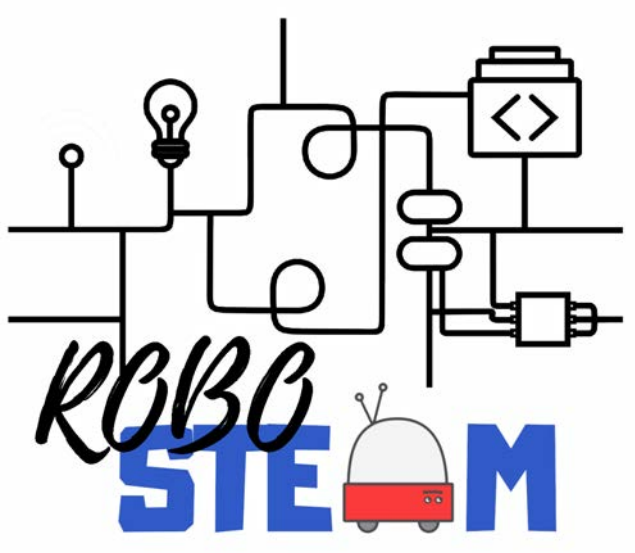
RoboSTEAM C2 – I.E.S. ERAS DE RENUEVA



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Version	Date	Comments
0.1	28/10/2020	First draft
0.2	15/11/2020	Inclusion of signatures
1.0	29/05/2021	Format changes
1.1	30/05/2021	Errata correction

Table of Contents

1. C2. Students Exchange

This document describes Spanish-Portuguese students exchange carried out in I.E.S. Eras de Renueva in the context of RoboSTEAM project [1-8] from October 21-25, 2019. 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 Portuguese team stay at hostel 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 making the models. Every team was provided with materials and tools for making the model, some computer for coding and an Arduino kit.

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 (4º 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:

3º ESO students:

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

4º ESO students

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

I.E.S. Eras de Renueva TEACHERS

Susana Celis Tena

Covadonga González Barrientos

2.3. Nano-challenges to be addressed

CHALLENGE

The school festival will be held in the auditorium. Students' relatives and friends will be welcome to the event. We want to signal how to get to the auditorium from the main entrance. To do this you will have to design the light signalling.

Design a program to get 8 different colour LEDs to turn on and off them in a simple sequence. Insert them in a board to get the route correctly marked.

It is required to use a simulator program before making the model (Tinkercad)

Nano-Challenge 1: Make an LED turn on and off

What type of component is an LED?

How is it connected? What resistor is required?

Nano-Challenge 2: Make an LED turn on and off with a switch or push

What is a switch used for?

What is a push used for?

Nano-Challenge 3: Make at least 8 LED turn on and off using a switch

Is it possible to light up only some of them?

Is it possible to light up all of them at the same time?

Nano-Challenge 4: Design the illuminated sign and the light sequence

Model shape? Size? Required materials?

Programming light sequence

2.4. Kits employed

Robotic Kits:

Reference	***Arduino:*** ELEGOO UNO Project Basic Starter Kit with Tutorial and UNO R3 Board Compatible with Arduino IDE for Beginner
Description	
Components needed for turning on the LEDs of the illuminated sign according to the sequence designed by the students	
Proposal	
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	
Components	
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

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

Programme

Day	Activities
Monday October 21t	Morning Arrival in León Reception of the participants 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 Gymkhana
Tuesday October 22nd	Morning 09:30 Work RoboSTEAM challenges. Teachers´ meeting and Coffee Break Activities for Students Afternoon….15:30…Visit HP
Wednesday October 23rd	Morning 09:30 Work RoboSTEAM challenges. Teachers´ meeting and Coffee Break Activities for Students Afternoon….16:00…Visit University of León Dinner in a restaurant at the historical centre of León.
Thursday October 24th	Morning 09:30 Work RoboSTEAM challenges. Teachers´ meeting and Coffee Break Activities for Students Afternoon….16:00…Visit to a cement plant "Cementos Tudela Veguin" in La Robla (León) Dinner
Friday October 25th	Morning 09:30 Work RoboSTEAM challenges. Teachers´ meeting and Coffee Break Exposure of the final result of the challenges Delivery of diplomas to Portuguese 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

