

SCENARIO

Title	MAP SCALE	
Summary	The activity consists of knowing the scales and how they are applied on the maps.	
Author/s	AIJU	

DIDACTIC OBJECTIVES

- Teach math in a different and attractive way.
- Show how a scale works on a map.

Physics Mathematics **X** Information Technology Robotics Programming

Education Level: 10-12 years 12-14 years **X**

PROBLEM STATEMENT

Some students have problems understanding the concept of what the mathematical or physics problem asks, so through a visual example it is intended to facilitate learning and understanding.

BOM (Bill Of Materials needed)

- Arduino Device
- Board
- (x2) Leds (Red and Green)
- (x3) Cables
- (x2) Resistors

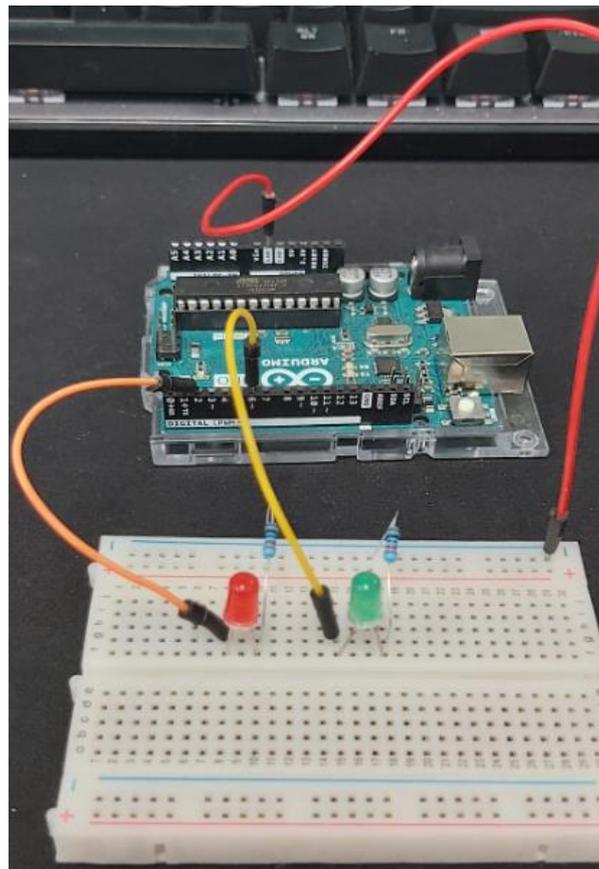
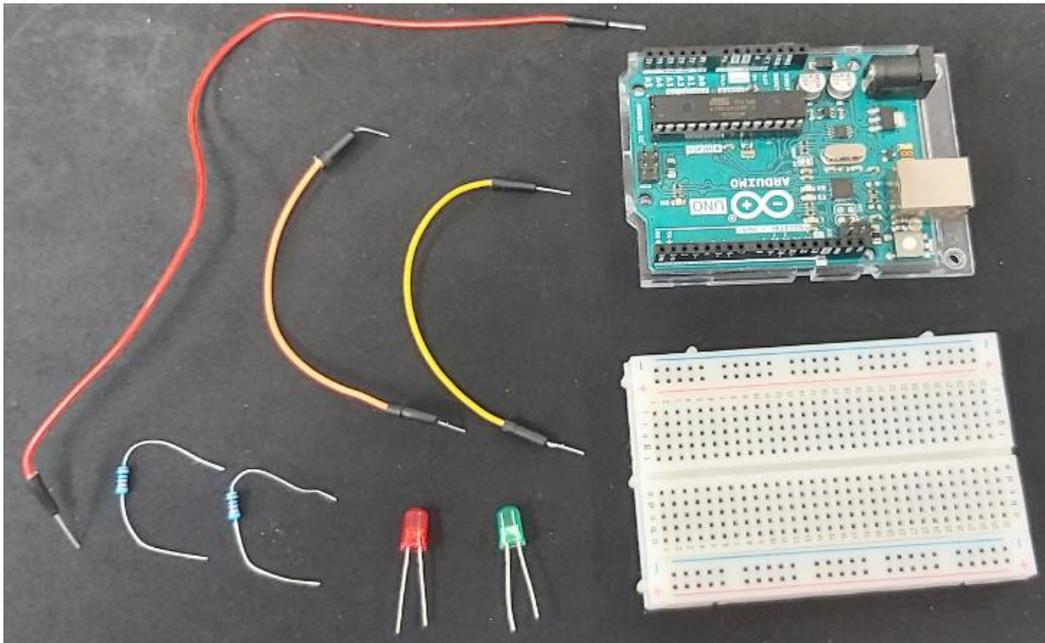


