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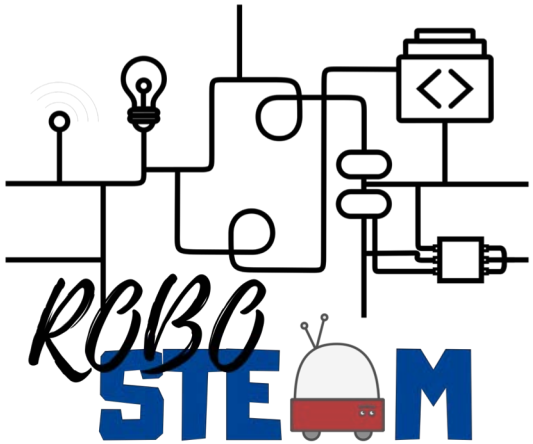

RoboSTEAM Project

2018-1-ES01-KA201-050939

Camino Fernández Llamas

Miguel Ángel Conde González

Universidad de León

Outline

- Localhost welcome and introduction
- Project overview
- Description of the university tasks and experience
- Intellectual Outputs 2 and 3, Activities 3 and 4
- School tasks and experience and students Exchange
- Management Issues
- Dissemination Strategy

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Schools

IES Eras de Renueva - LEÓN

UNIVERSITY OF EASTERN FINLAND

Agrupamento Emídio Garcia

Agrupamento de Escolas Emídio Garcia

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Universities

universidad de león

VNiVERSiDAD D SALAMANCA

ipb INSTITUTO POLITÉCNICO DE BRAGANÇA

KIT Karlsruher Institut für Technologie

UNIVERSITY OF EASTERN FINLAND

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Objectives

- Main objective
  - "Definition of a knowledge base to facilitate integrating STEAM and computational thinking by using robots"
- Subobjectives

  - Analyse the different existing activities that deal with STEAM integration

  - Define some challenges and instruments to facilitate STEAM integration and computational thinking development

  - Define metrics to evaluate both the integration and the competence development

  - Establish guides for the definition of integration STEAM challenges by using PD&R

  - Define educational resources for in-service teachers and future teachers

  - Establish ways of collaboration between robotic companies and educational institutions

  - Publish the obtained results in order to involve other educational institutions of the same and different contexts

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How to achieve this

- This require
  - “to experiment with STEAM integration projects that help learners to develop computational thinking by using/programming PD&R in pre-university education environments”

- To achieve this
  - Exchange in the European context of experiences related to this topic
  - Challenges and tools
  - Analyse results

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Activities

- Activities
  - A1. Project Management
    - Leader: ULE – Participants: All
  - A2. Quality Assurance
    - Leader: USAL – Participants: All
  - A3. Pilot Phase1 (M9-M17; June2019 – February2020)
    - Participants: all
  - A4. Pilot Phase2 (M12-M19; October2019-April2020)
    - Participants: all
  - A5. Dissemination and Mainstreaming
    - Leader: UEF – Participants: All

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Outomes

- O2. Guides for designing Open Hardware PD&R (M5-M19; February 2019 – April 2020)
  - Leader: ULE – Participants: ALL
  - Necessary for A3 and A4
- O3. RoboSTEAM Environment (M5-M24; February2019-September2020)
  - Leader: USAL – Participants: ALL

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Multiplier Events

- E1. Hackaton (M19 – Bragança; April 2020)
  - Multisite Event
- E2. Mainstreaming RoboSTEAM Final Conference (M24; End of September 2020 – León)
  - Only universities and IES Eras de Renueva
- E5. German Local Multiplier Event (M24; September2020)
- E6. Finnish Local Multiplier Event (M24;September2020)

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Learning/Teaching/Training Activities

