RoboSTEAM C3 – EXCHANGE REPORT BRAGANÇA
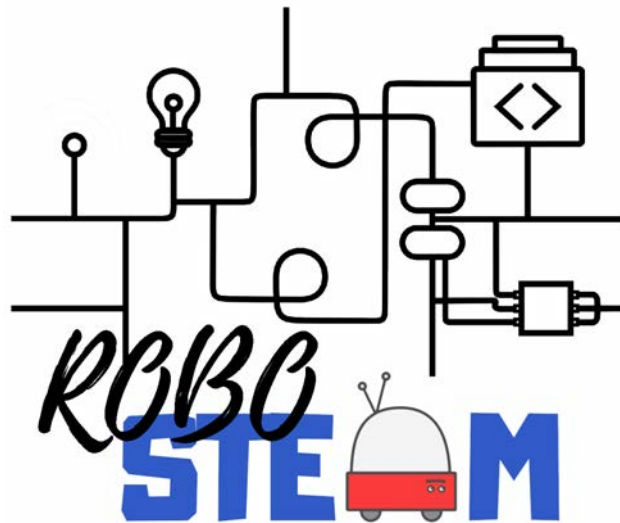
Version	1.1
Date of issue	29/05/2021
Filename	ROBOSTEAM_C3_29052021.pdf
DOI	10.5281/zenodo.4864406
Nature	Report
Dissemination level	PP (restricted to other programme participants)

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

Version History

Version	Date	Comments
0.1	25/11/2019	First Draft
0.2	31/12/2019	Including signatures
1.0	29/05/2021	Formatting and correcting errata
1.1	29/05/2021	Errata correction

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

Table of Contents

1. C3. Students Exchange

This document describes Portuguese-Spanish Students Exchange carried out in Agrupamento Escolas Emidio Garcia in the context of RoboSTEAM project [1-8] from November 18-22, 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

Portuguese and Spanish students belong to a similar socioeconomic context. They got along with each other very well; actually, the breaking of the ice was quick on the first day.

All students answered the online questionnaires on the first day of the exchange and did a self-evaluation on the last day (Co- Measure / rubric to assess collaboration in Steam Units). These ICT tools were useful to track how STEAM integrating by using PD&R is developed and gather evidence, which helped the teachers assess the students.

2.2. Description of students and teachers involved

The challenge was carried out by 7 Art Portuguese students (5 boys and 2 girls), 4 Science and Technologies students (3 boys and 1 girl) and 8 Spanish students with an educational background related to technologies (4 girls and 4 boys); All of them are fifteen-year-olds.

There were four groups which were made up of Portuguese and Spanish students, all of them with mixed abilities concerning STEAM related competences. Therefore, the groups were heterogeneous.

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

Hosts Teachers: Luísa Fernandes; Maria João Ramos; Manuel Trovisco.

Partners teachers: Susana Celis Tena; Covadonga González Barrientos.

IPB Partners: José Gonçalves; Caio Camargo; Laiany Brancalião.

ULE Partners: Miguel Ángel Conde González

2.3. Nano-challenges to be addressed

Wildfires concern all of us. It is a worldwide issue. According to Environmental Defence Fund (EDF), the number of annual large fires in the American West has doubled. In Europe, numbers and facts must be similar. We want to avoid the causes of wildfires and understand at what extent is Climate change responsible for wildfires in Iberian Peninsula. Propose approaches to reduce the impact of Global Warming (GW) on wildfires and suggest Prevention strategies.

Mini-challenge: *Use mobile robots to detect and avoid the cause(s) of wildfires and reduce the impact of global warming on this issue.*

Nano-challenges:

- Follow lines with a mobile robot to patrol the forest
- Avoid obstacles with a mobile robot to facilitate autonomous navigation
- Follow lines with a mobile robot to allow flame detection

2.4. Kits employed

mBot, a STEAM educational robot for beginners.