Erasmus+



InnoExperiment

INNOVATIVE APPROACH TO TEACHING THROUGH EXPERIMENT



„InnoExperiment – Innovative Approach to Teaching through Experiment”

Project Leader: Zespół Szkolno – Przedszkolny w Goniądzu (ZSP)



ACTIVITY DESCRIPTION

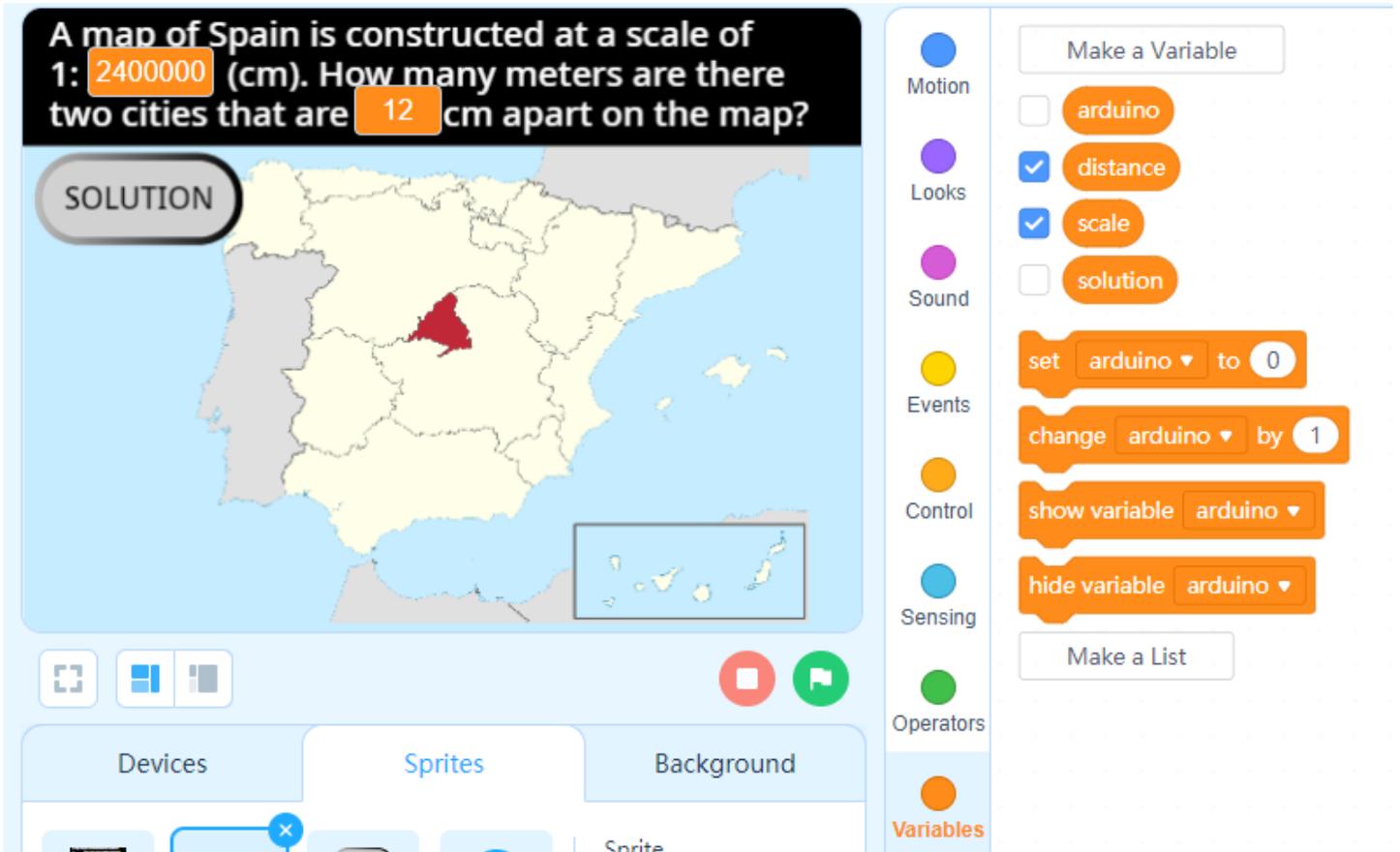
For the development of the activity, we will use software that allows us to unify the game developed in Scratch with the use of the Arduino board. In this case, we have used the mBlock software: (<https://mblock.makeblock.com/en-us/>)