- C1. Staff Exchange (M22;July2020 – Germany)
  - 2 Persons per partner
- C2. Students Exchange (M13;October2019 – Spain)
  - Portuguese school students to León school
- C3. Students Exchange (M14;November2019 – Portugal)
  - Spanish school students to Bragança school
- C4. Students Exchange (M17;February2020 – Spain)
  - Finnish school students to León school
- C5. Students Exchange (M17;February2020 – Portugal)
  - Finnish school students to Bragança school
- C6. Students Exchange (M18;March2020 – Finland)
  - Portuguese and Spanish students to Finland school

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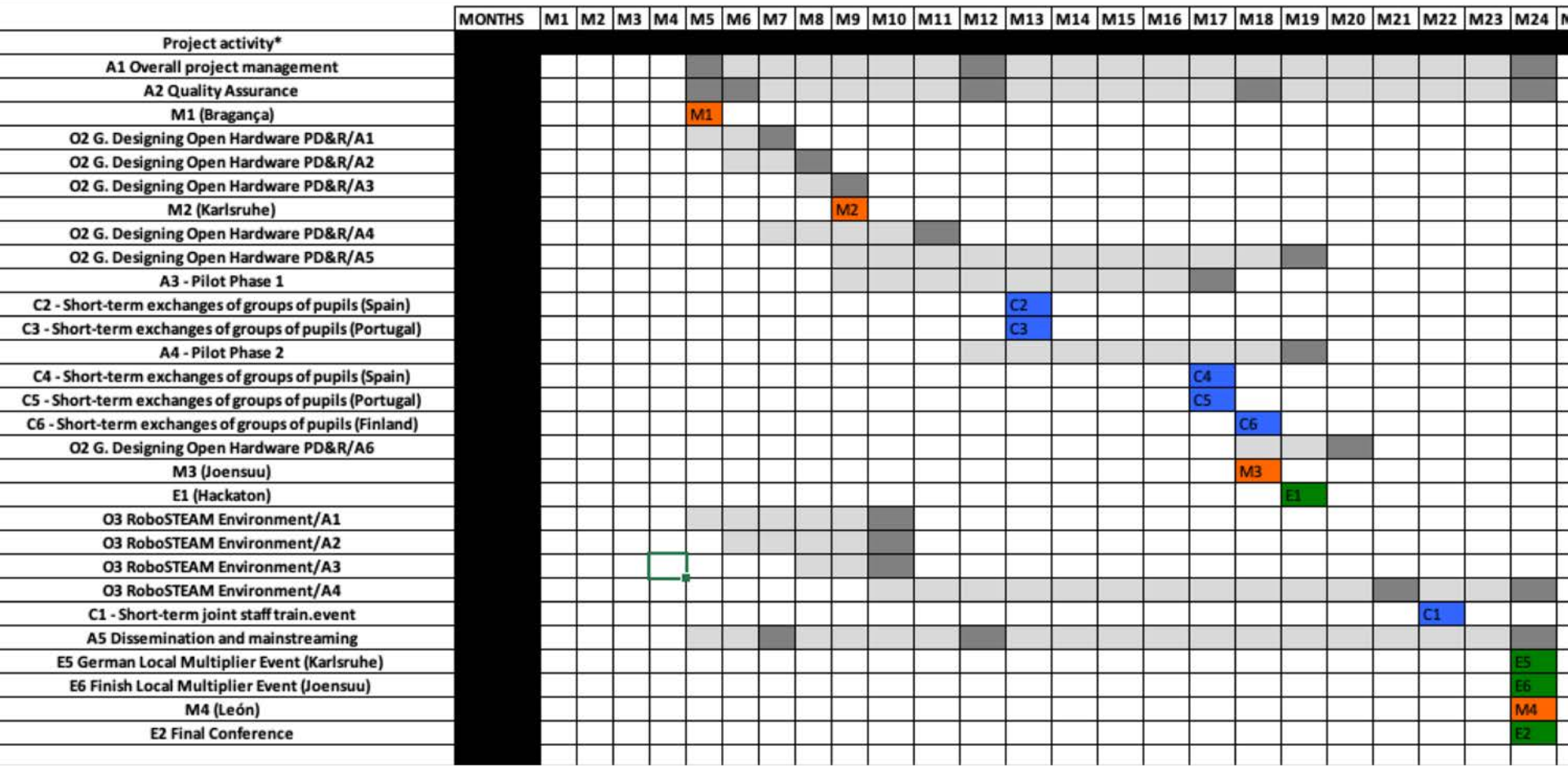
Schedule



