



COLLABORATIVE ROBOTICS FOR CIRCULAR ECONOMY IN MANUFACTURING SECTORS

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CROCEMS Educational Philosophy



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1. Introduction

The CROCEMS project has as objective to design and develop a comprehensive training course to address Collaborative Robotics units to perform waste management task and encourage the development of circular business models within manufacturing sectors. To achieve these objectives, the Partnership will meet the learning needs of manufacturing companies in terms of training and in terms of waste management measures and procedures. In this sense, profiles as Manager and Workers would have a special focus in order to meet the growing demand of more sustainable products and more sustainable manufacturing process, in order to save as much resources as possible, and try to transform Europe into a recycling society.

2. Why compose an Educational Philosophy?

There are two main reasons to compose an educational philosophy:

- To agree a shared vision of what CROCEMS training content should be.
- To dialogue our individual educational values, and subject, discipline, and professional values as well.

It is of great relevance to put the team together to consider the different point of views of the different professionals on how learners do their best on the different learning context. By developing the Educational Philosophy Statement at the beginning of the Programme it will ensure a good communication of the particular teaching, learning and assessment approaches of CROCEMS, the lack of a common Educational Philosophy impacted on Programme sequencing and coherence.

The Educational Philosophy is a Statement agreed by the team that sets out the Programme's purpose, education and professional values, the nature of the learning environment for students and the key approaches for teaching, learning and assessment. The starting point of a Programme design is: I) The consideration of he needs and resources of the Programme, II) The development and articulation of a vision and set of values that the Programme team aspire to, and III) Early consideration of students needs and pathways.

For the development of the Educational Philosophy Delivery, we have supported our Statement of the following questions:

- Are we being clear and concise?
- Are we being critical?
- Are we engaging our students in problem solving?
- Is our approach working?
- What is it we hope that students will have learned, that will still be there and have value, several ears after the course is over?

- What would the students have to do to convince us that they have achieved these learning outcomes?

3. Educational Philosophy Statement

3.1. Are we being clear and concise?

For the transfer of CROCEMS' relevant knowledge, it is important to design not only the content but also the communication framework so that the training content can be absorbed efficiently. In the planning phase, it will be taken care to ensure that the curriculum is challenging on the one hand, but also entertaining on the other, as personalized and focused on different choices but also as coherent and relevant as possible.

In addition to the accumulation of solid knowledge, the learning framework should allow personal and, if possible, profound progress.

Learning should be made available in a range of ways including interdisciplinary learning and a range of opportunities which ensure a broad approach, enabling, in the case of the CROCEMS project a coherent understanding of environmental issues.

3.2. Are we being critical?

Helping people learn in ways that are easier, faster, accurate and inspiring should be the prior objective of online courses. During the Covid-19 pandemic situation, teachers and students have been challenged as never happened before; this led to a brand-new way in the use of alternative technologies to support the students in their academic objectives. This recent experience should be considered during the definition of the different modules of the online course and as soon as topics, study objectives and target audience have been defined, the most suitable technology for creating learning objects should be identified (such as the use of H5P or Lumi <https://h5p.org>). Within the CROCEMS context the use of videos or interactive material will be ideal in order to help the experts in understanding how the interaction with collaborative robotics works. Previous work has found that people learn better with interactive learning videos. The structure of the video is crucial. When developing the videos, the results of the preliminary work should be taken into account.

The content of the training course is also of great importance. Climate change shows that a rethinking of waste and circular economy is indispensable in order to leave the same basis for life for future generations. Currently, we consume the resources of two earths within one year, so it is all the more necessary to create awareness for waste management and circular economy. With the CROCEMS project, we are taking a step in the right direction.

3.3. Are we engaging the students in problem solving?

In order to engage students in problem solving, several commitments should be considered:

1. Are students the core of the teaching purpose?. Are training contents designed to fully develop their capacities? Do training contents fulfilment facilitate their personal and professional life?



2. The development of new concepts requires recognising that new ideas, are adopted gradually by students and thus, required from several steps from conceptualization to self-evaluation of the acquired concepts. The aim is to make students more personally and professionally committed so that they can enjoy the lessons and personalise them to their specific needs (what they need to solve in their specific scenario).
3. Humans are more engaged to a particular scenario when that scenario fulfils in an integral manner a particular interest. A simple example of this could be "watching a movie". The experience tends to be more satisfying and endures longer over time when it has been planned in advanced, proper time has been allocated and resources allows are to use all our senses (cinema vs home). Therefore, we propose to develop training contents not only through specific competences, but also relating them to Values and Attitudes that can engage students by holistically understanding a topic to solve problems considering all parameters involved.

