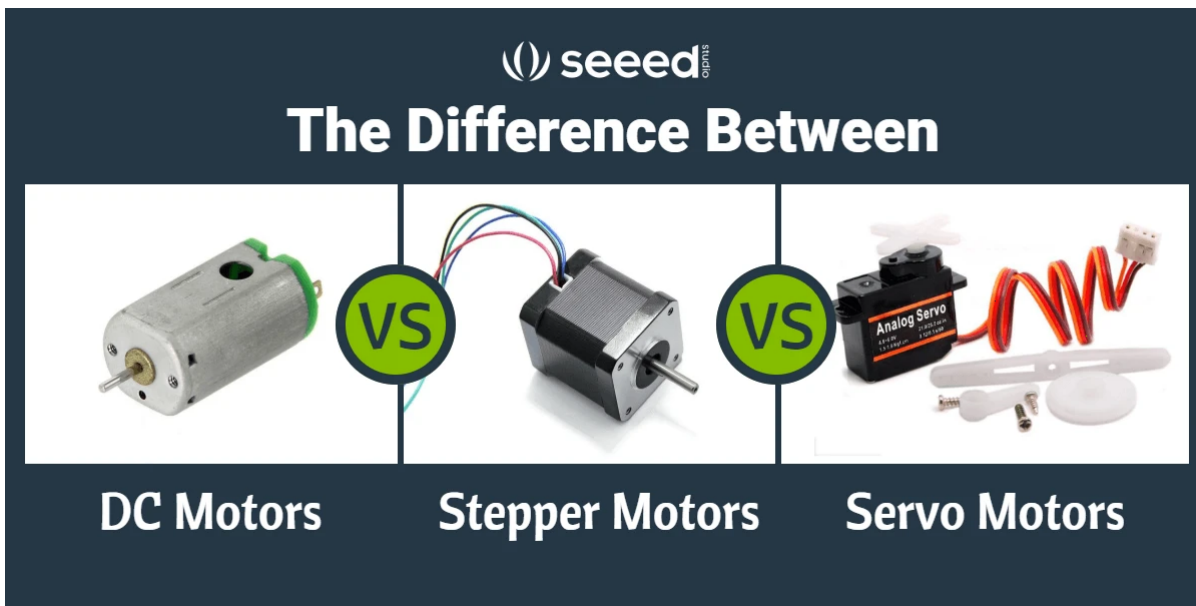
Imagina TDR Steam shield

We will use in our projects one shield called **Imagina TDR Steam** which is integrable into Arduino UNO, with a multitude of integrated sensors and actuators.
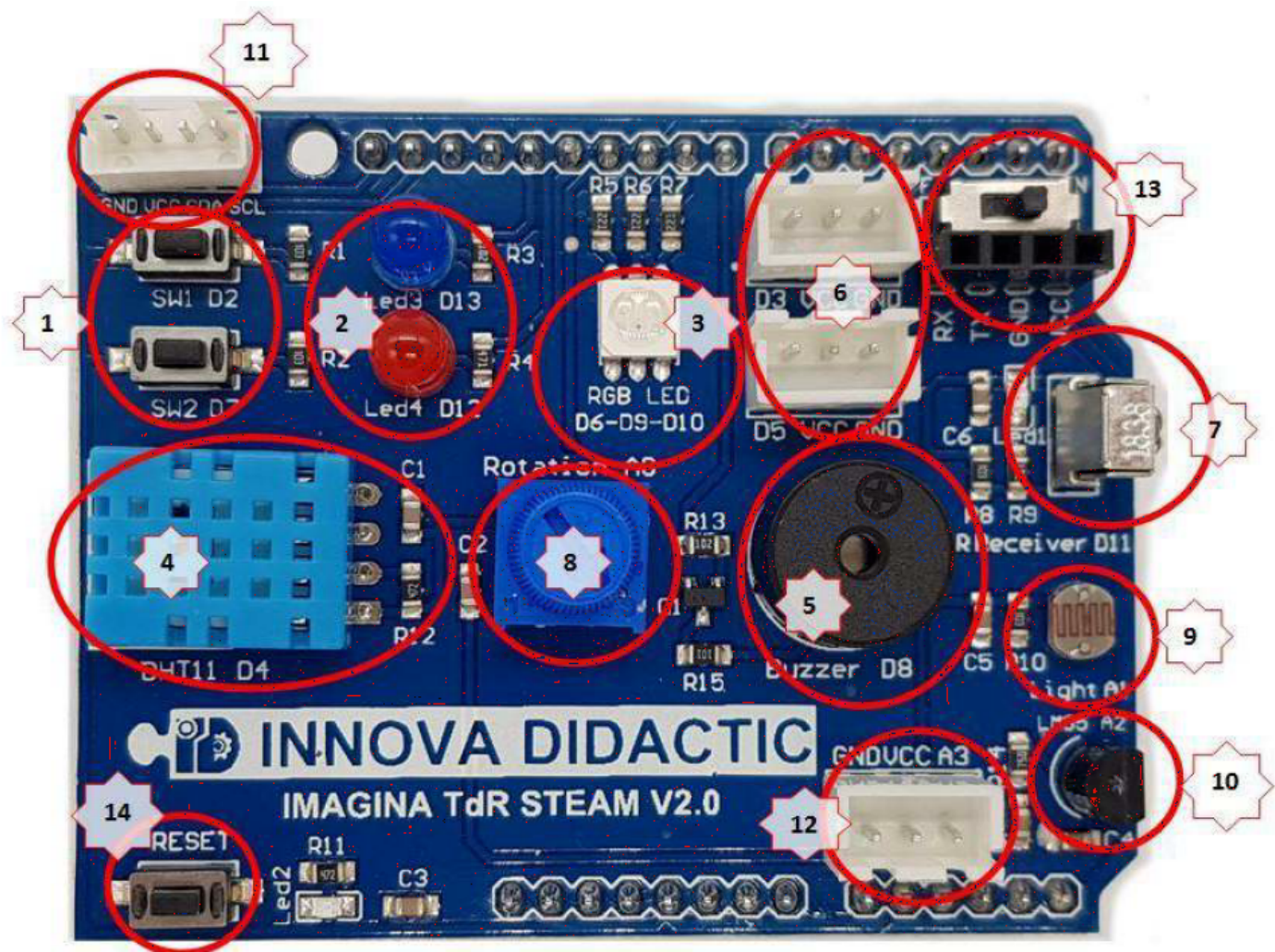
	Sensor/Actuator/Module
1	Two pushbuttons (SW1, SW2)
2	Two LEDS (Blue Led3 and Red Led4)
3	Led RGB
4	DHT11 Temperature and Humidity Sensor
5	Buzzer
6	Two digital outputs/inputs
7	Infrared receiver module (IR)
8	Rotary potentiometer module

9	Light sensor (LDR)
10	Temperature sensor (LM35)