1st LEARNING-TEACHING-TRAINING PROJECT MEETING

Hosted by IES ERAS DE RENUEVA in LEÓN, SPAIN

from 21st to 25th October 2019

Agenda

Participants:

1. Instituto de Eras de Renueva (IER)
   - Susana Celis Tena
   - Covadonga González Barrientos
2. Agrupamento de Escolas Emídio García (AEEG)
   - Maria João de Carvalho Ramos
   - Manuel Trovisco
3. Colegio Internato dos Carvalhos (CIC)
   - Manuel Domingos Moreira de Jesus
   - Jonny Filipe Ribeiro Alves
4. University of León (ULE)
   - Miguel Ángel Conde González
   - Camino Fernández Llamas
   - Francisco Jesús Rodríguez Sedano

1st Day: Monday, 21st October 2019

Arrival of the participants at IES Eras de Renueva. Location: C/ Comandante Cortizo, s/n, 24008 León http://bit.ly/2Mpj6Oj

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

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

11:30 - 11:55 Coffee break

12:00 - 13:00 Working on the RoboSTEAM challenge

13:30 - 14:30 Lunch time

16:30 - 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

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2nd Day: Tuesday, 22nd October 2019

9:30 - 11:30 Working on the RoboSTEAM challenge
11:30 - 11:55 Coffee break
12:00 - 13:00 Working on the RoboSTEAM challenge
13:30 - 14:30 Lunch time

15:30 - 18:30 Visit to HP company facilities. Localitation https://cutt.ly/Beal1Cf

3rd Day: Wednesday, 23rd October 2019

9:30 - 11:30 Working on the RoboSTEAM challenge
11:30 - 11:55 Coffee break
12:00 - 13:00 Working on the RoboSTEAM challenge
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
21:00 Dinner in the city center

4th Day: Thursday, 24th October 2019

9:30 - 11:30 Working on the RoboSTEAM challenge
11:30 - 11:55 Coffee break
12:00 - 13:00 Working on the RoboSTEAM challenge
13:30 - 14:30 Lunch time

16:00 - 19:00 Visit to a cement plant "Cementos Tudela Veguin" in La Robla (León). http://www.cementostudelaveguin.com/ Localitation https://cutt.ly/heal50w

5th Day: Friday, 25th October 2019

9:00 - 11:30 Working on the RoboSTEAM challenge
11:30 - 11:55 Coffee break
12:00 - 13:00 Exhibition of the final results of the challenge
13:30 –14:00 Feedback about the visit and the RoboSTEAM challenge
14:00 Lunch time
16:00 –17:00 Delivery of certificates and farewell
17:00 Departure of the Portuguese teams