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Project Transnational Meetings

- Bragança (February 2019)
- Karlsruhe
  - October 2019
- Joensuu (March 2020)
  - At the same time than C6
- León (September 2020)
  - At the same time than E2

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Expected results

- Analysis of current STEAM integration background in European schools (linked to O1 and necessary for A3 and A4)
- Set of methodological and diagnose tools that facilitate integrating STEAM through PD&R (linked to O1 but necessary in O3)
- Bank of instruments to assess STEAM related competences acquisition (linked to O1 but necessary in O3)
- Analysis of the application of PD&R in educational contexts and sample PD&R toolkits for integrating STEAM (linked to O1 and O2)
- Design and implementation of training actions. Different courses (initially in person, then online and self-learning) will train educational practitioners in the definition of challenges that integrates STEAM through PD&R (linked to O3, O4 and C1)
- Guides for defining integrating STEAM challenges that use PD&R in different contexts (O4)
- ICT tools (questionnaires, rubrics, learning analytics tools) to track how STEAM integrating is carried out and gather evidences (O3)
- Contact networks among the companies that develop PD&R for educational contexts (O3, O4 and A5)

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Monitorization

- USAL and ULE quality monitorization
  - Quality plan
- Steering Project Management Committee
- Key indicators
- To support quality monitoring there will be monthly skype meetings between the project leader and each partner
- Other
  - Questionnaires, face to face interviews, group discussions, document analysis and observations
- Special evaluation for the Exchange actions

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Indicators

- Management
  - Time, cost metrics
- Coordination
  - Meetings, threads, messages,…
- Quality and Evaluation
  - Effectiveness, implemented items, stakeholders perceptions, opinion
- Dissemination impact
  - Academic publications, researching projects, …
- Divulgation impact
  - Events, interventions, divulgation papers, participants per event, website visitors
- Evaluation instruments and methods impact (related to O3)
  - Instruments and methods compiled, instruments and methods downloaded, registered users, answers to the evaluation tools, satisfaction of RoboSTEAM members
- Pilot activities impact:
  - Students, teachers, people involved in STEAM experiments, participants in the evaluation, participants attitude
- Training course for teacher impact (C1)
  - Participants, Trainers, Answers to the evaluation tools, attitude
- Exchange of students
  - Participants, students, Attitude
- Tools
  - Quality rubrics and templates, questionnaires, attendance lists, Google Analytics, interviews with the stakeholders, dissemination logs, periodic reports

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Impact

- Beneficiaries
  - Students
  - Schools
  - Businesses
  - Society
- Impacts
  - Strengthened profile of teaching professions
  - Teaching innovation
  - Improving students employability
  - Attract students to STEAM and ICT

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Impact

- Participants
  - Research teams, extended research teams, schools involved in piloting
- Target groups
  - Teacher and staff involved in C1: 18
  - Teachers involved in the first pilot phase:10
  - Teachers involved in the second pilot phase: 10
  - Students: 3510
  - Students and teachers involved in the hackaton 38
  - Teachers and potential teachers involved in the local multiplier events: 40
  - Other stakeholders and policy-makers: 70
- Main indicators
  - number of schools involved by mailing lists, receiving information about the project and its activities.
  - number of teachers and practitioners registered and active in the environment
  - number of schools (teachers, students and staff) involved in the pilot phases.
  - number of stakeholders involved in the multiplier events

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Sustainability

- The ICT environment and their tools, based on open source software and hardware solutions, will be openly available for being used, downloaded and distributed during and after the project lifecycle.
- The framework and intercultural patterns identified will let future users to benefit from the results of RoboSTEAM project
- The structured training course for teachers will be offered after the end of the project
- RoboSTEAM web environment will become a group of interest and it will be maintained.
- Open hardware kits (O2) are open to modifications and specifications are going to be available in the project repository
- The technological environment will be maintained available in the ULE servers
- The outputs results produced will be stored in the partners public repositories and will be available under Creative Commons

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And now..