First of all, we will make the graphic composition of the activity:



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We add the “scale” and “distance” variables for the problem statement:



The screenshot shows the Scratch programming environment. The stage displays a map of Spain with a red region highlighted. A text box at the top reads: "A map of Spain is constructed at a scale of 1: 2400000 (cm). How many meters are there two cities that are 12 cm apart on the map?". A "SOLUTION" button is visible on the left. The right sidebar shows the "Variables" category with a "Make a Variable" button. Below it, the "arduino" variable is selected, and the "distance" and "scale" variables are checked. The script area contains the following blocks: "set arduino to 0", "change arduino by 1", "show variable arduino", and "hide variable arduino".

In addition, we will create the "Solution" variable, which will be the one that calculates the solution to the problem, and the "Arduino" variable, which will be in charge of sending to the Arduino board when and that the corresponding LED lights up.

Once we have the graphic composition and the variables created, we will start with the programming:

1. We will start by setting the visual background that we want to appear while the mathematical/physics problem is being posed and we will set the “Arduino” variable to 0, so that the LEDs are off. In addition, for the “time” variable, random value will be created, so that whenever the Activity starts, different values come out:

```

when clicked
  set arduino to 0
  switch backdrop to SpainMap
  forever
    hide variable solution
    set distance to pick random 1 to 20
    show variable distance
    set scale to pick random 10 to 90 * 100000
    show variable scale
  
```

2. Then, we apply the formula that will calculate the problem:

```

set solution to distance * scale
  
```

3. Next, the system wait for the user to write the result:

```

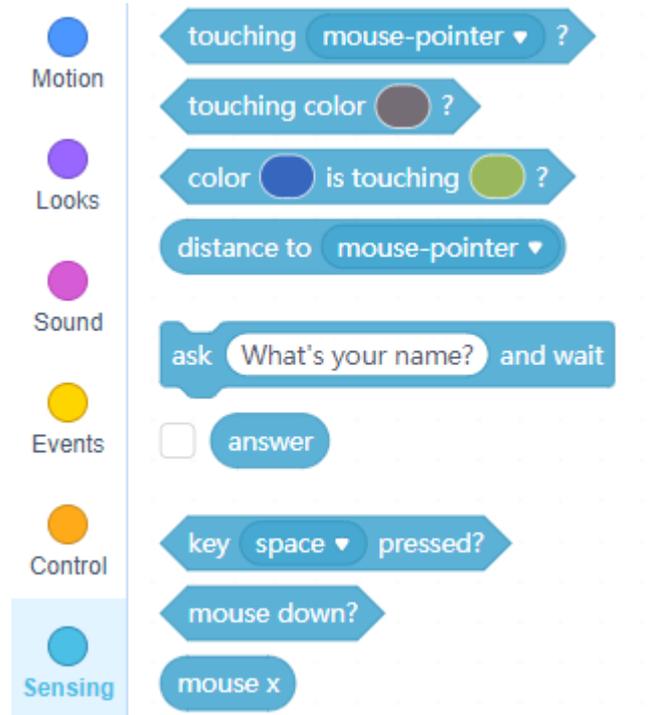
ask answer and wait
  
```

A map of Spain is constructed at a scale of 1: 7900000 (cm). How many meters are there two cities that are 3 cm apart on the map?

