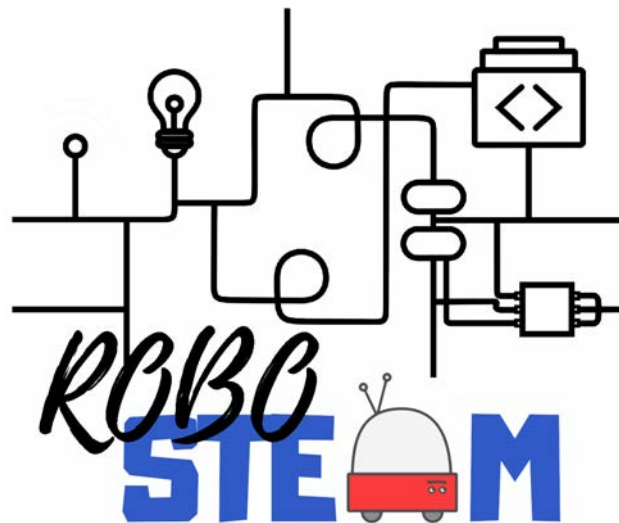


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# RoboSTEAM C4 – Students Exchange in León – Spain - Finland

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0.1	23/02/2020	First Draft
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## 1. C4. STUDENTS EXCHANGE

This document describes Spanish-Finish Students Exchange carried out in I.E.S. Eras de Renueva in the context of RoboSTEAM project [1-8] from February 17-20, 2020. The document includes the pilot description, the context and the main results.

## 2. Exchange description

This section describes how the activity was carried out and the context of such activity.

### 2.1. Context

IES Eras de Renueva is a big school with around 1375 students and 120 teachers. The school offers several bilingual Programs in English or French and a great variety of optional subjects. Students can participate in several international exchanges improving the international dimension of our education.

The Finish team stay at hotel they selected among the ones we offered them. Every day the come to the school to work together with the Spanish team to respond to the proposed challenges. They worked in mixed teams in a computer lab for coding and in a workshop for testing the circuit on the models. Every teams was provided with models and tools for testing, some computer for coding and an Arduino kit for making the circuit.

Spanish subjects involved:

- First level (3º ESO)- At this level, students have not studied before anything related to Robotics students. They can study a subject called Control and Robotics, in which they learn about electrical circuits and programming with Scratch.
- Second level (4º ESO)- In this level, students can study other subject called Programming. Most of the students have studied Control and Robotics in 3º ESO.

- Second level (4<sup>o</sup> ESO)- In this level, students can study other subject called Technology, in which they study electricity and robotics, among other fields.

## 2.2. Students and teachers involved

### I.E.S. Eras de Renueva Students:

#### 3<sup>o</sup> ESO students:

Class	Student	Year of birth	Sex	Subject
3 <sup>o</sup> A	Irene García Álvarez	2005	F	Control y Robótica
3 <sup>o</sup> B	Nerea Carral Martínez	2005	F	Control y Robótica
3 <sup>o</sup> B	Adriana Urdiales Martínez	2005	F	Control y Robótica
3 <sup>o</sup> C	Alba Pérez Sanz	2005	F	Control y Robótica

#### 4<sup>o</sup> ESO students

Class	Student	Year of birth	Sex	Subject
4 <sup>o</sup> A	Lucía Alaiz Cánovas	2004	F	Programación
4 <sup>o</sup> A	Hugo Hernández Mayo	2004	M	Tecnología
4 <sup>o</sup> A	Alejandro Ramos Martínez	2004	M	Tecnología
4 <sup>o</sup> A	Andrés Riaño Honrubia	2004	M	Programación
4 <sup>o</sup> A	Adrián Vega Rodríguez	2004	M	Programación
4 <sup>o</sup> B	César Juan Rodríguez	2004	M	Programación
4 <sup>o</sup> B	Mónica Montes Magalhaes	2004	F	Programación
4 <sup>o</sup> B	Álvaro Sarmiento de Puente	2004	M	Programación
4 <sup>o</sup> E	Francisco Gil Muñiz	2004	M	Programación

## **I.E.S. Eras de Renueva TEACHERS**

Susana Celis Tena

Covadonga González Barrientos

Julio Carlos Fernández Domínguez

## **FROM UEF:**

### **Students**

Mikael Ahonen

Eliel Kempas

Atte Linnolahti

Johan Rissanen

Matias Rissanen

### **Teachers**

Anni Hirvonen

Annukka Juutinen

## **2.3. Nano-challenges to be addressed**

### **CHALLENGE**

The school wants to improve our energy consumption. We want to control some situations for decrease it. To do this you will have to design different challenges.

