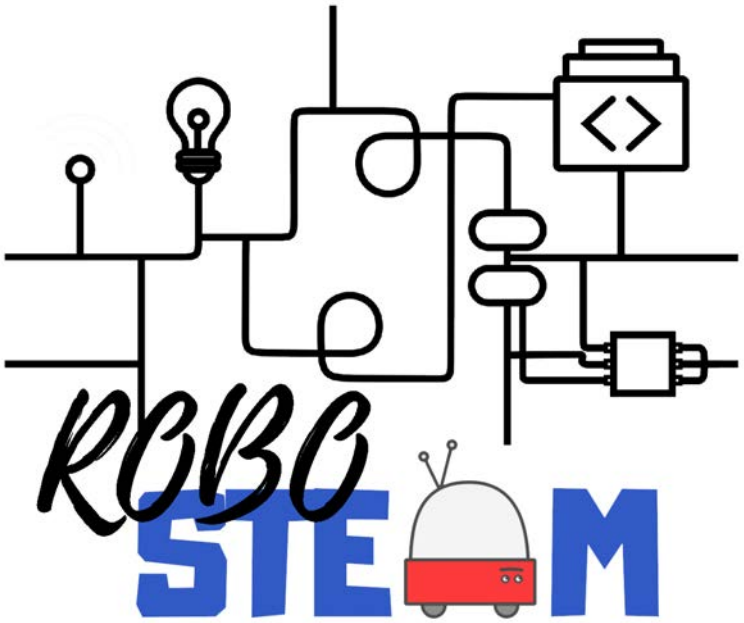
Co-funded by the
Erasmus+ Programme
of the European Union

RoboSTEAM Progress Report – M12



Version	0.1
Date of issue	30/09/2019
Filename	ROBOSTEAM_PRM12_30092019.pdf
DOI	10.5281/zenodo.3524975
Nature	Service/Product
Dissemination level	PP (restricted to other programme participants)

Project Number: 2018-1-ES01-KA201-050939

Version History

Version	Date	Comments
0.1	30/09/2019	First draft of the Progress Report

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1. Introduction

This Progress Report describes the project activities, outputs and organisation for the first year of the RoboSTEAM project [1-3]. It describes some of the issues presented in the interim report although the transnational meetings are not described so deeply. Specifically, the topics that we dealt with in this document are:

- Overall state of the project.
- Activities carried out for project management and implementation.
- Project Monitoring.
- Partners Contribution.
- Main difficulties found.
- Impact and dissemination.

2. Overall state of the project

RoboSTEAM project is defined to facilitate integrating STEAM [4] and the development of computational thinking in schools by using Physical Devices and Robotics (PD&R) [5-8]. In order to do this it is necessary to know how to define challenges for integrating STEAM, how is possible to assess STEAM and computational thinking related competences [9-11], the set of competences that could be promoted by applying challenges based on PD&R, the available tools and how to use them. This means that the main objective of this project is the definition of a knowledge base to facilitate integrating STEAM and computational thinking by using robots. This will be carried out by developing pilot programs, gathering good practices and tools, and defining learning actions and educational resources for teachers.

The progress of the project to achieve this objective has been correct during this first year, despite the difficulty caused by the late granting of the project and the cut down on the working plan (O1 and O4 were removed) and budget originally requested. According to the specific subobjectives of the proposal (that were not associated to O1 and O4):

- **Analyze the different existing activities that deal with STEAM integration.** This has been achieved during O2.A1. with the definition of a systematic mapping to collect and analyze the existing works related to the

application of PD&R in STEAM education. It has involved the review of 242 in the main scientific libraries such as IEEE, Springer Link, ACM DL, Web of Science and Scopus.

