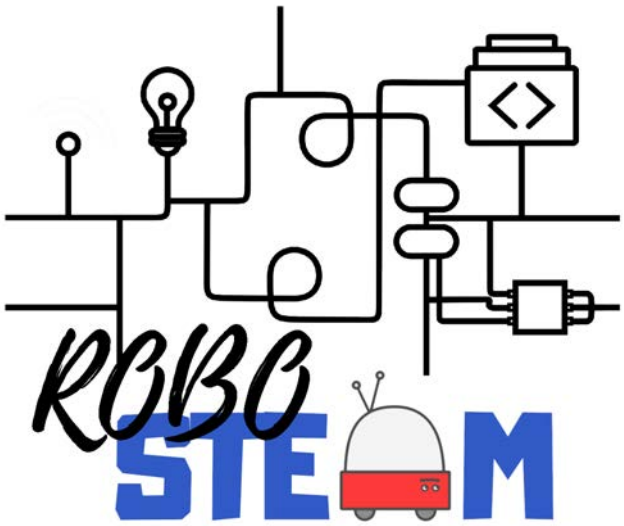
Testing Contexts – O2.A3



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Version	Date	Comments
0.1	01/05/2019	Designing a questionnaire
0.2	01/06/2019	Gathering information
1.0	01/07/2019	Analysing results

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1. O2.A3

This document describes part of the work of the RoboSTEAM project [1, 2] Output 2 - Guides for designing Open Hardware PD&R. The output aims to define guides that allow designing learning challenges for the development of STEAM [3] competencies [4] and computational thinking [5-8] by using PD&R. In order to do so it is necessary to know the existing educational contexts, the competencies that there could be achieved, and the issues related to cultural contexts and. Given this fact it is necessary to explore the possible application context where later the piloting will be carried out. In other to do so the activity is described as:

> "*Identification of the contexts to be tested (1 or 2 per partner). With the previous information it is possible to define possible different contexts to apply challenges based on PD&R and to take into account what context related issues could have an impact in the learning experiment*".

2. THE PROCESS

The process followed was the definition first of a questionnaire, which after a review was published for the partners. Each of them should describe at least one testing context. The results are gathered in a Google Form. After that the results were analysed.

2.1. The form

A form was design attending a deep description of the context taking into account the students, times, methodologies and tools and instruments to apply. It has two sections, a general one (Figure 1 and 2) and other to specify information (Figure 3) if the user states that he/she has applied PD&R experiments.