It is required to use a program (ArduinoBlocks) for programming the devices and a kit with Arduino microcontroller, a protoboard, sensors, connector and actuators. You must design a model to simulate these situations and be able to check the real operation

**Challenge 1: The bell rings when each class stars or ends.**

Parts of the bell? Programming ring sequence (use seconds instead of hours or minutes)

You could use a passive and active buzzer. Be careful with the polarity of the buzzer.

We prefer the passive buzzer because it provides different sounds.

**Challenge 2: Make some LEDs turn on and off depending on the light**

What type of component is an LDR? How is it connected?

You could use three LEDs and a LDR sensor. Be careful when you connect the LEDs (polarity).

The LDR needs to connect a 10 k $\Omega$  resistor and each LEDs need to connect a 220  $\Omega$  resistor.

**Challenge 3: Barrier motor stops when an obstacle is detected.**

Type of position sensors?

You could use the HC-SR04 sensor, a Servomotor SG90 and a Button (small)

**Challenge 4: The heating turns on or off depending on the temperature**

Types of temperature sensor?

You must use LED (to simulate the heating on and off) and a DHT 11 Temperature sensor.

**Challenge 5: Sound the alarm if it detects a fire**

Alarm systems? Evacuation protocol?

You could use a buzzer and a DHT 11 Temperature sensor.

**Challenge 6: Blinds rise or fall depending on the light**

Type of motor? Programming turns and speed engine.

You must use a LDR sensor and a motor.

## 2.4. Kits employed

### Robotic Kits:

<b>Reference</b>	<b>Arduino:</b> ELEGOO UNO Project Basic Starter Kit with Tutorial and UNO R3 Board Compatible with Arduino IDE for Beginner
<b>Description</b>	
Components needed for turning on the LEDs of the illuminated sign according to the sequence designed by the students	
<b>Proposal</b>	
Cheap and basic kit for beginners. Applicable Age: 12+ To use Elegoo starter kits requires basic electronic knowledge. If the user has no experience, it would be better to have someone lead and teach them while studying	
<b>Components</b>	
<p>1pcs ELEGOO R3 Controller Board            1pcs USB Cable            1pcs Breadboard            pcs 65 Jumper Wire            1pcs IC 74HC595            1pcs Active Buzzer            1pcs Tilt Switch            2pcs Photo resistor            5pcs Yellow LED            5pcs Blue LED            5pcs Green LED            5pcs Red LED            1pcs RGB LED            5pcs Button(small)            10pcs Resistor (10R)            10pcs Resistor (100R)            30pcs Resistor (220R)            10pcs Resistor (330R)            10pcs Resistor (1K)            10pcs Resistor (2K)            10pcs Resistor (5K1)            10pcs Resistor (10K)            10pcs Resistor (100K)            10pcs Resistor (1M)            5pcs Female-to-male DuPont Wire</p>	

### Kits for the models

- Wooden board
- Colour paper
- Tin solder



- Glue guns
- Poster card
- Saws, cutters, drill, clamps and pliers.
- Paints and brushes.

## 2.5. Cultural activities

<b>Programme</b>	
<b>Day</b>	<b>Activities</b>
<b>Monday February 17<sup>th</sup></b>	22:00 Arrival at León Train Station Reception and welcome of the participants Transfer to the hotel. Accommodation
<b>Tuesday February 18<sup>th</sup></b>	Morning 09:30 Reception of the participants at I.E.S. Eras Guided tour to know the school facilities Work RoboSTEAM challenges. Teachers' meeting and Coffee Break Activities for Students  Afternoon 16:30 Visit the Cathedral and the historical centre. Photo Gymkana
<b>Wednesday February 19<sup>th</sup></b>	Morning 09:30 Work RoboSTEAM challenges. Teachers' meeting and Coffee Break Activities for Students  Afternoon....16:00 Visit University of León: Robotic Lab and Computational Center  Dinner in a restaurant at the historical center of León.
<b>Thursday February 20<sup>th</sup></b>	Morning 09:30 Work RoboSTEAM challenges. Teachers' meeting and Coffee Break Exposure of the final result of the challenges Delivery of diplomas to Finland students and teachers.  Afternoon Departure

The main aims of the activities carried out were, on one hand, for the participants to get to know each other to improve the teamwork and, on the other hand, to know the socio-cultural context of the city where the exchange took place.