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

2.5. Cultural activities

	MONDAY, 18TH	TUESDAY, 19TH	WEDNESDAY, 20TH	THURSDAY, 21ST	FRIDAY, 22ND
from 90:30 to 13:30 a.m. morning breaks (from 10 to 10:20 and from 11:50 to 12:00)	**Welcoming session** at Emidio Garcia Secondary School. Answering to the online survey.	Beginning of the challenge under the topic "Fires" – a global issue. Mini Challenge: **Activity:** Researching about the impact of robotics on preventing and fighting Fires.	Follow up "Fires"- a global issue. Nano Challenge(s): **Activity:** i) programming with scratch. ii) debating ideas about scientific and technical restrictions for the artwork *St Martin celebration by roasting chestnuts on a bonfire*	Follow up with Nano Challenge(s) "Fires"- a global issue.	**Completion** of the challenge. **Display** for the school community. **Assessment:** Students will talk about their experience throughout the challenge. (the groups will appoint a spokesperson or give a personal testimony)
13:45 – 14:30	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
from 15:00 to 17:30 p.m.	**Welcoming session** at the Town Hall and a guided **sightseeing** tour in the town.	Visiting the **castle**, **Military museum**, mask museum and **Domus Municipalis.**	Follow up Teachers' Dinner	Visiting the **Modern Art Centre Graça Morais**. The students will do an activity related with the current exhibition.	Departure to León.

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.

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

3. Signatures and Agenda

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

AGRUPAMENTO DE ESCOLAS EMÍDIO GARCIA
Código 151816

ERASMUS PLUS STRATEGIC PARTNERSHIP PROJECT

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

2nd LEARNING-TEACHING-TRAINING PROJECT MEETING

Hosted by Agrupamento de Escolas Emídio Garcia(AEEG)

From 18th to 22nd November 2019

Agenda

Participants:

1. Agrupamento de Escolas Emídio García (AEEG)
   - Maria João de Carvalho Ramos
   - Manuel Trovisco
   - Luísa Maria Fernandes
2. Instituto de Eras de Renueva (IER)
   - Susana Celis Tena
   - Covadonga González Barrientos
3. Instituto Politécnico de Bragança (IPB)
   - José Gonçalves
   - José Lima
   - Caio Camargo
   - Laiany Brancalião
4. University of León (ULE)
   - Miguel Ángel Conde González

1st Day: Monday, 18th November 2019

Arrival of the participants at Emídio Garcia Secondary School (AEEG)

9:15 - 10:00 Reception of the participants. Guided tour to be familiar with the school facilities.

10:00 - 10:20 Coffee break

10:20 – 11:05 Answering to an online survey

Accommodation

Lunch time (school canteen)

15:00 - 17:30 Reception of the participants by the Town Hall; visiting the Smart building of the Town Hall.

Tour around Bragança.

1

2018-1-ES01-KA201-050939

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

2nd Day: Tuesday, 19th November 2019

9:15 - 10:00 Working on the RoboSTEAM challenge
10:00 - 10:20 Coffee break
10:20 - 11:50 Working on the RoboSTEAM challenge
11:50 – 12:00 Coffee break
12:00 – 13:30 Working on the RoboSTEAM challenge
Lunch time (school canteen)

15:30 – 17:30 Visiting Bragança Military Castle, Mask Museum and Domus Municipalis

3rd Day: Wednesday, 20th November 2019

9:15 - 10:00 Working on the RoboSTEAM challenge
10:00 - 10:20 Coffee break (S. Martin's celebration – Roasting Chestnuts)
10:20 - 11:50 Working on the RoboSTEAM challenge
11:50 – 12:00 Coffee break
12:00 – 13:30 Working on the RoboSTEAM challenge
Lunch time (school canteen)

15:00 - 17:30 Working on the RoboSTEAM challenge
21:00 Dinner in the city centre

4th Day: Thursday, 21st November 2019

9:15 - 10:00 Working on the RoboSTEAM challenge
10:00 - 10:20 Coffee break
10:20 - 11:50 Working on the RoboSTEAM challenge
11:50 – 12:00 Coffee break
12:00 – 13:30 Working on the RoboSTEAM challenge
Lunch time (school canteen)

15:00 - 17:30 Visiting the Modern Art Centre Graça Morais (current photography exhibition:
"Between the ruin and the Fire" by Valter Vinagre).

