

Robot-Based Pedagogy Requirements: Results from Stakeholder Interviews Executive Summary

EDUROB: Educational Robotics for Students with Learning Disabilities (EDUROB - 543577-LLP-1-2013-1-UK-KA3-KA3MP)

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This report presents the findings from partner countries from interviews and focus groups exploring the potential use of robotics within current teaching practice, the aim of which is to produce a set of pedagogical requirements that define the needs of robotic use. An interview protocol carried out in each partner country sought to gain data regarding current teaching practice, potential use of a robot in teaching and the barriers that must be overcome if robots are to be introduced.

A thematic analysis carried out on the data produced three key themes analysing student diversity, learning needs and methods and final the actual potential use of the robot. Within each of these key themes the commonalities and difference between partner countries is noted as a robot-based pedagogy will have to cater for both to be successful across all partners.

The first theme, diversity, illustrates a mixed classroom that must be catered for. Students may be organised into groups in some partner countries or taught one-on-one in others and they may have a variety of diagnosed learning difficulties that range in severity.

The second theme, learning needs, examines current practice in teaching across countries in term of success measures, methods and barriers to providing meaningful education within the context of SEN teaching. Findings suggest that a range of learning outcomes are required due, in part, to the diversity illustrated in the previous theme. These learning outcomes are required to be scalable such that they can deal with profound disabilities but also allow more able students to benefit from the teaching delivered. At a minimum, however, it was reported across partner countries that maintaining engagement is a vital success measure employed by teachers.

The final theme, robotic use, explores the potential use of robots within current teaching practice as proposed by stakeholders. After being shown a demonstration of the NAO robot, participants proposed potential learning activities that can be broadly classified within 5 areas of learning:

1. Imitation – reinforcing behaviour.
2. Cause and Effect – associating action with behaviour.
3. Problem solving – through spatial reasoning, coordination.
4. Speech – improving speaking and listening through robot interaction.
5. Social Learning – how to act, appropriate behaviour.

Furthermore, partners reported the potential barriers to introducing robots into their current teaching practice. These include access to the technology in terms of the required confidence and skill, readiness of learning tools in terms of pre-designed tasks and control of the technology if being used in varying ways. It is clear from these three themes that robots have the potential to introduce an engagement and new way of learning. However, they are an added complexity and the pedagogy must be able to flexible enough to make use of the technology in an accessible way.

From each of these three themes arise a series of requirements that can be used to guide the development and implementation of the robot based pedagogy. Using the pedagogical framework proposed by Monarch (2009) (and implemented in the ViPi project), these requirements can be summarised according to four dimensions: social, educational, organisational and technological.

**Social**

A robot-based pedagogy must:

* Be adaptable to the size of the class allowing for both group based teaching and single student cases.
* Be adaptable to the range of diagnosed SEN’s that could be found within a student cohort across all partners.
* Be adaptable to the range of abilities that could be found within a student cohort across all partners (mild to profound disabilities that may be both cognitive and physical in nature).

**Educational**

A robot-based pedagogy must:

* Allow for a range of learning outcomes that are required for the student cohort.
* Maintain engagement across all ranges of ability.
* Activities which are customisable by age, SEN and difficulty required.
* Be able to “plug-in” to existing curriculum as well as provide quick informal sessions.

A robot-based pedagogy should:

* Provide activities within at least one of the following areas: Imitation, Cause and Effect, Problem solving, Speech, Social Learning.
* Allow for scalable learning outcomes suitable for the ranges in ability across the student cohort based on these areas.
* Encourage inclusion within mainstream education where appropriate.

**Technological**

A robot-based pedagogy must:

* Encourage interaction through a variety of tactile stimuli.
* Have a series of pre-defined activities that cover the learning outcomes required of the session.
* Have a series of pre-defined scalable activities that cover the abilities of the student cohort.
* Require little technical skill from the teacher.

A robot-based pedagogy should:

* Have a single input device for student interaction.
* Have a single input device for teacher interaction allowing set-up of activities.
* Have a single input device if multiple robots are used.
* Be accessible for teachers to implement from session to session.

**Organisational**

A robot-based pedagogy must:

* Be implementable across all partners which include the cost of the robot.
* Be clear in terms of its purpose and goals.

A robot-based pedagogy should:

* Have a clear user guide to allow for a low level of technical skill on behalf of the teacher – this should detail how to set-up, carry out and modify a session.

In summary, this report presents the key success factors that can guide a robot-based pedagogy and raises some significant research gaps that need to be addressed through this project which can be summarised as the following:

* How can scalable learning outcomes be introduced that are adaptable to the needs of the student in a diverse student cohort?
* How can this pedagogy be adapted to current curricula and teaching methods with a longitudinal view?
* How can the variation across teaching activities cater for variation across the student cohort?
* How can the technology be made accessible for teachers while maintaining the inherent complexity that makes it a potentially powerful teaching tool in the SEN domain?