- **Define some challenges and instruments to facilitate STEAM integration and computational thinking development.** During O2.A4 and O2.A5 [12] the project partners have defined the concept of challenge for the project, the granularity of the challenges, templates to describe the challenges at the different levels and also the kits to address them. Moreover, each partner has provided one or two challenges and kits descriptions.
- **Define metrics to evaluate both the integration and the competence development.** Although this is linked to the results of O1, it has been addressed during O2.A2 [13] considering the works in the literature and also the experience of the partners involved in the project. In addition, the metrics and tools to apply them will be employed during the piloting, as is described in O2.A5 [12].
- **Define educational resources for in-service teachers and future teachers.** The project is progressing in this objective by the definition of the RoboSTEAM ecosystem (O3.A1) [14] that includes a portal, LMS, Zenodo Community, Institutional Repository and Social Media Components. Regarding how to work with the ecosystem it is described in O3.A3 report [15] and the population of the ecosystem with resources is described in the report of O3.A2 [13].
- **Establish guides for the definition of integration STEAM challenges by using PD&R.** This part is being addressed during O3.A5 and O3.A6, but this task is not finished this project year so, the main contribution will be the second year of the project.
- **Publish the obtained results in order to involve other educational institutions of the same and different contexts.**

  This has been done during all the project by following the dissemination strategy and specially participating in different educational events such as the

TEEM 2019 International Conference, participating in local events and publishing information about the project in social media.

This means that Output 2 is completed in more than a half, because only part of O2.A5 and O2.A6 will be completed next year (the former during the piloting and the later after it while evaluating the obtained results). Also Output 3 is almost completed in around a 50% because the ecosystem has been designed, implemented and initially populated of resources. Next year it will be necessary to add more resources and maintain it. The reviewer can access to the RoboSTEAM portal (http://robosteamproject.eu/), the Zenodo Community (https://zenodo.org/communities/robosteam/?page=1&size=20), the Institutional Repository (https://repositorio.grial.eu/handle/grial/1519), or the LMS (http://robosteamproject.eu/). With the latter the reviewer can access to all the project process, management, documents, conference minutes, etc. Please use the following credentials (user: roboSTEAMEvaluator, password: e_roboSTEMProject2019). Regarding the other activities some will be described in the next sections such as the management, quality assurance, dissemination, etc. It should be noted that, until the 30 of September there were 2 transnational meetings and a monthly videoconference meeting that facilitate the project coordination.

3. Activities carried out for project management and implementation

The activities proposed by the project for the management and implementation were Project Management, Quality Assurance, the Piloting Phases and the Dissemination. Below we have a detailed description of what we defined until now:

- A1. Project Management. Overall project management tasks include monitoring the progress of all work done and the budget and resources used and ensuring the timely completion of deliverables. This requires of:
    - A Project Management Handbook [16] defined in the first month of the project, describing the project management structure and procedures

(structure, organization and communication), the planning and the contact information.

- An internal communication platform (Moodle Based Environment). As part of the RoboSTEAM Ecosystem implementation, a platform was defined to facilitate the project Management and communication among the project partners.
- Signature of the consortium partnership agreements. Each partner has signed its agreement, which in some cases has required of administrative work preparing and adapting the agreements to each specific institution needs.
- Financial monitoring and payment to the partner organizations. The part of the money each institution needs is transferred to them following a specific distribution pattern based on the partners completed work.
- Meetings organization. 2 Transnational meetings (hold at Bragança and Karlsruhe) and 6 videoconference meetings.
- Collection of data and reporting on the project implementation.

To ensure the proper working of the project is not enough and in M12 a progress report is published.

- A2. Quality Assurance. This activity is focused on ensuring that all the activities, resources and objectives planned in the proposal are correctly executed, used and achieved. During this year the actions carried out regarding quality assurance were:
  - Creation of the Quality Assurance Plan [17] in the month 2 of the project that describes the purpose of this plan and the key performance indicators about quality.
  - The definition of a space in the LMS where the partners can discuss quality issues.
  - Distribution of meeting evaluation and internal monitoring questionnaires. Two questionnaires regarding meetings were delivered (one per transnational meeting to find out participants opinion) and one

regarding the first year of the project (designed to assess partners' satisfaction and provide feedback regarding project).

- Reporting on the monitoring activities. By providing the partners with the results of the questionnaires and the internal reports about quality in the LMS section defined to this aim.

4. Project Monitoring

The institution in charge of monitoring is the University of Salamanca, USAL (partner of the project), which is very experienced in international and in particular European projects. They leaded the A2 Quality Assurance and, according to the project proposal, they prepared a Quality Assurance plan and the monitoring tools to be used to evaluate both products and processes developed inside the project. USAL has been supported by the Steering Project Management Committee, formed by the contact person of each institution and formally constituted during the kick-off meeting, that provided feedback to the plan.