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

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

AGRUPAMENTO DE ESCOLAS EMÍDIO GARCIA
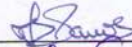Código 151816

5th Day: Friday, 22nd November 2019

9:15 - 10:00 Working on the RoboSTEAM challenge

10:00 - 10:20 Coffee break

10:20 - 11:50 Display of the final results of the challenge to the school community

11:50 – 12:00 Coffee break

12:00 – 13:30 Feedback / assessment concerning the visit and the RoboSTEAM challenge / delivery of certificates
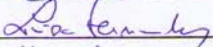
Lunch time

15:00 Departure of the Spanish team

Written today, November 22, 2019, in Bragança, Portugal

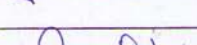Maria João de Carvalho Ramos

Luísa Fernandes

Manuel Trovisco

Susana Celis Tena

Covadonga González Barrientos

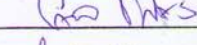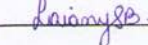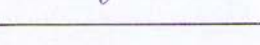José Gonçalves

José Lima

Caio Camargo

Laiany Brancalião

Miguel Ángel Conde González

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

AGRUPAMENTO DE ESCOLAS EMÍDIO GARCIA
Código 151816

ERASMUS PLUS STRATEGIC PARTNERSHIP PROJECT

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

2nd LEARNING-TEACHING-TRAINING PROJECT MEETING

Hosted by Agrupamento de Escolas Emídio Garcia, Bragança, Portugal

from 18th to 22nd November 2019

LIST OF THE PARTICIPANTS

LIST OF TEACHERS				
Nº PARTICIPANT	NAME SURNAME	COUNTRY	SCHOOL	SIGNATURE
1	Maria João de Carvalho Ramos	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
2	Manuel J. C. Trovisco	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
3	Luísa Maria Fernandes	Portugal	Agrupamento de Escolas Emídio García (AEE	
4	José A. C. Gonçalves	Portugal	Instituto Politécnico de Bragança (IPB)	
5	José L. S. M. Lima	Portugal	Instituto Politécnico de Bragança (IPB	
6	Caio R. D. Camargo	Portugal	Instituto Politécnico de Bragança (IPB	
7	Laiany S. Brancalião	Portugal	Instituto Politécnico de Bragança (IPB	
8	Susana Celis Tena	Spain	Instituto de Eras de Renueva (IER)	
9	Covadonga González Barrientos	Spain	Instituto de Eras de Renueva (IER)	
10	Miguel Ángel Conde González	Spain	University of León (ULE)	
LIST OF STUDENTS				
1	Lucia Alaiz Cánovas	Spain	Instituto de Eras de Renueva (IER)	
2	Nerea Carral Martinez	Spain	Instituto de Eras de Renueva (IER)	
3	Adriana Urdiales Martinez	Spain	Instituto de Eras de Renueva (IER)	
4	Alba Pérez Sanz	Spain	Instituto de Eras de Renueva (IER)	

2018-1-ES01-KA201-050939

ROBO STEAM

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

AGRUPAMENTO DE ESCOLAS EMÍDIO GARCIA
Código 151816

| 5	Hugo Hernandez Mayo	Spain	Instituto de Eras de Renueva (IER)	
6	Alejandro Ramos Martinez	Spain	Instituto de Eras de Renueva (IER)	
7	Álvaro Sarmiento de la Puente	Spain	Instituto de Eras de Renueva (IER)	
8	Francisco Gil Muñiz	Spain	Instituto de Eras de Renueva (IER)	
9	Miguel Rosa Baptista	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
10	Luís Daniel Monteiro Cordeiro	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
11	Bruno Rafael Lucas	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
12	Catarina Maria F. Sobral	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
13	Lucas T. da Trindade	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
14	Luísa C. M. D. dos Santos	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
15	Hugo F. A. Pires	Portugal	Agrupamento de Escolas Emídio García (AEEG)	
16	Ana Rita R. Machado	Portugal	Agrupamento de Escolas Emídio García (AEEG)	

Bragança - Portugal, 22nd November 2019

Coordinator of ERASMUS+

Headmaster

Maria João Ramos

Eduardo Santos

ROBO STE M

Co-funded by the
Erasmus+ Programme
of the European Union
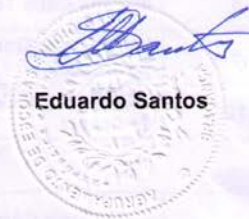
4. Results

Team work

Students worked in mixed teams of 4 to 6 members from the two 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.