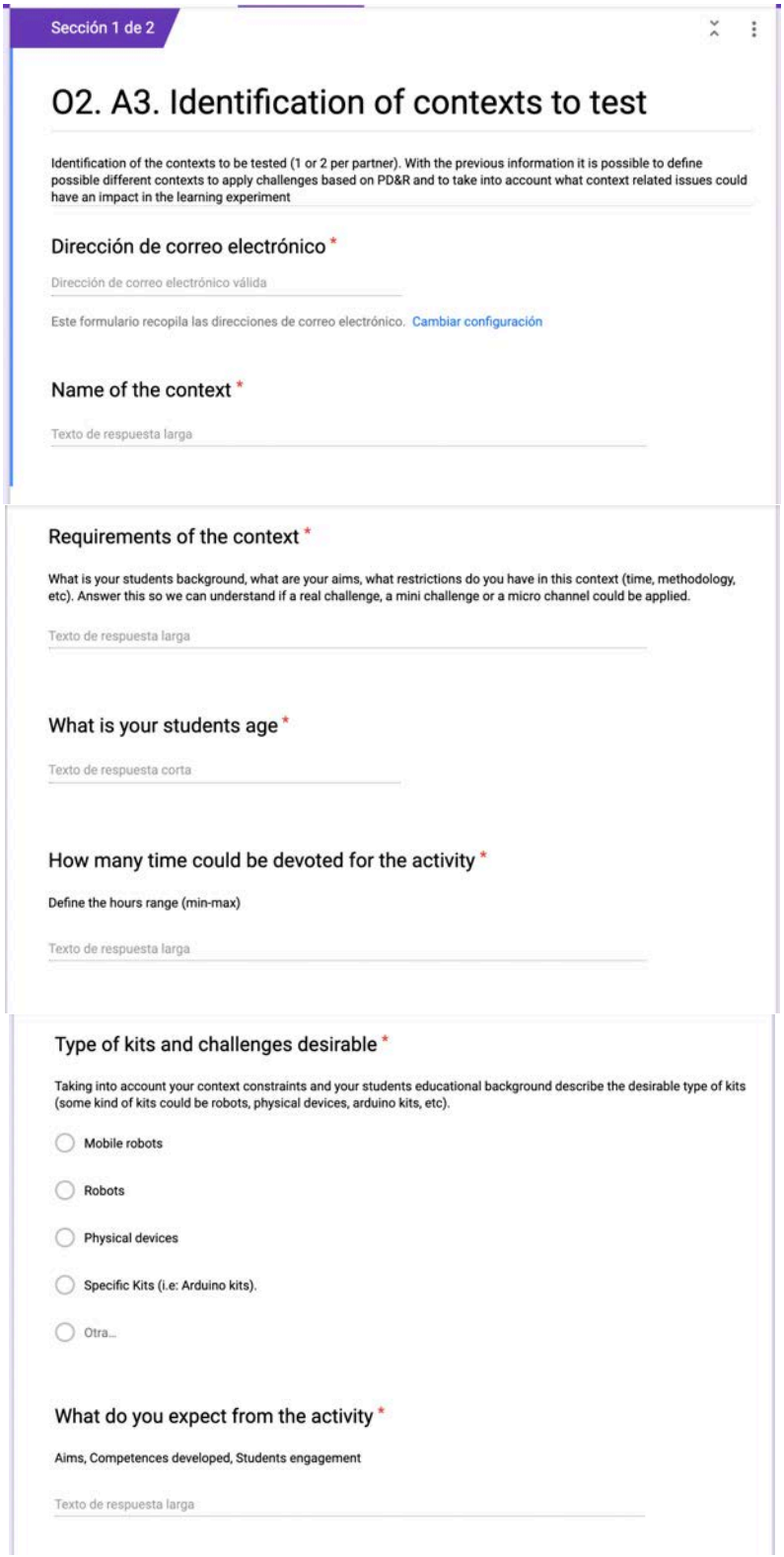

Figure 1. – First pat the questionnaire.

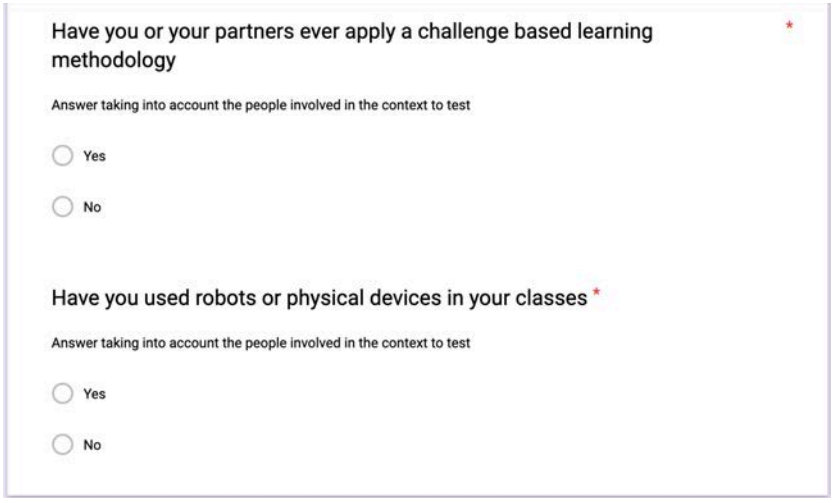

Figure 2. – Second part of the questionnaire.

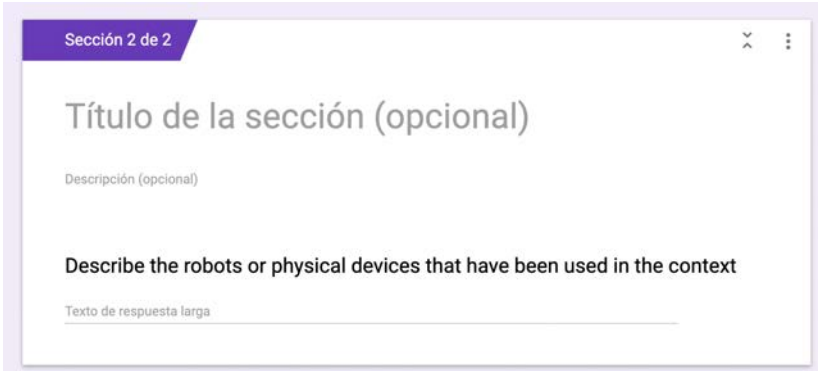

Figure 3. – Specific section of the form.