Communication among the participants have been fluently and regularly developed through the Moodle platform and by email so to ensure the regular review of the project implementation.

The quality assurance activities are progressing according to plan. The different internal quality processes have been run at each meeting and the internal evaluation process has progressed appropriately and is on schedule.

Two questionnaires have been distributed among the participants after the face to face meetings. The objective of the meeting evaluation is to collect the partners' feedback on the meeting; more specifically, to measure the level of satisfaction with the preparation for the meeting, the content of the meeting and the arrangements and to identify the strengths and weaknesses of the meeting, reveal the areas of concern, and collect the suggestions for improvement. USAL elaborated the reports and presented the results to the project coordinator.

One internal periodical monitoring survey has been distributed among the partners' staff. The monitoring point of these surveys is for internal purposes to signal and detect any quality challenges which need to be addressed.

USAL elaborated the reports and presented the results to the project coordinator.
The evaluation questionnaires have been implemented and distributed using Google Forms. The reports have been commented, if possible, coinciding with a face to face meeting or, otherwise, shared through the internal communication platform. It should be noted that there is a change in the initial proposal of quality reports due to the late beginning of the project. There was estimated an internal report in the sixth month of the project, but as it was granted in January, the project does not begin until the fifth month and a report about how the partners were working has not sense when they have almost begun with the project.

5. Partners Contribution

The distribution of tasks has been maintained according to the project proposal. All partners participate in all the output tasks, although in some of them having a greater number of hours. It should be noted that all partners provide competencies and assessment tools in STEAM contexts (O2.A2) [18], described testing contexts (O2.A3) [19], provide challenges (O2.A4) and participate in the design of the piloting (O2.A5) [12]. Regarding O3, some are more focused on the development and maintenance of the ecosystem and other collaborate by testing the system. All of them have provided resources to include in the ecosystem. Beyond these tasks some more details about each partner involvement:

ULE. It was in charge of the project management. In addition, given the technological background and robotics expertise it was responsible O2 and participated in the rest of outputs. In O2, ULE led the systematic mapping definition (O2.A1), the definition of the challenge concept (O2.A4), facilitates gathering competencies and assessment methods (O2.A2) [18]. In O3 ULE led the design and implementation of the ROBOSTEAM environment (O3.A1) [14].

AEEG, CIC, IER and UEF secondary school. These schools participate in all the outputs providing their point of view as final users of the outcomes defined during the project. They are involved in O2 as the schools that host the pilots, they described the particular features of their context, the competencies and assessment methods they use or they know, challenges to be applied, and began with the development of the first pilot. This

partners also begin exchanges during the month 13 of the project. In O3 they work testing the ecosystem and populating it.

IPB. This partner, also with expertise in PD&R, participated in O2 leading the definition of competencies related requirements depending on age and cultural contexts (O2.A2) [18], participating in the rest of task and specially in the systematic mapping (O2.A1). In O3 in the definition and maintenance of the learning environment (O3.A1) [14] and leading the definition of use manual and tutorials (O3.A3) [15]. It should be also note that they lead a pre-piloting carried out during a summer camp in Bragança as part of O3.A5 to test the concept of mini-challenge and nano-challenge.

KIT. This partner provided their educational expertise in all the outputs. In O2 KIT worked in the all the tasks, especially in the definition of competences and instruments (O2.A2) [18] and in the identification of context for the piloting and in the definition of challenges (O2.A3) [19]. In O3 this partner has contributed by compiling STEAM challenge tools and guides (O3.A2) [13].

UEF. This partner, with both a technological and pedagogical background, has participated in all outputs. In O2 in all the activities, with more hours devoted to the definition of age and cultural context dependent competences (O2.A2) [18]. In O3 it participated in the compilation of STEAM challenges tools and guides (O3.A2) [13]. In addition, it is responsible for the dissemination activity.

USAL. This partner, with broad expertise in several learning projects and with a pedagogical and technical background, will be in charge of O3 and participate in all the rest of outputs. They are also in charge of quality management as commented above.