The teachers monitored the ongoing challenge and assessed students' performance and competences acquisition based on Direct Observation. Teachers also took into account the students' perception about the experiment in order to assess the Co-Measure Test. Moreover, each group appointed a spokesperson to give testimony of the experience. Throughout the challenge teachers gave students systematic feedback about their evolution and accomplishments in problem solving tasks.

Results of Co-Measure Test:

Parameters/descriptors: Peer Interactions; Positive Communication; Inquiry Rich & Multiple Paths; Transdisciplinary Approach.

1st group: Miguel Baptista; Álvaro Puente; Hugo Mayo and Francisco Muñiz. - **Acceptable** in the overall of the four parameters.

2nd group: Alba Sanz; Luís Cordeiro: Lúcia Cánovas and Lucas Trindade - **Proficient** in 1/2/4 parameters and **Acceptable** in 3.

3rd group: Bruno Lucas; Luísa Santos; Adriana Martinez and Nerea Martinez - **Proficient** in all parameters.

4th group: Ana Machado; Catarina Sobral; Hugo Pires and Alejandro Martinez - **Needs Work** In parameter 1 **; Acceptable** in parameter 2/3/4 **.**

Computational Thinking: Students programmed mBots to follow straight lines with some turnings by the use of infrared sensors. The students programmed a fire detector which emits a sound whenever detects heat. Afterwards, students programmed ultrasonic sensors to create alternative ways so that mBots could avoid obstacles. All students achieved a good level at this skill although both Bruno Lucas and Luís Cordeiro have excelled compared to the others.

5. Photos
Visit to the Bragança Town Hall

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

Visit to the Castle, Military museum, Mask museum and Domus Municipalis

Visit to the Modern Art Centre Graça Morais
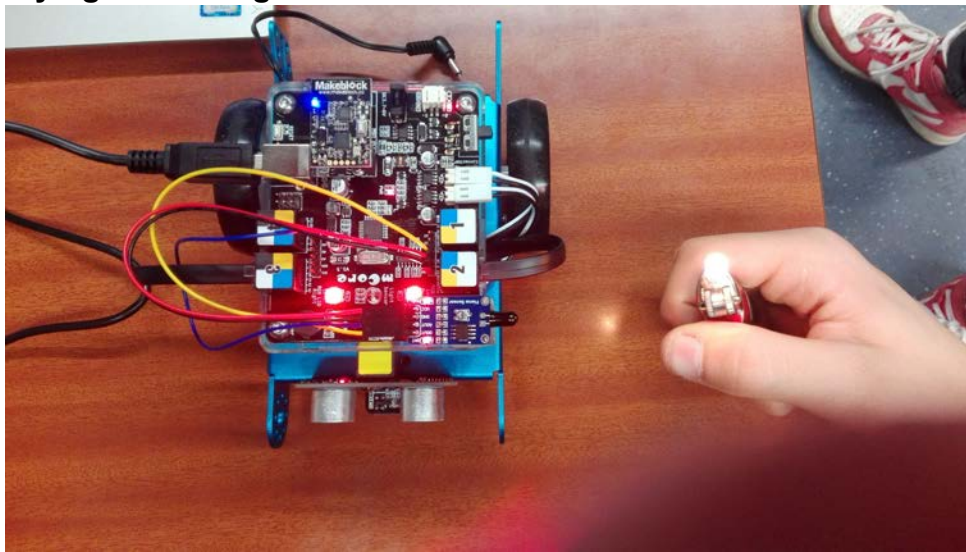
Co-funded by the
Erasmus+ Programme
of the European Union

Making models

Coding in teams
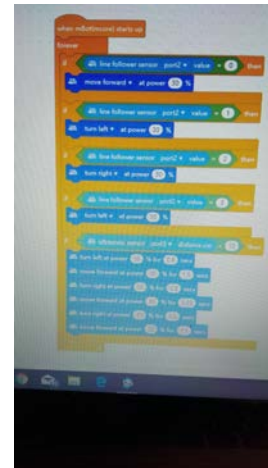
Trying the coding with the robots

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

Presenting their projects

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

6. Teachers' and students' perceptions

In a global perspective the Challenge was achieved successfully. The Artwork didn't pose any kind of problems since all students took part in it actively and enjoyed building the forest, no matter their educational background.