Furthermore, these socio-cultural visits were completed with other activities regarding the challenge, both from an industrial and labour point of view as well as an academic research point of view.

### 3. Signatures and Agenda



Co-funded by the  
Erasmus+ Programme  
of the European Union

#### ERASMUS PLUS STRATEGIC PARTNERSHIP PROJECT

**ROBOSTEAM – INTEGRATING STEAM AND COMPUTATIONAL THINKING DEVELOPMENT BY USING ROBOTICS AND PHYSICAL DEVICES**

#### 3rd LEARNING-TEACHING-TRAINING PROJECT MEETING

**IES Eras de Renueva (León), 17<sup>th</sup> February – 20<sup>th</sup> February 2020**

#### Agenda

##### Participants:

1. Instituto de Eras de Renueva (IER)
  - Susana Celis Tena
  - Julio Carlos Fernández Domínguez
  - Covadonga González Barrientos
2. University of Eastern Finland (UEF)
  - Anni Hirvonen
  - Annukka Juutinen
3. University of León (ULE)
  - Miguel Ángel Conde González
  - Camino Fernández Llamas
  - Francisco Jesús Rodríguez Sedano

#### 1<sup>st</sup> Day: Monday, 17<sup>th</sup> February 2020

Arrival of the participants at León train station.

22:20 Reception and welcome to Finish teachers and students.

Transfer to the hotel and accommodation.

Hotel Quindos

Localitation:

C/ Gran Vía de San Marcos, 38

24002 León



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### 2<sup>nd</sup> Day: Tuesday, 18<sup>th</sup> February 2020

Arrival of the participants at IES Eras de Renueva. Location: C/ Comandante Cortizo, s/n, 24008 León <http://bit.ly/2Mpi8Oj>

9:30 - 10:30 Guided tour to know the school facilities.

10:30 - 11:30 Working on the RoboSTEAM challenges

11:30 - 11:55 Coffee break

12:00 - 13:00 Visiting different groups and subjects

13:30 - 14:30 Lunch time

17:00 - 17:30 Visit to the historical city center. Tour around the City of León. Visit to the Cathedral and other monuments

17:30 - 19:00 Orientation Tour for all the Students - 'Photo Gymkana' starting at The Cathedral

20:30 Dinner at the hostel

### 3<sup>rd</sup> Day: Wednesday, 19<sup>th</sup> February 2020

9:00 - 11:30 Working on the RoboSTEAM challenges

11:30 - 11:55 Coffee break

12:00 - 13:00 Visiting different groups and subjects

13:30 - 14:30 Lunch time

16:00 - 17:00 Visit to Control and Robotic laboratory in the University of León

17:30 - 18:30 Visit to Computation Center in the University of León

20:30 Teachers and Students Dinner in a restaurant at the city center

### 4<sup>th</sup> Day: Thursday, 20<sup>th</sup> February 2020

9:30 - 10:30 Working on the RoboSTEAM challenges

10:30 - 11:30 Exhibition of the [final results](#) of the challenges

11:30 - 11:55 Coffee break

12:00 - 12:30 Feedback about the visit and the RoboSTEAM challenges

12:30 - 12:45 Delivery of certificates and farewell

13:00 Departure of the Finland team

Signature list are pasted below, they were signed in different moments because the COVID outbreak. The members of the coordinator have not signed as they are hosting the documents.



Co-funded by the  
Erasmus+ Programme  
of the European Union

**ERASMUS PLUS STRATEGIC PARTNERSHIP PROJECT**  
**ROBOTEAM – INTEGRATING STEAM AND COMPUTATIONAL THINKING**  
**DEVELOPMENT BY USING ROBOTICS AND PHYSICAL DEVICES**  
**3<sup>rd</sup> LEARNING-TEACHING-TRAINING PROJECT MEETING**  
 Hosted by IES ERAS DE RENEUEVA in LEÓN, SPAIN  
 from 17<sup>st</sup> to 20<sup>th</sup> February 2020