2.2. Tables with the context information

The information of the different context is gathered in tables from 1 to 8.

Table 1. – Context proposed by I.E.S Eras de Renueva

e-mail	covadongag@ieserasderenueva.org
Name of the context	I.E.S. Eras de Renueva. High School
Requirements of the context	We have two different levels: - First level (3º ESO)- Students haven`t studied before anything related to Robotics. During this year, students can study subject called Control and Robotics, in which they have learn about electrical circuits and programming with Scratch. - Second level (4º ESO)- Most of the students have had a two hours/week subject called Control and Robotics in 3º ESO, during this year, students can study other subject called Programming.
What is your students age	3º ESO (14-15) and 4º ESO (15-16)
How many times could be devoted for the activity	1 hour a week
Type of kits and challenges desirable	Specific Kits (i.e.: Arduino kits).
What do you expect from the activity	The participation in this project will be an opportunity for the students to learn about Robotics through a challenge what always represents a special motivation to learn. Sharing their experiences with students from other countries will be an enriching environment for learning.
Have you or your partners ever apply a challenge-based learning methodology	Yes
Have you used robots or physical devices in your classes	Yes
Describe the robots or physical devices that have been used in the context	Students have designed and created their own physical device using electrical components such as motors, switches, limits switches. In Control and Robotics they design basic circuits with Arduino kits.

Table 2. – Context proposed by USAL

email	fgarcia@usal.es
Name of the context	Robot kits for primary education
Requirements of the context	Bee-Bot robot
What is your students age	5-7
How many times could be devoted for the activity	8-10
Type of kits and challenges desirable	Mobile robots
What do you expect from the activity	Computational thinking, basic programming skills
Have you or your partners ever apply a challenge-based learning methodology	Yes
Have you used robots or physical devices in your classes	No
Describe the robots or physical devices that have been used in the context	

Table 3. – Context proposed by KIT

e-mail	daniela.reimann@kit.edu
Name of the context	Carl Benz School Karlsruhe, Vocational school
Requirements of the context	This issue was discussed with the school, I am awaiting the response
What is your students age	16-18
How many times could be devoted for the activity	15,75h
Type of kits and challenges desirable	Arduino LilyPad Smart textile
What do you expect from the activity	The pupils are planning, designing, constructing, wiring, programming and presenting interactive objects. they invent things according to their creative ideas
Have you or your partners ever apply a challenge-based learning methodology	Yes
Have you used robots or physical devices in your classes	Yes
Describe the robots or physical devices that have been used in the context	Lego Mindstorms, Arduino Lilypad wearables

Table 4. – Context proposed by AEEG

e-mail	f331aepq@gmail.com
Name of the context	Agrupamento de Escolas Emídio Garcia
Requirements of the context	Science area and artistic (music/visual arts) background
What is your students age	15-16-year-olds
How many times could be devoted for the activity	from 4 to 8 H
Type of kits and challenges desirable	Specific Kits (i.e: Arduino kits).
What do you expect from the activity	enhance students' competences such as: problem solving, critical thinking, creativity, computational thinking, communcation skills and give them the oportunity to have an intercultural experience
Have you or your partners ever apply a challenge-based learning methodology	No
Have you used robots or physical devices in your classes	No
Describe the robots or physical devices that have been used in the context	

Table 5. – Context proposed by UEF

e-mail	ilkka.jormanainen@uef.fi
Name of the context	SciKids' technology club (informal, extracurricular setting)
Requirements of the context	A variety of students from different schools, the club is a hobby for them. Gathering every second week for 2-2,5 hours.
What is your students age	10-15 mostly
How many times could be devoted for the activity	2 hours / twice in a month during the school year
Type of kits and challenges desirable	Mobile robots
What do you expect from the activity	Developing students' understanding about the robotics environments as well as basic CT skills. The students are engaged to design, programming, and testing cycle of robotics sets (typically tasks such as line following or maze solver; sometimes RoboCup rescue or soccer).
Have you or your partners ever apply a challenge-based learning methodology	Yes
Have you used robots or physical devices in your classes	Yes
Describe the robots or physical devices that have been used in the context	Lego robots, variety of Arduino-based mobile robot building kits.