11	I2C Interface
12	Analogic input
13	Bluetooth and Wifi connection
14	Reset button

Controller: Arduino board

Arduino UNO is an **electronic card** that integrates a microcontroller and a set of **input and ouptut connections pins** that allow, through a certain program, to **interact** with the physical environment through electronic sensors and actuators. The sensors are connected to the input pins and the actuators to the output pins.
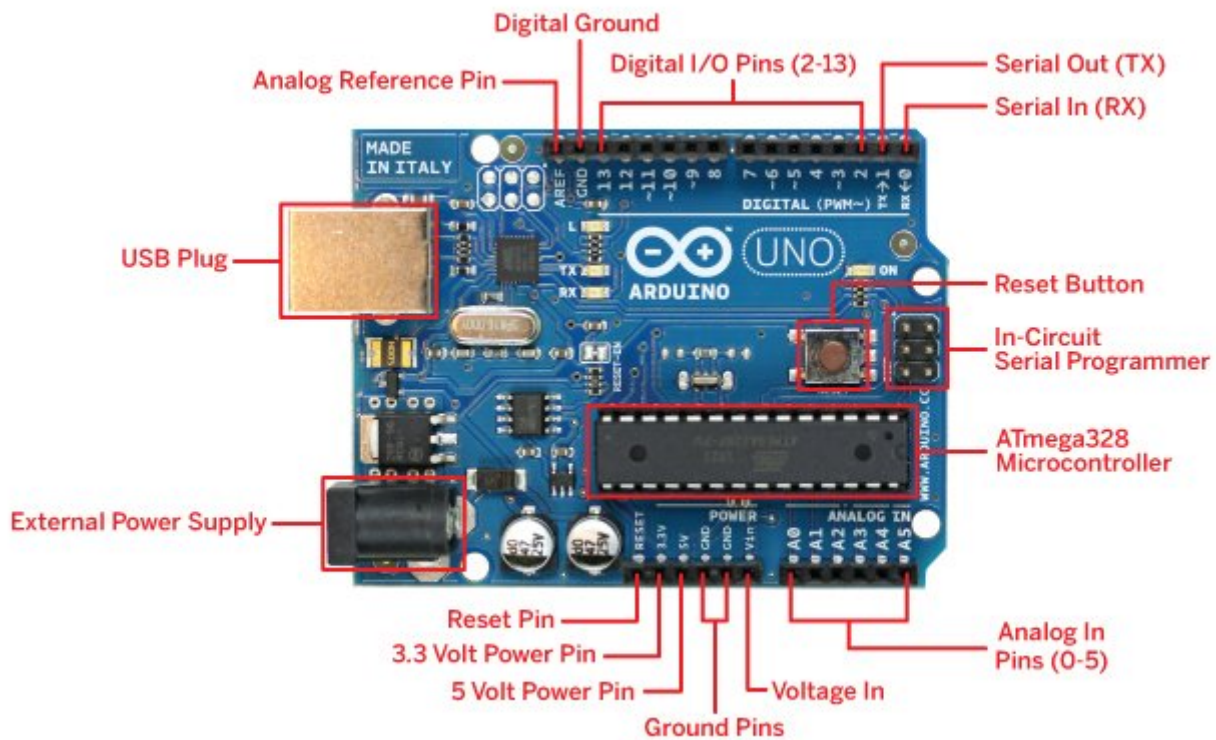
Information extracted and translated from here