A MORE DETAILED DESCRIPTION OF ACTIVITIES AND OUTCOMES

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A1

A1. Project Management (M1-M24)

- Leader: ULE
- Participants: All
- Project Management tasks, including work monitoring, the Budget and resources
- Internal progress reports beyond the interim and final report
- Tools
  - Project meetings, video conferences, online workspace, etc.
  - Project Management Handbook
- Prince 2 methodology

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A2

A2. Quality Assurance (M1-M24)

- Leader: USAL
- Participants: All
- Ensuring that all the activities, resources and objectives are correctly executed and achieved
- Two elements
  - Assurance plan with reports in months 6, 12, 18 and 24
  - Questionnaires and individual and group interview techniques to identify partners perceptions and issues

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A3

A3. Pilot Phase 1 (June2019-February2020)

- Participants: All
- Testing of RoboSTEAM methodology and PD&R testing kits
- 5 Secondary schools with students from 12 to 16 years old
  - Diagnostic phase, 4 challenges for class of secondary school teachers, resolution of challenges, comparison of results
  - Indicators
    - Time, Grade, External people involved, CT assessment, self perception

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A4

A2. Pilot Phase 2 (October2019-April2020)

- Participants: All
- 5 Secondary schools with students from 12 to 16 years old
  - Same activities than in Pilot 1
  - Same groups to solve the challenges
  - Instruments, methods and tools from other socioeconomic contexts
  - Comparison of results and with those of pilot 1

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A5

A5. Dissemination (January 2019– October 2020)

- Leader: UEF
- Participants: All
- Three phases:
  - Introduce the project to the community of practitioners and stakeholders
  - Describing the approach and initial outcomes
  - From the second phase show the results and the approach of the project
- Dissemination plan and the overall graphic design in April
- Reports in M12 and 24 describing the dissemination activities

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O2.

O2. Guides for designing Open Hardware PD&R (February 2019– May 2020)

- Leader: ULE Participants: All
- Guides that allow designing learning challenges for the development of STEAM competencies and computational thinking by using PD&R
  - O2. A1. – Analysis of the existing PD&R
  - O2. A2. – Definition of competencies related requirements depending on age and cultural contexts
  - O2. A3. – Identification of the contexts to be tested (1 or 2 per partner)
  - O2. A4. – Design of Open Hardware Kits to be applied during the learning challenges
  - O2. A5 – Application of the kits to STEAM challenges in the defined contexts
  - O2- A6 – Evaluation of the experiences

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O3.

O3. RoboSTEAM Environment (January 2019– October 2020)

- Leader: USAL Participants: All
- Educational environment which will offer to schools and teachers a complete set of tools, activities, guides and support to manage the implementation of STEAM challenges.
  - O3. A1 – Design and implementation of a virtual environment as the base of the portal
  - O3. A2 – Compilation of STEAM challenge tools and guides
  - O3. A3 - RoboSTEAM user manual and tutorials.
  - O3. A4 – Environment maintenance

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Multiplier Events

- Local and general
- Portugal (Hackaton) – At the same time than the international week
  - 30 local and 8 foreign
  - Multisite
- Mainstream conference (León with the last meeting)
- Finnish and Portuguese local events (September)
  - 20 teachers or potential teachers
- List of signatures and graphical evidences

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Cooperation and Communication