ERASMUS PLUS STRATEGIC PARTNERSHIP PROJECT

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

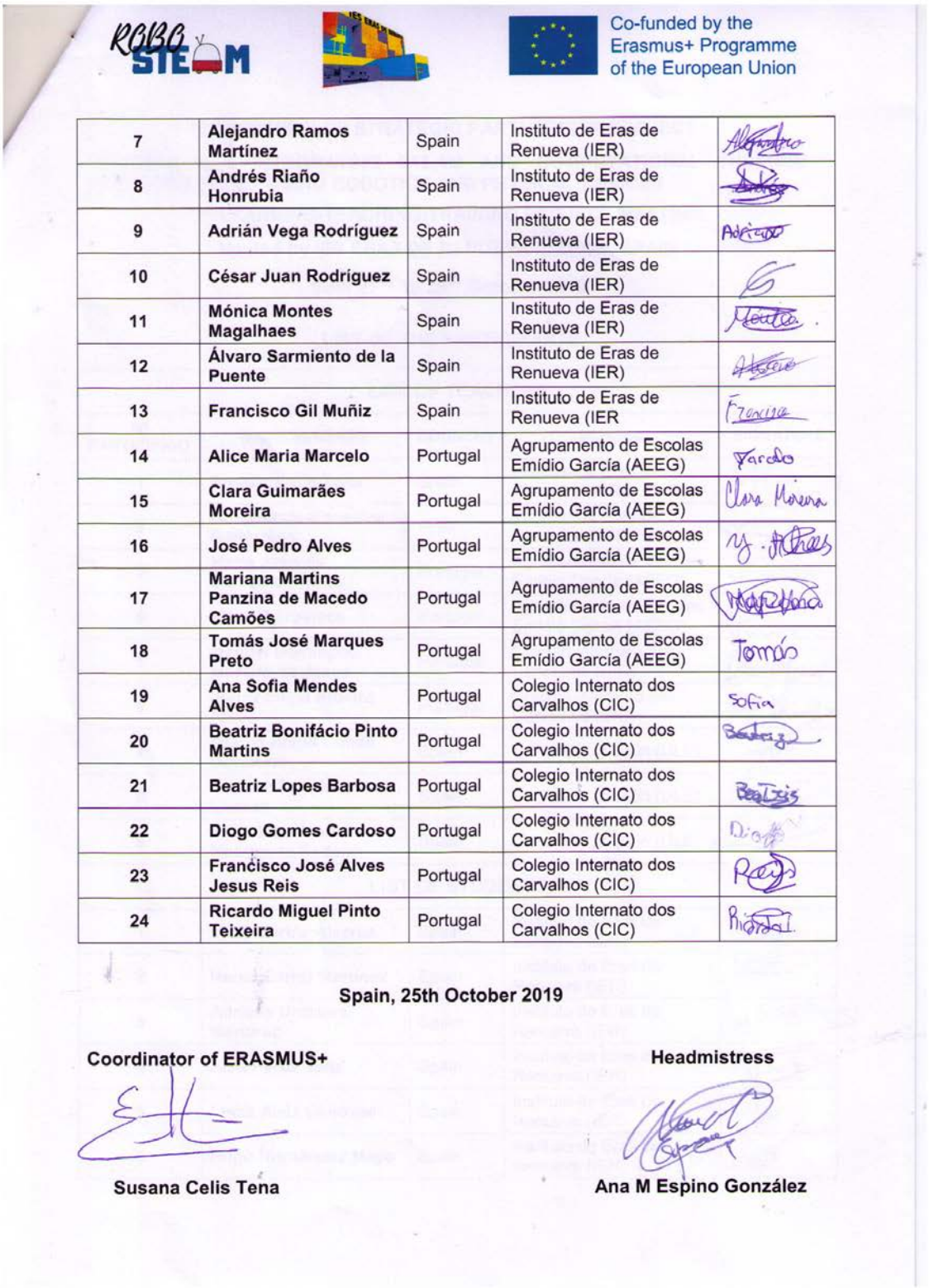
1st LEARNING-TEACHING-TRAINING PROJECT MEETING

Hosted by IES ERAS DE RENUEVA in LEÓN, SPAIN

from 21st to 25th October 2019

LIST OF THE PARTICIPANTS

LIST OF TEACHERS				
N° 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	**Maria João de Carvalho Ramos**	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
4	**Manuel Trovisco**	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
5	**Manuel Domingos Moreira de Jesus**	Portugal	Colegio Internato dos Carvalhos (CIC)	
6	**Jonny Filipe Ribeiro Alves**	Portugal	Colegio Internato dos Carvalhos (CIC)	
7	**Miguel Ángel Conde González**	Spain	University of León (ULE)	
8	**Camino Fernández Llamas**	Spain	University of León (ULE)	
9	**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)	



ROBO STEAM

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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	Alice Maria Marcelo	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
15	Clara Guimarães Moreira	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
16	José Pedro Alves	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
17	Mariana Martins Panzina de Macedo Camões	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
18	Tomás José Marques Preto	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
19	Ana Sofia Mendes Alves	Portugal	Colegio Internato dos Carvalhos (CIC)	
20	Beatriz Bonifácio Pinto Martins	Portugal	Colegio Internato dos Carvalhos (CIC)	
21	Beatriz Lopes Barbosa	Portugal	Colegio Internato dos Carvalhos (CIC)	
22	Diogo Gomes Cardoso	Portugal	Colegio Internato dos Carvalhos (CIC)	
23	Francisco José Alves Jesus Reis	Portugal	Colegio Internato dos Carvalhos (CIC)	
24	Ricardo Miguel Pinto Teixeira	Portugal	Colegio Internato dos Carvalhos (CIC)	

Spain, 25th October 2019

Coordinator of ERASMUS+

Susana Celis Tena

Headmistress

Ana M Espino González

4. Results

4.1. Teamwork

Students worked in mixed teams of 4 to 6 members from the different participating schools. All the teams worked in a coordinated way. 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.