Picture extracted from here

Programming Arduino board with Arduinoblocks

[Arduinoblocks](#) is a software created by the teacher Juanjo López. Thanks to its graphical environment, it facilitates the programming of Arduino boards at all levels.

It is not free software because the creator does not make public the code , but it can be used freely.

imagen.png
Image not found or type unknown

[Challenges](#) to create with Arduino and Imagina TDR (in Spanish)

Log in with Arduinoblocks as a Student and joining a project

To work with Arduinoblocks as a student there is a series of steps to follow:

- Connect the Arduino UNO board to the computer.
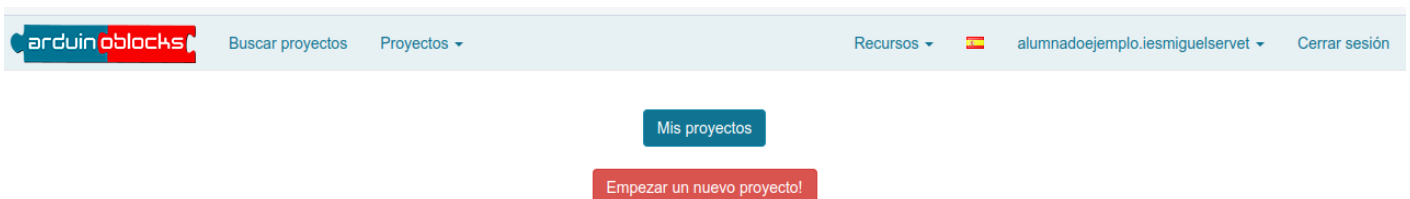- Run the program Arduinoblocks connector.
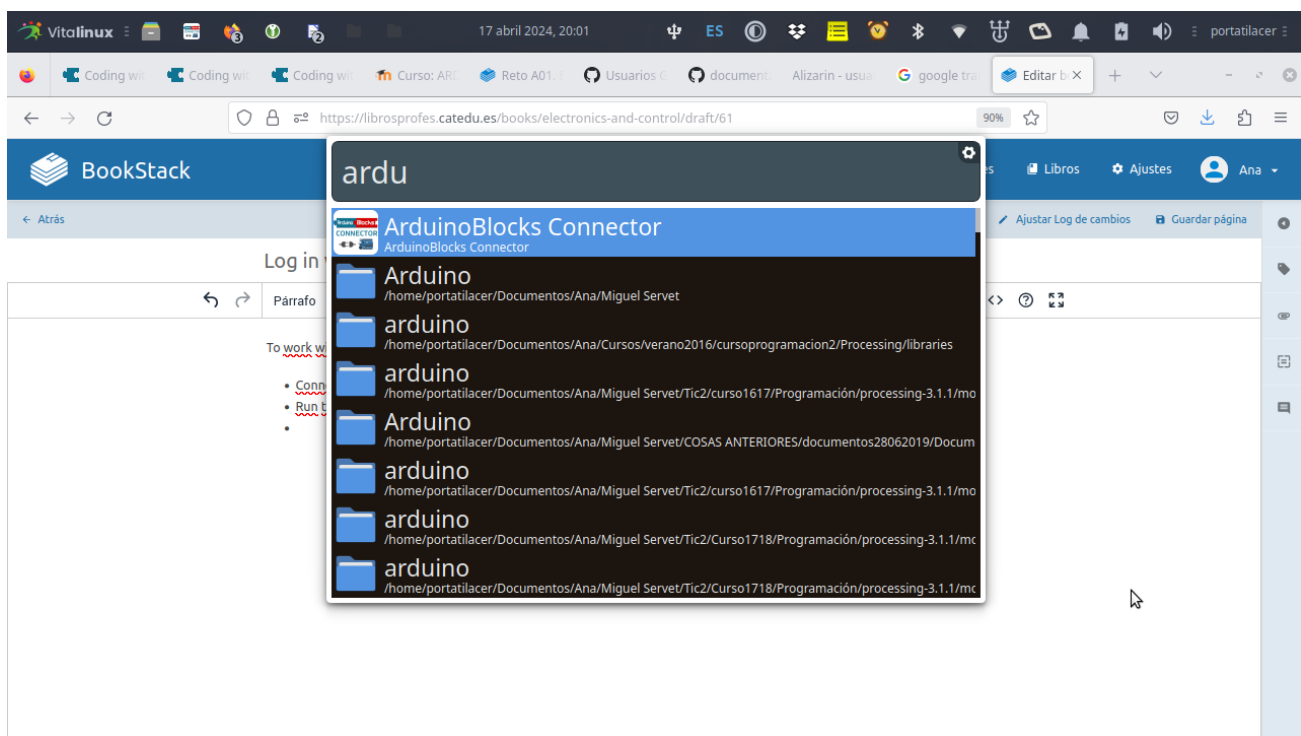
This program has to be open all the time we are using the Arduino.