- Internal website:
  - http://robosteamproject.eu/moodle
- Monthly online meeting
- Project Management Handbook
- Dissemination plan
- Internal documents
- External website:
  - http://robosteamproject.eu

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All

- Participation in all the activities
- Involve their contact networks
- Dissemination and divulgation
- Support schools with exchanges
- Support schools during the pilots and carry out the results analysis
- Multiplier events
- Provide all required documentation for justification
- Provide outcomes in time and with the proper quality

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IPB

- O2. A1. – Analysis of the existing PD&R
- O2. A2. – Definition of competencies related requirements depending on age and cultural contexts (leader)
- O2. A3. – Identification of the contexts to be tested
- O2. A4. – Design of Open Hardware Kits to be applied during the learning challenges
- O2. A5 – Application of the kits to STEAM challenges in the defined contexts
- O2- A6 – Evaluation of the experiences
- O3. A1 – Design and implementation of a virtual environment as the base of the portal
- O3. A2 – Compilation of STEAM challenge tools and guides
- O3. A3 - RoboSTEAM user manual and tutorials (leader with USAL)
- O3. A4 – Environment maintenance
- HACKATON

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KIT

- O2. A2. – Definition of competencies related requirements depending on age and cultural contexts
- O2. A3. – Identification of the contexts to be tested
- O2. A5 – Application of the kits to STEAM challenges in the defined contexts
- O2. A6 – Evaluation of the experiences
- O3. A2 – Compilation of STEAM challenge tools and guides
- O3. A3 - RoboSTEAM user manual and tutorials
- Local dissemination event
- Host staff exchange

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UEF

- Leader of A5
- O2. A2. – Definition of competencies related requirements depending on age and cultural contexts
- O2. A3. – Identification of the contexts to be tested
- O2. A4. – Design of Open Hardware Kits to be applied during the learning challenges
- O2. A5 – Application of the kits to STEAM challenges in the defined contexts
- O2- A6 – Evaluation of the experiences
- O3. A2 – Compilation of STEAM challenge tools and guides
- O3. A3 - RoboSTEAM user manual and tutorials
- Local dissemination event

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ULE

- Leader of A1 and coordinator for A3 and A4
- O2. A1. – Analysis of the existing PD&R (leader)
- O2. A2. – Definition of competencies related requirements depending on age and cultural contexts
- O2. A3. – Identification of the contexts to be tested (leader)
- O2. A4. – Design of Open Hardware Kits to be applied during the learning challenges (leader)
- O2. A5 – Application of the kits to STEAM challenges in the defined contexts (leader)
- O2- A6 – Evaluation of the experiences (leader)
- O3. A1 – Design and implementation of a virtual environment as the base of the portal (leader)
- O3. A2 – Compilation of STEAM challenge tools and guides
- O3. A3 - RoboSTEAM user manual and tutorials
- O3. A4 – Environment maintenance
- Mainstreaming conference

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USAL

- Leader of A2
- O2. A1. – Analysis of the existing PD&R
- O2. A3. – Identification of the contexts to be tested
- O2. A5 – Application of the kits to STEAM challenges in the defined contexts
- O2- A6 – Evaluation of the experiences
- O3. A1 – Design and implementation of a virtual environment as the base of the portal
- O3. A2 – Compilation of STEAM challenge tools and guides (leader)
- O3. A3 - RoboSTEAM user manual and tutorials (leader)
- O3. A4 – Environment maintenance (leader)

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Contribution

- What is your experience in related projects?
- How do you think that you can contribute to the project beyond the existing activities?
- Is it possible to use some of your expertise or outputs as an input for the project?
- What will be the hardest part for you?
- And the easier one?