Table 6. – Context proposed by IPB

e-mail	goncalves@ipb.pt
Name of the context	Robotics Summer Camp at IPB
Requirements of the context	Secondary school students
What is your students age	14 to 17
How many times could be devoted for the activity	20 hours
Type of kits and challenges desirable	Mobile robots
What do you expect from the activity	Prototyping and programming mobile robots in order to solve nano-challenges.
Have you or your partners ever apply a challenge-based learning methodology	Yes
Have you used robots or physical devices in your classes	Yes
Describe the robots or physical devices that have been used in the context	One of the used devices used devices the mBot robot, from Makeblock Co. Ltd., an entry-level STEAM educational robot kit for beginners, that makes teaching and learning robot programming simple. Thereby, the students involved during the challenge can learn about some of the robot machinery and electronic parts, get ideas about how works the fundamentals of block-programming, and develop their logical thinking and design skills. It was used another robot, being designed to be able to pick parts and move them from source to destination points. The parts should be picked based on a controlled magnet placed on the front of the robot. An identification of parts (with a RFID reader) should also be included to decide the destination of the parts. The robot kit was developed applying 3D printing technology, using PLA or ABS, and the robot modules are intended to be assembled and connected in a fast and easy way.

Table 7. – Context proposed by CIC

e-mail	manuel.jesus@cic.pt
Name of the context	Logistic management of a warehouse
Requirements of the context	Students have virtually no programming and robotics background. They need to know how to get the information and what to do with it. They need to solve small problems in a short time.
What is your students age	15, 16
How many times could be devoted for the activity	Minimum 1 hour maximum 3 hours per week, but not every week.
Type of kits and challenges desirable	Specific Kits (i.e: Arduino kits).
What do you expect from the activity	that develop logical thinking and build their own knowledge.
Have you or your partners ever apply a challenge-based learning methodology	No
Have you used robots or physical devices in your classes	No
Describe the robots or physical devices that have been used in the context	

Table 8. – Context proposed by ULE

e-mail	mcong@unileon.es
Name of the context	University of León ICT Summer Camp
Requirements of the context	The students are interested in ICT, we use to have 1-hour visit, we can apply a nano challenge
What is your students age	6-18
How many times could be devoted for the activity	1
Type of kits and challenges desirable	Robots
What do you expect from the activity	That they be more engaged with Robotics and STEAM
Have you or your partners ever apply a challenge-based learning methodology	No
Have you used robots or physical devices in your classes	Yes
Describe the robots or physical devices that have been used in the context	Baxter Robot and Pepper

The contexts chosen for the piloting were the posed by IES Eras, AEEG, CIC, KIT and UEF.

2.2. Other Issues

From the contexts description it is possible to find out other issues related with the contexts were the piloting will take place. First of all, the type of PD&R that is most appreciated by the experts are in most cases specific kits and mobile robots (Figure 4).