- The browser opens with the arduinoblocks site. Click on the **Iniciar sesión** button
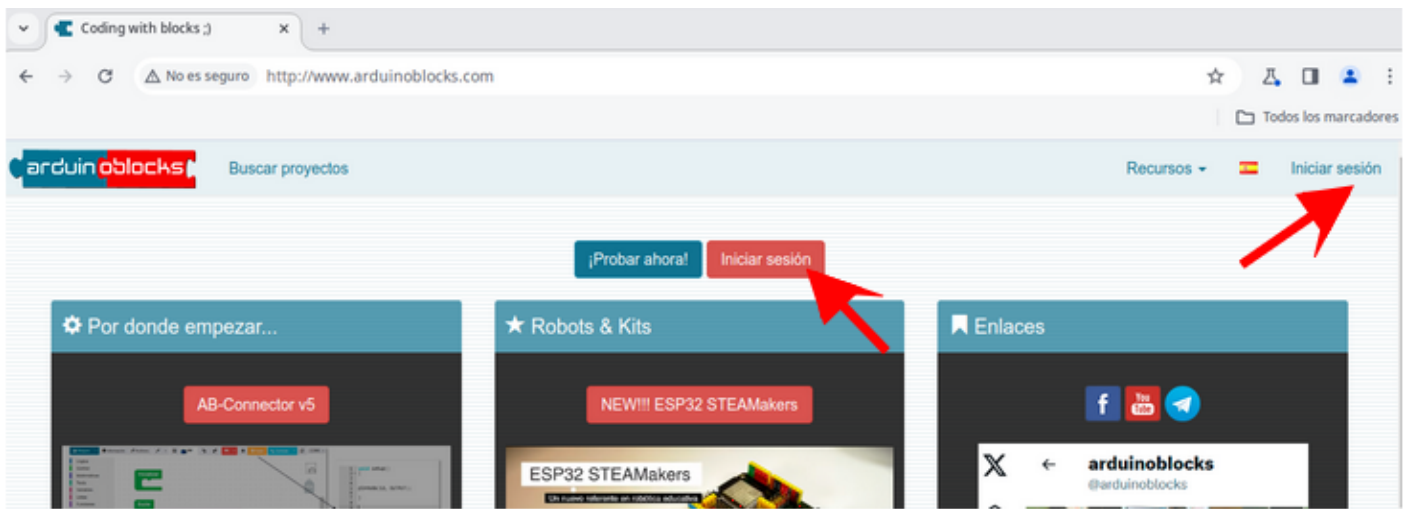
- Introduce the keys your teacher has given to you. You will be able to change the password later in your profile.