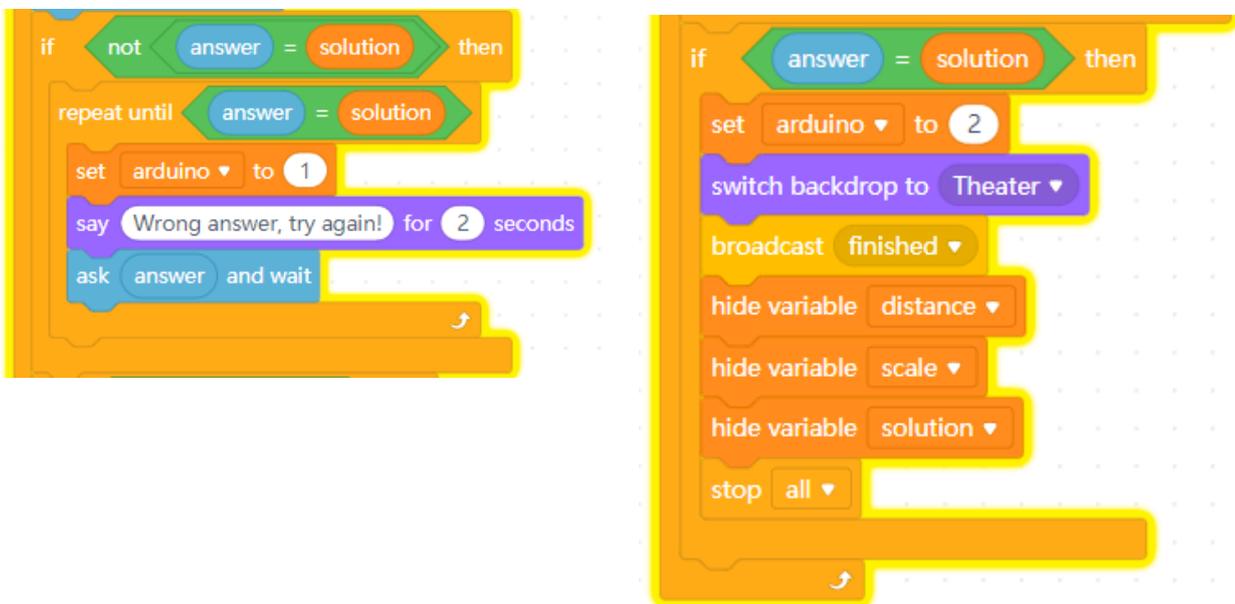
SOLUTION



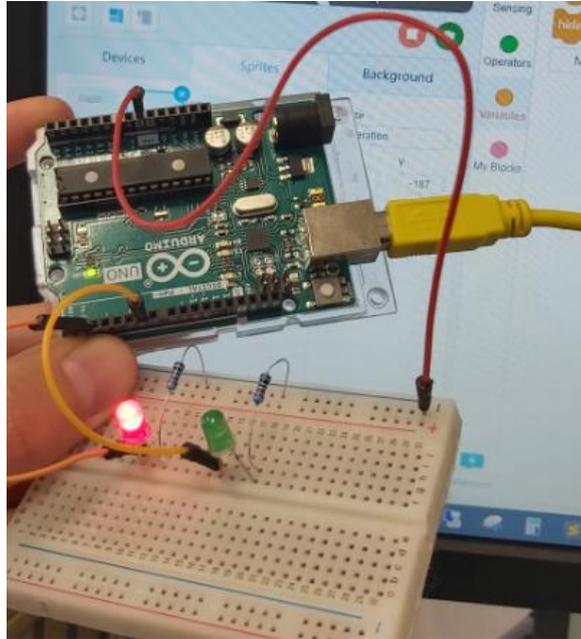
4. The result indicated by the user will be saved in a variable called “answer”, which will be created in the “Sensing” section:



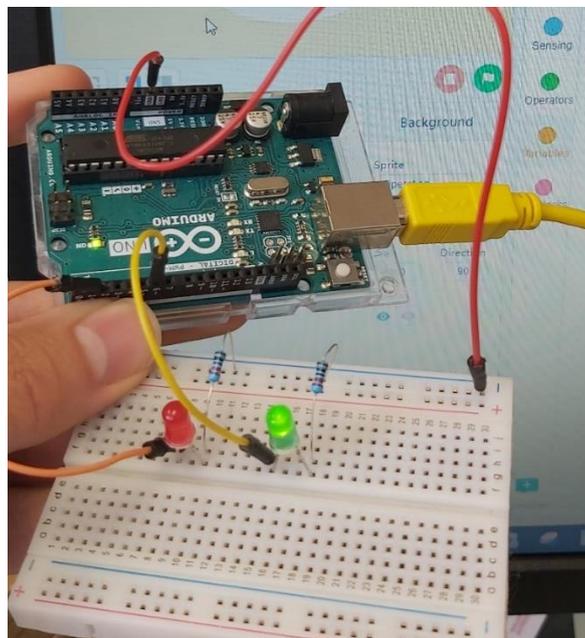
5. Once the answer has been inserted, the programming will check to verify the result:



6. If the entered result is wrong, the game will display "Wrong answer, try again!" and will prompt the user to retype the answer. In this block the Red LED of the Arduino will light:



7. If, on the contrary, the user types the correct answer, the Green LED will light up and the variables will be hidden and the background will change:



8. The main Code would be as follows:

A map of Spain is constructed at a scale of 1: 7900000 (cm). How many meters are there two cities that are 3 cm apart on the map?

SOLUTION



Make a Variable

- arduino
- distance
- scale
- solution

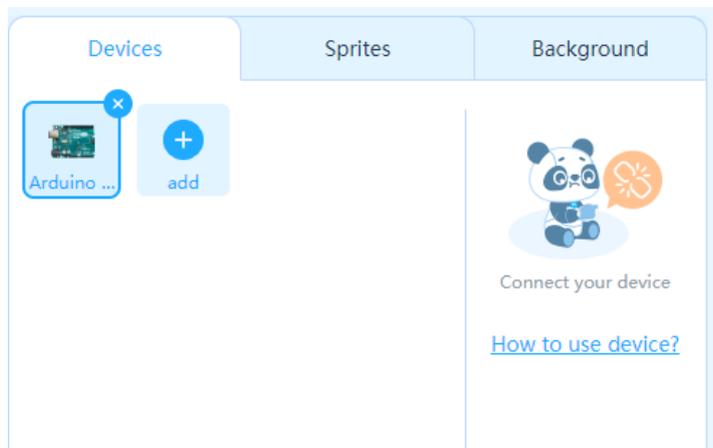
Make a List

```

when clicked
  set arduino to 0
  switch backdrop to SpainMap
  forever
    hide variable solution
    set distance to pick random 1 to 20
    show variable distance
    set scale to pick random 10 to 90 * 100000
    show variable scale
    set solution to distance * scale
    ask answer and wait
    if not answer = solution then
      set arduino to 1
      say Wrong answer, try again! for 2 seconds
      ask answer and wait
    if answer = solution then
      set arduino to 2
      switch backdrop to Theater
      broadcast finished
      hide variable distance
      hide variable scale
      hide variable solution
      stop all
          
```

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9. The code that would be in charge of lighting the LEDs on the Arduino board would be as follows:



```

when clicked
if arduino = 0 then
  set digital pin 2 output as low
  set digital pin 6 output as low
if arduino = 1 then
  set digital pin 2 output as high
  set digital pin 6 output as low
if arduino = 2 then
  set digital pin 2 output as low
  set digital pin 6 output as high
  
```

STUDENTS' EVALUATION

The way to evaluate the students would be for them to demonstrate on paper how they have developed the exercise and to use the program / game to check the solutions.

SCALABILITY

Regarding the concept of scalability, it can be applied to objects or several objects or maps at the same time.