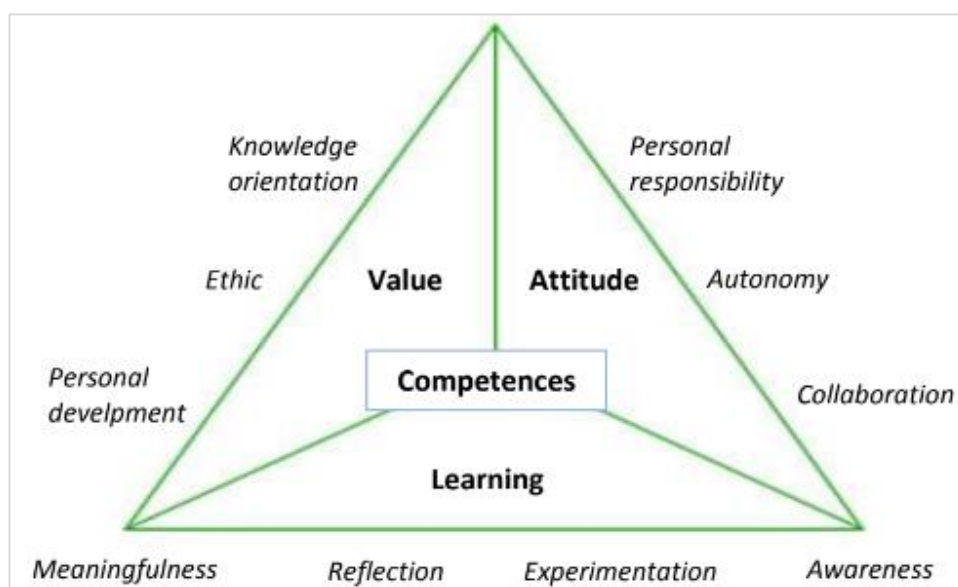


Figure 1. Training model by DEUSTO

To facilitate and enhance the good running of the training contents, in terms of students' engagement, we propose to split each problem that needs to be solved in 5 specific training areas, each of one with one purpose in mind:

- Contextualisation: Students can understand the topic, implications in real life scenarios and prepare them to take more advantage of the topic.
- Reflection: Students can reflect if the vision they have about the problem to solve was correctly stated, or if different considerations must be made.
- Conceptualisation: In this stage, different modules provide students with specific concepts, examples, and applications of the specific topic of study. Students are more engaged to the learning process, because previously they have contextualised it and reflect about their particular problem (scenario) and that makes learning process more attractive.

- Experimentation: Most students engage to some topic when they experiment with it. Thus, it is interesting to include questions, activities, etc. Students can apply in their specific workplace.
- Self-assessment: Finally, self-assessment helps students to check if different topics they learnt have been understood properly, reinforcing their engagement, or guiding them to recap misunderstood concepts.

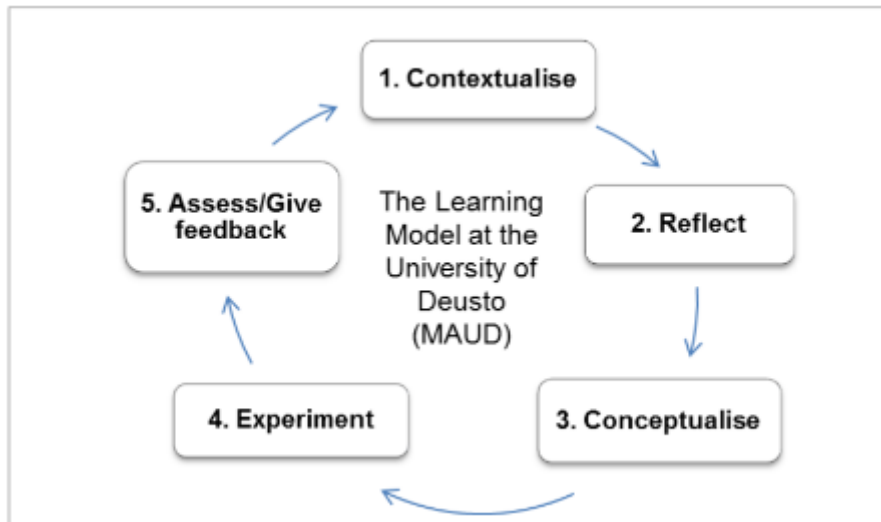


Figure 2. Training model by DEUSTO II (MAUD)

3.4. Is our approach working?

Training courses are intended to people with different learning abilities and preferences, for this reason they must have a dynamic approach to the concepts taught to be able to meet the need of different groups of individuals. The use of different educational technology may guarantee that our approach is well-balanced and functional to the specification and objectives of CROCEMS. BY defining different learning roles, the learning content can be individually adapted to the needs of the participants.

3.5. What is it we hope that students will have learned, that will still be there and have value, several years after the course is over?

The aims of CROCEMS in this sense are:

- To help learners to gain the needed knowledge about what is Collaborative Robotics, how it works and ow to put it in place in company.
- To help some learners to be able to solve concrete problems concerning their company waste management by putting in place Collaborative Robotics in the assembly line of their (future) companies.

Collaborative Robotics have numerous applications in the different fields and its implementation is adaptable to different situations. The online course should ensure good general preparation in relation

to:

- The interaction with Collaborative Robotics,
- The identification of real-life problems and resolutions, and
- The critical evaluation of the risk and the ability to avoid any misbehaviour.

Collaboration with a robot will become friendlier and the opportunity to work synchronously will be seen as a benefit for the performance of expert tasks. Collaborative Robotics applications are considered more often, as the training course will provide a good basis for understanding the potential of Collaborative Robotics in terms of waste management and how it can be used in circular processes. In the longer term, this knowledge can be used to implement applications in other areas or challenging applications.

3.6. What would the students have to do to convince us that they have achieved these learning outcomes?

The training course should allow students to easily express their educational feedback, CROCEMS will identify and apply the right learning feedback and training path monitoring system. Based on a real-life case, the Consortium will evaluate expert's technical knowledge together with their ability to identify and propose solutions to problems and misbehaviours. Using interactive learning tools, learning outcomes can be reviewed and recorded.