**LIST OF THE PARTICIPANTS**

LIST OF TEACHERS				
Nº PARTICIPANT	NAME SURNAME	COUNTRY	SCHOOL	SIGNATURE
1	Susana Celis Tena	Spain	Instituto de Eras de Renueva (IER)	
2	Covadonga González Barrientos	Spain	Instituto de Eras de Renueva (IER)	
3	Julio Carlos Fernández Domínguez	Spain	Instituto de Eras de Renueva (IER)	
4	Anni Hirvonen	Finland	University of Eastern Finland (UEF)	
5	Annikka Juutinen	Finland	University of Eastern Finland (UEF)	
6	Miguel Ángel Conde González	Spain	University of León (ULE)	
7	Camino Fernández Llamas	Spain	University of León (ULE)	
8	Francisco Jesús Rodríguez Sedano	Spain	University of León (ULE)	
LIST OF STUDENTS				
1	Irene García Álvarez	Spain	Instituto de Eras de Renueva (IER)	
2	Nerea Carral Martínez	Spain	Instituto de Eras de Renueva (IER)	
3	Adriana Urdiales Martínez	Spain	Instituto de Eras de Renueva (IER)	
4	Alba Pérez Sanz	Spain	Instituto de Eras de Renueva (IER)	
5	Lucía Aláiz Cánovas	Spain	Instituto de Eras de Renueva (IER)	
6	Hugo Hernández Mayo	Spain	Instituto de Eras de Renueva (IER)	
7	Alejandro Ramos Martínez	Spain	Instituto de Eras de Renueva (IER)	



8	Andrés Riaño Honrubia	Spain	Instituto de Eras de Renueva (IER)	
9	Adrián Vega Rodríguez	Spain	Instituto de Eras de Renueva (IER)	
10	César Juan Rodríguez	Spain	Instituto de Eras de Renueva (IER)	
11	Mónica Montes Magalhaes	Spain	Instituto de Eras de Renueva (IER)	
12	Álvaro Sarmiento de la Puente	Spain	Instituto de Eras de Renueva (IER)	
13	Francisco Gil Muñiz	Spain	Instituto de Eras de Renueva (IER)	
14	Mikael Ahonen	Finland	University of Eastern Finland (UEF)	
15	Eliel Kempas	Finland	University of Eastern Finland (UEF)	
16	Atte Linnolahti	Finland	University of Eastern Finland (UEF)	
17	Johan Rissanen	Finland	University of Eastern Finland (UEF)	
18	Matias Rissanen	Finland	University of Eastern Finland (UEF)	

Spain, 20<sup>th</sup> February 2020

Coordinator of ERASMUS+

Susana Celis Tena

Headmistress

Ana M Espino González



## 4. Results

### Team work

Students worked in mixed teams of 3 to 4 members from the different participating schools. All the teams worked in a coordinated way to solve the challenges proposed, obtaining good results both in the programming part, as well as the physical construction of the model and the presentation of the proposals of each team.

Photos of the work done by the different teams are attached.

### Assessment instruments:

- **STEAM Semantic Survey**

Before starting with the different projects, this survey was carried out to assess learners' starting points.

At the end of the Project, the survey will be carried out again to evaluate their progress in skills related to control, robotics and physical devices.

The project carried out in this exchange will be decisive in the overall progress of our students.

- **Co-Measure rubric**

A rubric to assess student collaboration in STEAM units.

This rubric was used for the evaluation and co-evaluation of the work developed by each of the groups. It values both teamwork and the variety of solutions provided by each team, and the problem-solving process as well.

All the teams finished three of the five challenges, coded with Arduino Blocks, connected the circuit and implemented it in the model in a satisfactory way.