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Main concepts

- CBL
  - “Nichols, M., Cator, K., and Torres, M. (2016) Challenge Based Learner User Guide. Redwood City, CA: Digital Promise.”
  - Real challenges, involving lot of people, identify good ideas, ask good questions, discover and solve

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CBL Phases

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Two type of challenges in our context

- “Nano Challenges are shorter in length, focus on a particular content area or skill, have tight boundaries and are more teacher directed. The Learners typically start with the Challenge without identifying a Big Idea or Essential Question. The process includes the Investigation and Act phases, but at a significantly lower level of intensity and often stop short of implementation with an external audience. Typically Nano Challenges are used as scaffolding leading to more significant Challenges or during longer Challenges to address specific concepts”
- “Mini Challenges widen the boundaries and provide Learners with an increased level of choice and responsibility. An increase in duration (2- 4 weeks) allows the Learners to start with a Big Idea and work through the entire framework. The research depth and the reach of their Solutions increases and the focus can be content specific or multidisciplinary. Taking a “show me what you can do” perspective, Mini Challenges are good for intense learning experiences that stretch the Learners and prepare them for longer Challenges“

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PD&R

- Physical devices
  - Components to define kits
  - Arduino
  - Other possibilities
- Little and programable robots
- Robots defined by students

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O2. Guides for designing Open Hardware PD&R

- Define guides for the development of STEAM competencies and CT by using PD&R
- Design, test and assess Open Hardware Kits
- Challenges to be applied
- Objectives
  - Analyse current landscape regarding PD&R application in educative contexts (literature review)
  - Identify socioeconomic social issues of the contexts where kits will be applied
  - Public results of the application

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O2. Schedule

	MONTHS	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19
Project activity*																				
A1 Overall project management																				
A2 Quality Assurance																				
M1 (Bragança)						M1														
O2 G. Designing Open Hardware PD&R/A1																				
O2 G. Designing Open Hardware PD&R/A2																				
O2 G. Designing Open Hardware PD&R/A3																				
M2 (Karlsruhe)													M2							
O2 G. Designing Open Hardware PD&R/A4																				
O2 G. Designing Open Hardware PD&R/A5																				
A3 - Pilot Phase 1																				

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O2. A1

- Analysis of the existing PD&R (April 2019)
  - Systematic review to gather and analyse the existing works related to the application of PD&R in education
    - Methodology, Acquisition of competences, Age and Cultural contexts of the students involved
    - Also take into account kits that could have been applied but not published as research works

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O2. A2

- Competencies related requirements (May 2019)
  - Competencies that facilitate PD&R application in school contexts (we have not O1 results)
    - Age
    - Cultural contexts

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O2. A3

- Identification of the contexts to be tested (June 2019)
  - Define the context to apply challenges
  - Classes, students knowledge, type of students, possible control and experimental groups
  - Contexts related issues
  - Define an instrument to gather such information

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O2. A4

- Design of Open Hardware Kits
  - Take into account the competences to be acquired and context
  - Clarify the type of components we can use
  - Describe how and where to acquire the kits and how they should be applied

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O2. A5

- Application of the kits (July 2020)
  - Pilots
    - Pilot 1
      - Kits for the specific contexts
    - Pilot 2
      - Kits from other socioeconomic environments
    - Universities: support in the application of the kits
    - Schools: developing of pilots

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O2. A6

- Evaluation
  - Evaluate results
    - Pilot1 between those who test and those who doesn't
    - Pilot2 comparing previous pilots and between different contexts
    - Challenge achievements, degree of achievement, time employed, resources employed, quality of the solution
  - Guides about how to apply the kits

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O3. RoboSTEAM Environment

- Educational environment which will offer to schools and teachers a complete set of tools, activities, guides and support to manage the implementation of STEAM challenges
  - Portal, repository, community and social tools
    - Web-based social networking environment
    - Open source solutions
  - IT Tools for diagnostic (developed in O1)
    - General overview about how STEAM is integrated and CT developed (specially in PD&R is used)
  - Authoring tools for designing challenges
  - IT tools for challenges evaluation

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O2. Schedule

	MONTHS	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
Project activity*																									
RoboSTEAM Environment/A1																									
RoboSTEAM Environment/A2																									
RoboSTEAM Environment/A3																									
RoboSTEAM Environment/A4																									