4.2 Assessment instruments:

STEAM Semantic Survey

Before starting with the different projects, this survey was carried out to assess 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 the models and the programming part. One of the teams had coordination problems while working and in the presentation not all the leds work properly

5. Photos

Visit to the Cathedral

Visit to HP Computer facilities

Robotics Lab of the University of León

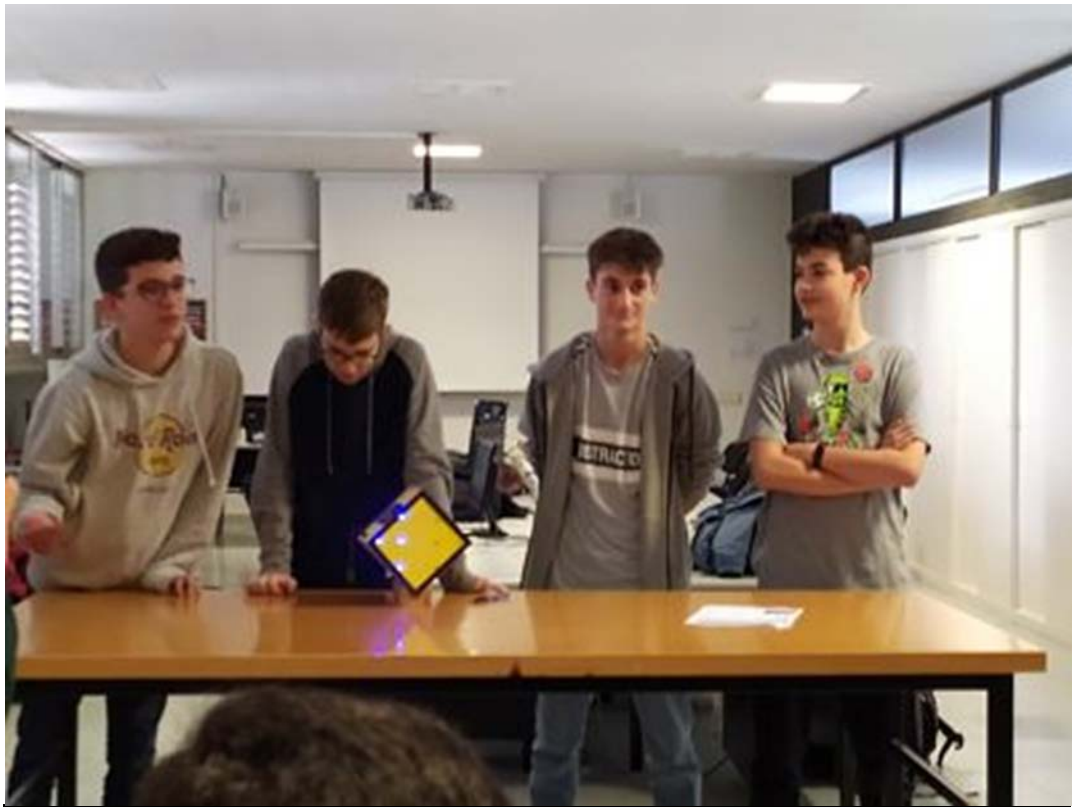
Supercomputing Centre of the University of León

Visit to the Tudela Veguin cement factory in La Robla (León)

Coding in teams

Making models

Presenting their projects



Certificate delivery

Teams photo

6. Teachers' and students' perceptions

Strengths:

- Students worked in mixed teams. Both the Portuguese and Spanish students worked very actively 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. Thus, the teachers from the art center, who had not previously worked in coding and robotics, collaborated mainly in the design, while the other teachers guided the students in coding and making process.
- Each team proposed a different solution 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 labour world.
- 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 this was the first mobility, the process was not clearly defined, so the organization involved a little more effort, in terms of how to propose the challenges, time required 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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