Impact on school community: The exchange was disseminated in the two local newspapers and on Facebook. A video was made in order to record the final result and it was posted on the school online newspaper.

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

8. References

[1]   RoboSTEAM Consortium, "RoboSTEAM Project," presented in RoboSTEAM Erasmus+ project Kick-Off, Bragança, Portugal, February 15-16, 2019, 2019.   Available   from: https://goo.gl/Ni43mK.   doi: 10.5281/zenodo.2575066.

[2]   M. Á. Conde *et al.*, "RoboSTEAM - A Challenge Based Learning Approach for integrating STEAM and develop Computational Thinking," in *TEEM'19 Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality (Leon, Spain, October 16th-18th, 2019)*, M. Á. Conde-González, F. J. Rodríguez-Sedano, C. Fernández-Llamas and F. J. García-Peñalvo, Eds. pp. 24-30, New York, NY, USA: ACM, 2019. doi: 10.1145/3362789.3362893.

[3]   J. Gonçalves *et al.*, "Educational Robotics Summer Camp at IPB: A Challenge based learning case study," in *TEEM'19 Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality (Leon, Spain, October 16th-18th, 2019)*, M. Á. Conde-González, F. J. Rodríguez-Sedano, C. Fernández-Llamas and F. J. García-Peñalvo, Eds. pp. 36-43, New York, NY, USA: ACM, 2019. doi: 10.1145/3362789.3362910.

[4]   C. Fernández-Llamas and M. Á. Conde-González, "RoboSTEAM Project – A brief review," 2019. Available from: https://zenodo.org/record/3531941. doi: 10.5281/zenodo.3531941.

[5]   M. Á. Conde, F. J. Rodríguez Sedano, C. Fernández-Llamas, J. Gonçalves, J. Lima and F. J. García-Peñalvo, "RoboSTEAM Project Systematic Mapping: Challenge Based Learning and Robotics," in *2020 IEEE Global Engineering Education Conference (EDUCON), (27-30 April 2020, Porto, Portugal)* pp. 214-221, USA: IEEE, 2020. doi: 10.1109/EDUCON45650.2020.9125103.

[6]   M. Á. Conde *et al.*, "Exchanging Challenge Based Learning Experiences in the Context of RoboSTEAM Erasmus+ Project," in *Learning and Collaboration Technologies. Design, Experiences. 7th International Conference, LCT 2020, Held as Part of the 22nd HCI International Conference, HCII 2020, Copenhagen, Denmark, July 19–24, 2020, Proceedings, Part I*, P. Zaphiris and A. Ioannou, Eds. Lecture Notes in Computer Science, no. 12205, pp. 442-455, Cham, Switzerland: Springer Nature, 2020. doi: 10.1007/978-3-030-50513-4_33.

[7]   M. Á. Conde *et al.*, "Adaption of RoboSTEAM Project to the Pandemic Situation," in *Proceedings TEEM'20. Eighth International Conference on Technological Ecosystems for Enhancing Multiculturality (Salamanca, Spain, October 21st - 23rd, 2020)*, F. J. García-Peñalvo, Ed. ICPS: ACM

International Conference Proceedings Series, New York, NY, USA: ACM, 2020. doi: 10.1145/3434780.3436620.

[8] M. Á. Conde, F. J. Rodríguez-Sedano, C. Fernández-Llamas, J. Gonçalves, J. Lima and F. J. García-Peñalvo, "Fostering STEAM through Challenge Based Learning, Robotics and Physical Devices: A systematic mapping literature review," *Computer Application in Engineering Education,* vol. 29, pp. 46-65, 2021. doi: 10.1002/cae.22354.