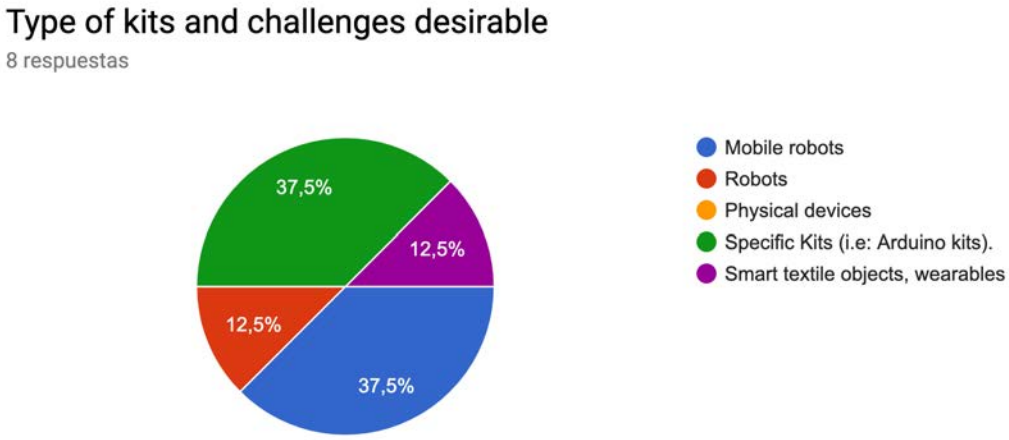

Figure 4. – Distributions of type of PD&R kits for the piloting

Another issue to explore was if the partners have been involved in any ChBL experiment and the answer was yes for the 62.5% (Figure 5). This should be checked with them because the answer is not coherent with the information about methodologies and instruments described in O2.A2. Something that comes from a lack of knowledge about what ChBL really means.

Figure 5. – Previous knowledge about ChBL

Other interesting issue is to know if the experts involved in the testing context have employed PD&R in their classes. There is a 37.5% that has not, which are the answers from the teachers of schools related to Arts. This made the definition of the challenge a real critical issue.

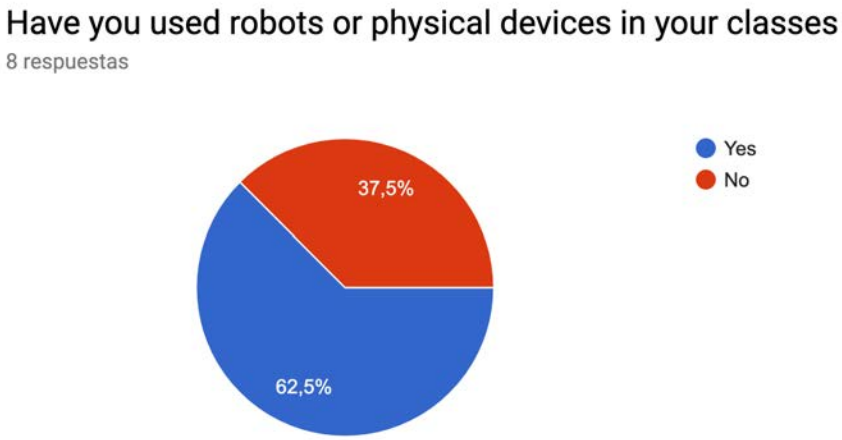

Figure 6. – Previous piloting experts' knowledge about the use of PD&R

3. Acknowledgements

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4. References

[1] 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. New York, NY, USA: ACM, 2019, pp. 24-30.

[2] RoboSTEAM Consortium, "RoboSTEAM Project," presented at the RoboSTEAM Erasmus+ project Kick-Off, Bragança, Portugal, February 15-16, 2019, 2019. [Online]. Available: https://goo.gl/Ni43mK.

[3] E. Hamner and J. Cross, "Arts & Bots: Techniques for distributing a STEAM robotics program through K-12 classrooms," in *Proceedings of 2013 IEEE Integrated STEM Education Conference (ISEC) (March 9th, 2013, Princeton, NJ, USA)*. USA: IEEE, 2013, pp. 1-5.

[4] E. Morales-Morgado, F. J. García-Peñalvo, R. A. Campos-Ortuño, and C. Astroza Hidalgo, "Desarrollo de competencias a través de objetos de aprendizaje," *RED. Revista de Educación a Distancia,* no. 36, 2013.

[5] F. J. García-Peñalvo, "Computational thinking," *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje (IEEE RITA),* vol. 13, no. 1, pp. 17-19, 2018, doi: 10.1109/RITA.2018.2809939.

[6] F. J. García-Peñalvo and J. Cruz-Benito, "Computational thinking in pre-university education," in *Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'16) (Salamanca, Spain, November 2-4, 2016)*, F. J. García-Peñalvo Ed., (ICPS: ACM International Conference Proceeding Series. New York, NY, USA: ACM, 2016, pp. 13-17.

[7] F. J. García-Peñalvo and J. A. Mendes, "Exploring the computational thinking effects in pre-university education," *Computers in Human Behavior,* vol. 80, pp. 407-411, 2018, doi: 10.1016/j.chb.2017.12.005.

[8] J. M. Wing, "Computational Thinking," *Communications of the ACM,* vol. 49, no. 3, pp. 33-35, 2006, doi: 10.1145/1118178.1118215.