- Click on Empezar un nuevo proyecto

- Introduce the code of the project your teacher wil have provided to you and click on **Unirme...**

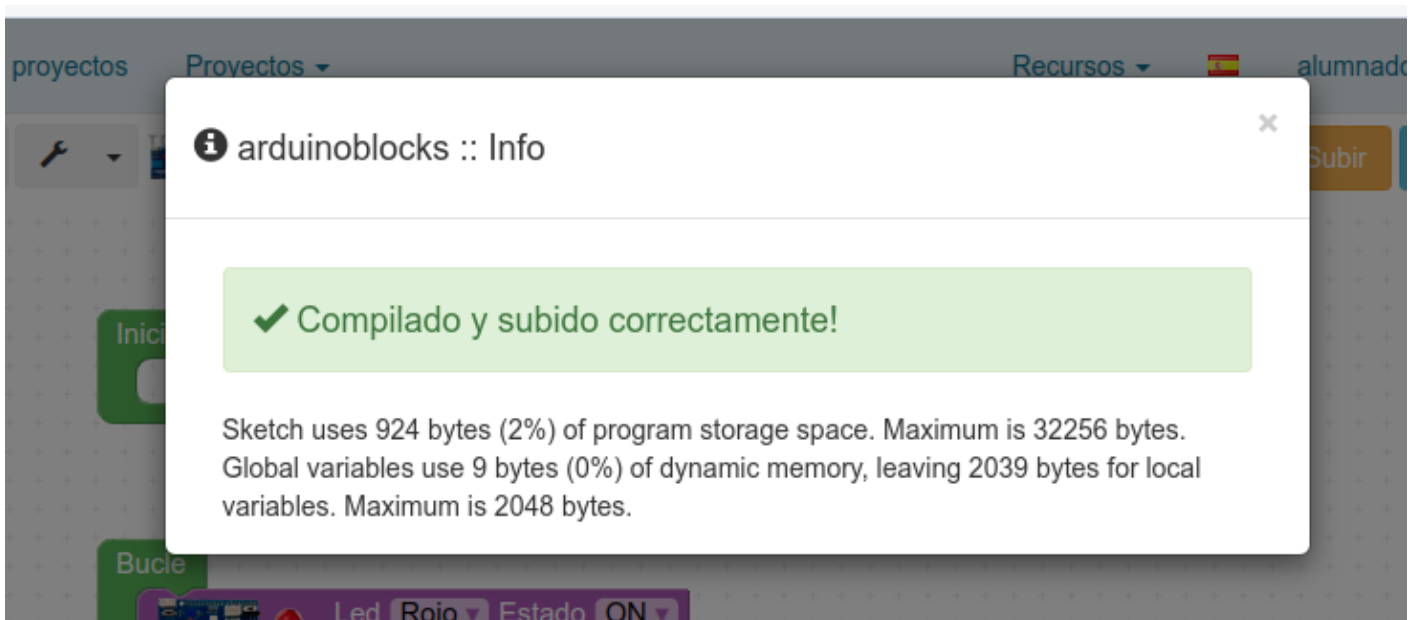- So now you can start working on your project