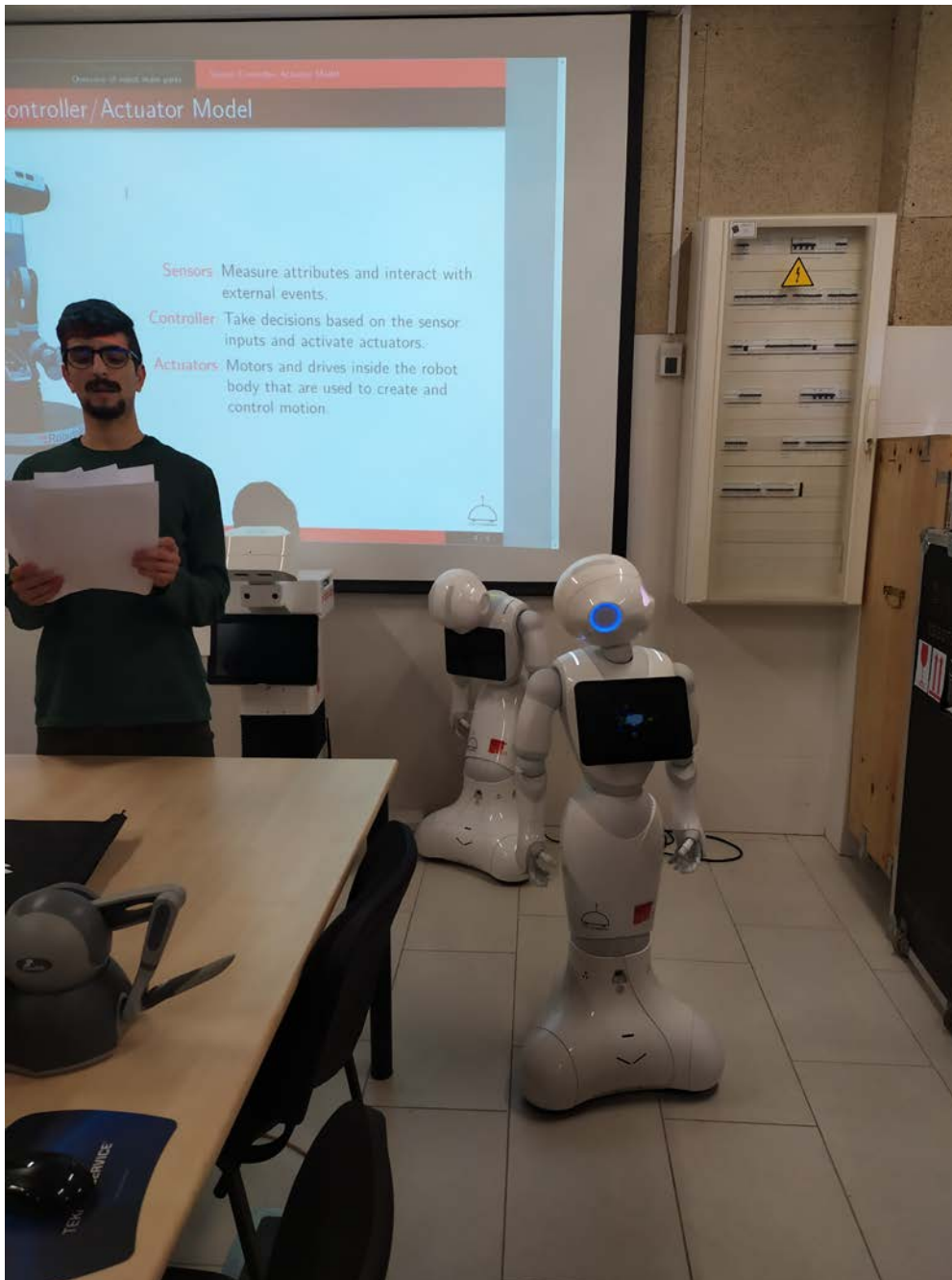
Finish student had not work with these programs and Arduinio kits before. For this reason, Spanish students led the work of coding and conecting the circuits explaining their colleagues how to do it.

## 5. Photos

### Visit to the Cathedral



## Robotics Lab of the University of León



### Impress 3D Centre of the University of León





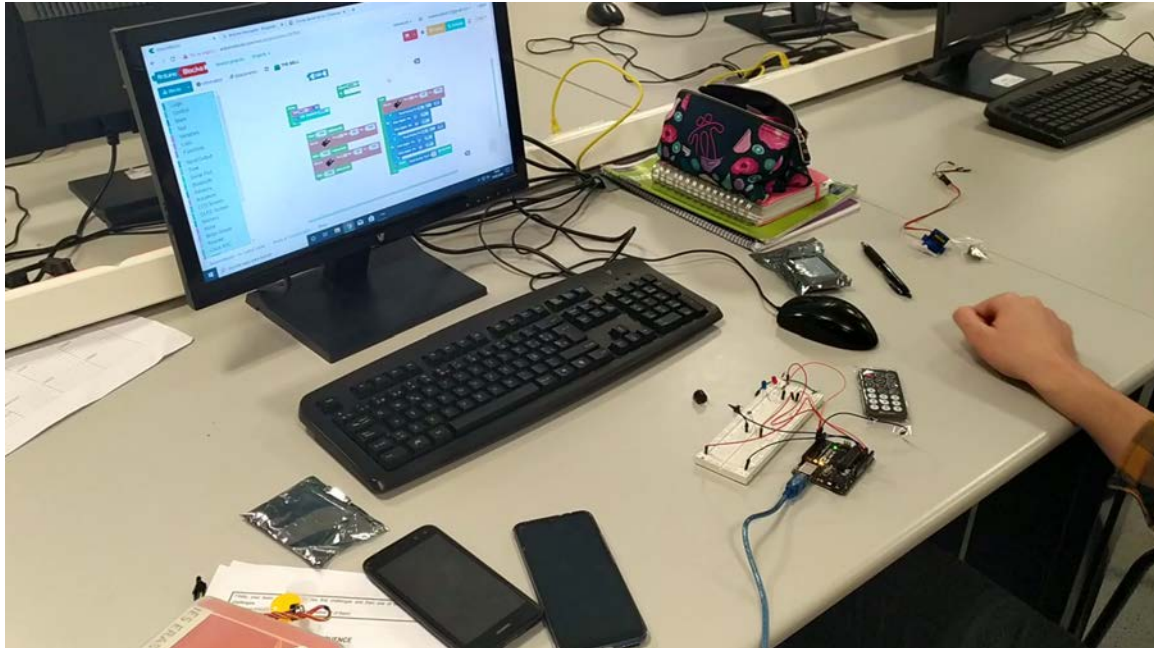
## Supercomputing Centre of the University of León