There are two entities involved in the project as associated partners that could be included in this section:

- Arduino Verksatd. This is a Research & Development company that has evolved from being a small consultancy firm devoted to realizing art and design projects to become an entity capable of driving mid-sized projects, the development of new products and running pilot studies with thousands of users at once. They are a very important company in the field of Physical Devices and Robotics. During the project they have had several videoconferences with the project

coordinator to explore possible collaboration ways. They have provided to ULE extensive catalogs with their components and kits, just in case they can be employed in the challenges.

- Carl-Benz school. This is a German school that is interested in the project and is participating as the testing educational context for KIT, with their 16-year-old students classes. That is, it is involved in A3 and A4 and in O2.A5 [12].

6. Main difficulties found

The project management strategy worked well and helped to ensure an increasing degree of engagement and commitment from partners. The Moodle system used for project communications worked well and the forums allow useful discussions among partners on project activities, management of financial and other activities, etc.

The two main problems found were:

- The late communication of the project funding. It was notified at the end of December and accepted at the end of January (that is in the project M4). Although the work defined for that months of the project was also cut down, it is was not easy begin to work as a team together. However, this was early overcome due to the attitude of the partners and their experience in previous projects.
- Two outcomes and the associated budget was also removed. The O1, was the base for some of the activities of O2, but in this case the problem was overcome by looking for information in the literature (something carried out in the mapping of O2.A1) and with experience in the field of several of the partners. Regarding removal of O4, it has not impact during this year, but probably it can have an effect in the results publication and possible final users of the project next year.

7. Impact and dissemination

7.1. Impact

As described in the project proposal, RoboSTEAM project as a whole is expected to produce a broad impact through the delivery and publication of the intellectual outputs, the implementation of training courses for in-service teachers, and the results and the dissemination plan. Taking into account the final beneficiaries of the project will be the students, schools, businesses, and the society.

The impacts on the direct beneficiaries during the project are:

- I1: STRENGHTENED PROFILE OF TEACHING PROFESSIONS: Transfer of competences, knowledge, pedagogic and didactic tools, focused on integrating STEAM and computational thinking development.
- I2: TEACHING INNOVATION: Introduction innovative teaching approaches based on the use of challenge-based learning methods and by applying PD&R.
- I3: IMPROVING STUDENTS EMPLOYABILITY: The literature and previous experiments have shown that by integrating STEAM and developing computational thinking competences the students (future professionals) will be more prepared for the labour market, so their employability will be higher.
- I4: ATTRACT STUDENTS TO STEAM AND ICT: RoboSTEAM project will attract students to STEAM and ICT by the use of PD&R to solve open challenges. PD&R has become something that attracts young students independently of they have or not a technical background.

During this first year of the project the impact is not very high, as the piloting and students exchange have just begun at the end of the year or are beginning right now (in month 13). However, some of the target groups were reached, as the teachers, some students in the pre-piloting phase carried out in Bragança (for more information see report A2.A5), such as teachers and some students. In fact, in M12 some of the piloting schools have begun with the Diagnosis phase and several students between 12-16 have been involved. In numbers we can distinguish between participants and target groups reached this year. Specifically:

Participants:

- Research team: it is composed by the member of each partner staff (managers, researchers and technical). 20 Persons have been involved.
- Extended research team: these researchers come from partner institutions and will be recruited during the project development (23 participants). Without including trainers for teaching and learning activities that will take place the second year.
- Number of schools involved in the piloting: 5 and 1 in the pre-piloting.

Target groups:

- Teachers involved in the pilot phase: 10.
- Students (secondary school level): 1526 that have been involved during the beginning of the piloting.

Public in general:

- Project website visitors: 64 visitors and 125 pages viewed.
- An average of 1 post published by each institution in their official website informing on the project launch and/or progress.
- 3 press release about the launch of the project in local newspapers and several news in organizations web pages (the complete detail of the activities carried on is described in the 1st year Dissemination report, published in the internal project communication platform).
- 2 publications about the project in an International Conference.

The impact is not high but is something expected for the first year of the project where the outputs are at 50%.

7.2 Dissemination and Use of Project's Results

During this year the only target group involved are the teachers involved in the piloting and partially some of the students. They have been reached when designing and describing the pilots, in the pre-pilot carried out and in the Diagnosis Phase of the piloting when the students should answer the STEAM Sematic Survey.

8. Acknowledgements

This document has been developed within ROBOSTEAM Erasmus+ KA201 Project with reference 2018-1-ES01-KA201-050939.

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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