- First thing you have to do is checking that the Arduino Shield is well connected. You can see it at the top right of the screen. You have to see something similar to this:
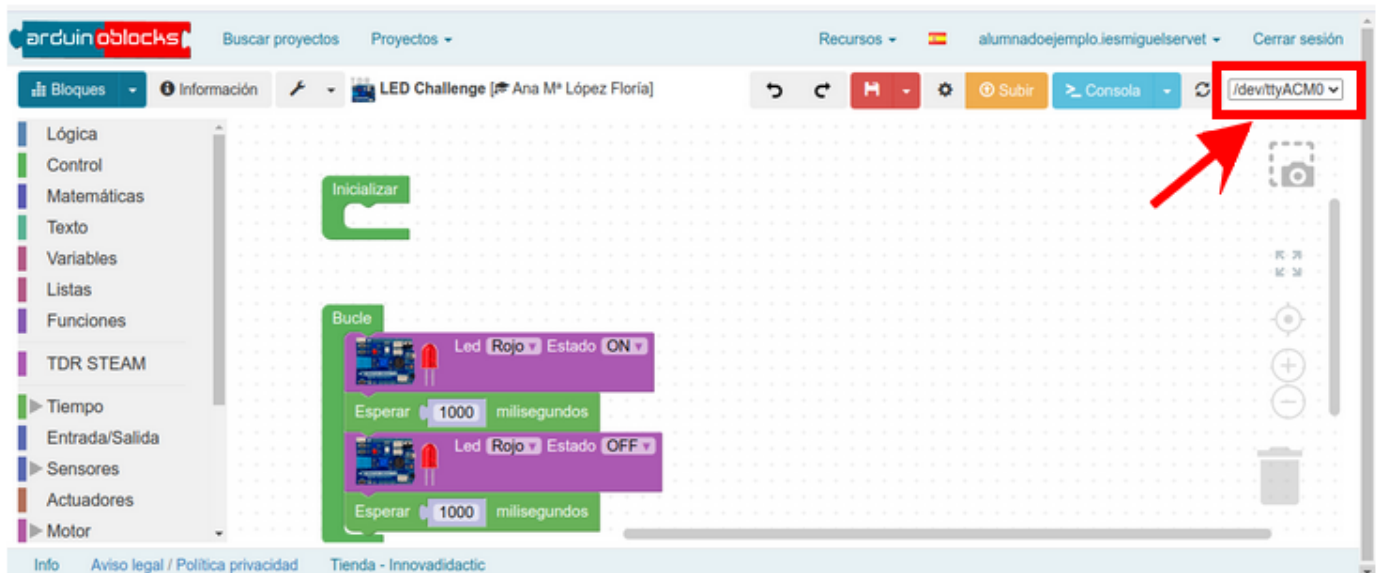
- Then it is time to upload the program to the Arduino to check it works. To do that you have to click on the Subir button.
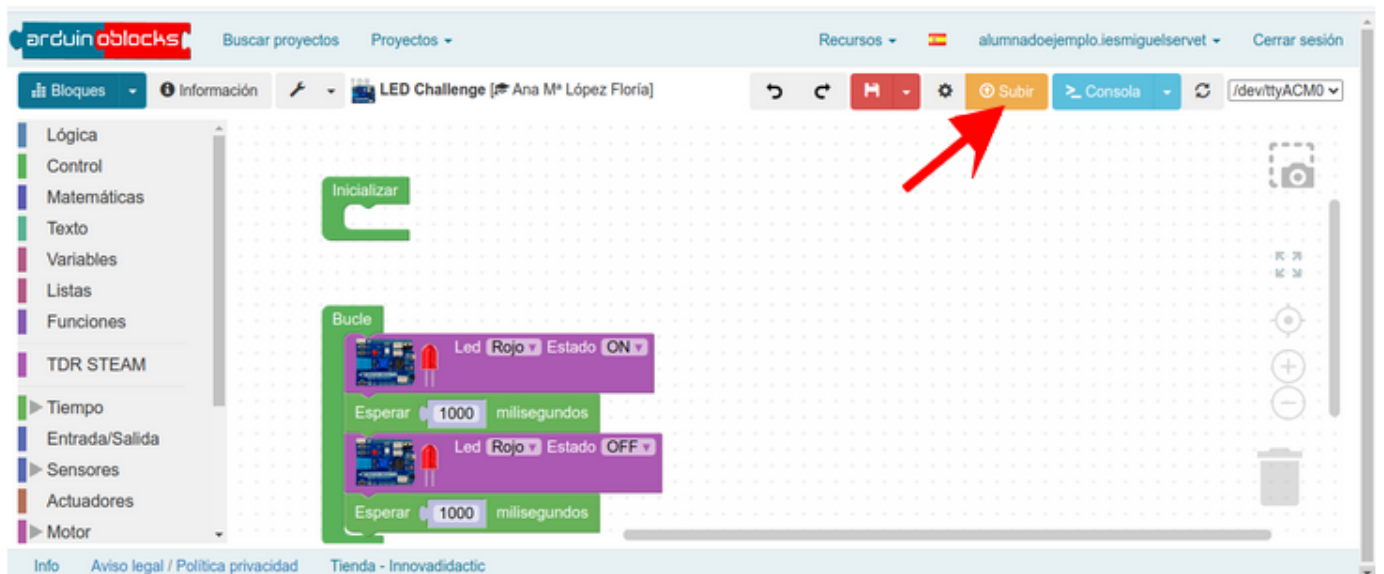
- You will see lights on the arduino shield and if everything is ok, a confirmation message.

● arduinoblocks :: Info

✔ Compilado y subido correctamente!

Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes.

- From this moment on, you will see the program working on the shield.