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O3. A1

- Design and implementation of a virtual environment as the base of the portal (June 2019)
  - Web, virtual campus, software repository, videoconference tools, media capabilities, intranet system, etc.
  - Technology to be define
  - Technological Ecosystem

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O3. A2

- Compilation of STEAM challenge tools and guides (May 2019)
  - Online and desktop software for designing action/activity plans
  - Online questionnaires about integrating STEAM
  - Integration systems with open source LMS environments (Moodle, Sakai, etc.)
  - Report generator tools
  - Learning analytics tools

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O3. A3

- RoboSTEAM user manual and tutorials (June 2019)
  - Collection of multimedia, video and HTML guides and tutorials to use the system
  - Complete User Manual for teaching

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A4. Pilot Phase 1

- June2019 – February 2020
  - Not all the time
  - Testing of both RoboSTEAM methodology and PD&R testing kits
  - 5 schools involved
  - 12-16 years old
    - First diagnostic phase (to all students in the age range)
    - Challenges
    - Analysis
      - Challenge groups vs traditional
      - Time, grade, people involved, perceptions, competence acquisition
  - 2 or 3 groups of about 6 or 10 persons per challenge
  - Exchange between Spain and Portugal
  - What to do if I have not control group

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A4. Pilot Phase 2

October 2019 – April 2020

- Participants: All
- Test kits from others
  - Same activities than in Pilot 1
  - Same groups to solve the challenges
  - Instruments, methods and tools from other socioeconomic contexts
  - Comparison of results and with those of pilot 1
- Same groups size and age
- Spain Exchange kits with Finland
- Portugal with kits Germany
- Students Exchange between Finland, Spain and Portugal

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A3 and A4

- Diagnosis phase should be carried out before any exchange
- What is better?
  - Begin with the pilots before the Exchange is carried out
  - After it is carried out

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All

- Participation in all the activities and outputs
- Involve their contact networks
- Dissemination and divulgation
- Exchanges (except the German School) 7 students 2 accompanying
- Implement Pilots
- Participate in multiplier events if possible
- Provide all required documentation for justification
- Provide outcomes in time and with the proper quality

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AEEG, CIC, IES ERAS and UEF

- O2. A2. – Definition of competencies related requirements depending on age and cultural contexts (leader)
- O2. A3. – Identification of the contexts to be tested
- learning challenges
- O2. A5 – Application of the kits to STEAM challenges in the defined contexts
- O2- A6 – Evaluation of the experiences
- O3. A2 – Compilation of STEAM challenge tools and guides
- O3. A3 - RoboSTEAM user manual and tutorials (leader with USAL)