### Coding in teams

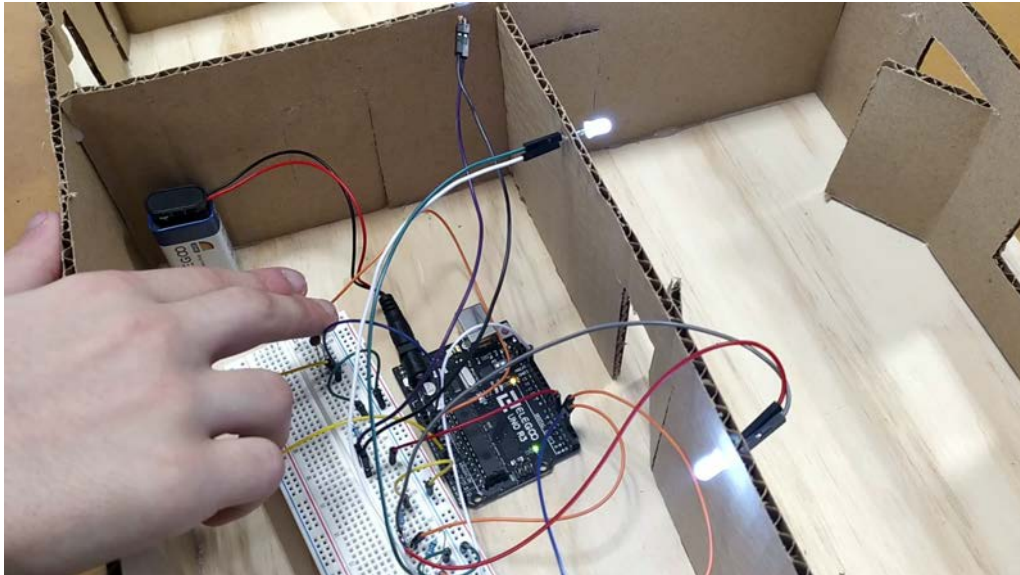


### Testing the circuit





### Checking in the models



### Presenting their projects









Teams photo



## 6. Teachers' and students' perceptions

### Strengths:

- Students worked in mixed teams. Both the Finish and Spanish students worked together in all aspects of the project, such as designing, coding, implementation with Arduino boards and construction of the models to respond to the proposed challenges.
- The teachers from the schools involved explained the challenges and supervised the students' work. Each team of teachers supervised the aspect related to their teaching work. Finish teachers and students had not previously worked in this coding and robotics applications. They mainly collaborated in the design, while the Spanish teachers and students guided the project in coding and making process.
- Each team got finished three of the five challenges with different solutions and most of them were made with a high degree of finish and performance.
- Participants had the opportunity to visit places where they could see the relationship between the digital devices, they had been using to solve their challenges and those used in the world of the university research.
- Moreover, the mobility fostered cultural exchange between students both in work contexts and through the cultural visits.
- In general, the proposed agenda was quite successful in all aspects.

### Points to be improved:

- As the mobility lasted only a few days, there was not enough time to finish all the challenges, so the organization required a little more effort, in terms of how to propose the challenges, time needed by the students to carry them out, how to organize the teams, how to match the schedules of the host teachers with those of the visiting members, etc.

## 7. Acknowledgements

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