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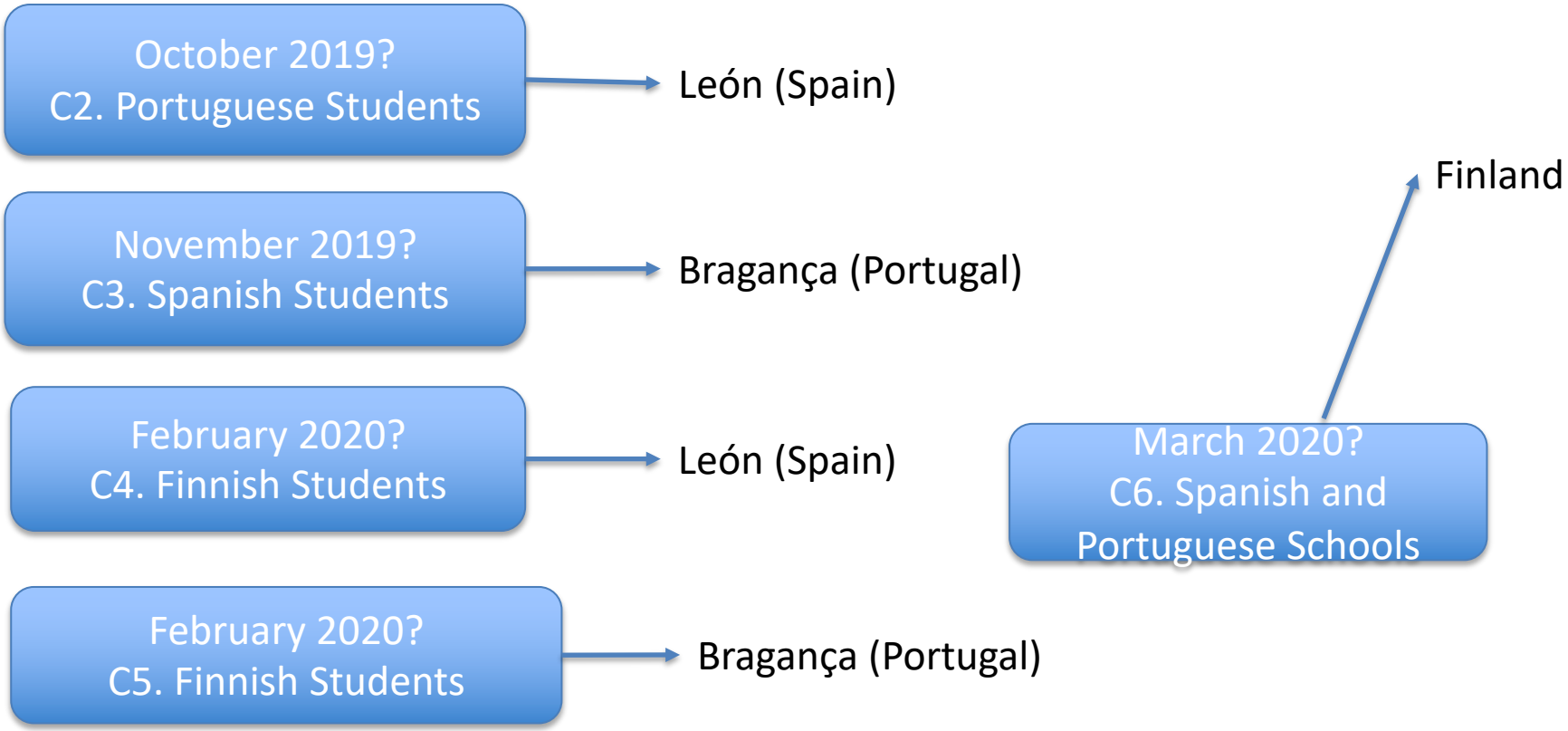
Students Exchanges



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Staff Exchanges

July 2020?
All → Karlsruhe (Germany)

- Only people hired by the institution
- 5 days
- Universities will help to define the contents for this training action

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Contribution

- What is your experience in related projects?
- How do you think that you can contribute to the project beyond the existing activities?
- What do you think about the exchanges?
- What about the pilots?
- What will be the hardest part for you?
- And the easier one?

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

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Questions

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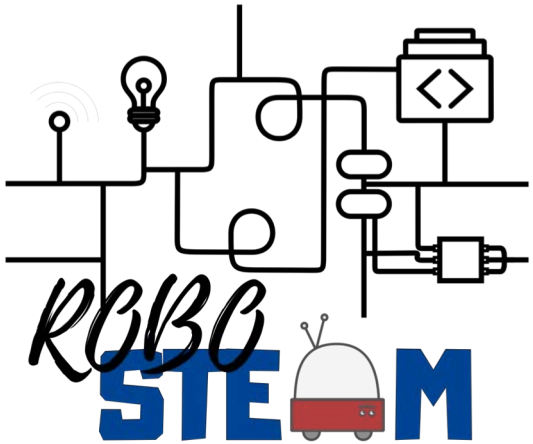

RoboSTEAM Project

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