



Educational Robotics  
for Students with Learning Disabilities



# Learning with robotics cases' analysis report

## SUMMARY

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EDUROB:

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



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*The EDUROB (543577-LLP-1-2013-1-UK-KA3-KA3MP)project has been partially funded under the Lifelong Learning programme. This publication reflects the views only of the author(s), and the Commission cannot be held responsible for any use which may be made of the information contained therein.*

The current piloting report represents an integral part of the European funded project “EDUROB: Educational Robotics for Students with Learning Disabilities”. As an integral part of the whole project process, Work Package 4 (Pedagogy assessment) aimed to collect relevant empirical data - related to robotics in education and increased progress towards learning goals and engagement for students with learning disabilities. Conceptually this pilot is based on Single centre, single subject experimental design using an ABAB design.

The Piloting Report sets out to describe the piloting methodology and to provide the analysis of the results of the EDUROB pedagogy in the Bulgaria, Italy, Lithuania, Poland, Turkey, and the UK. In addition, it will include country-specific findings as well as comparative analysis and general conclusions.

The assessment process consisted of analysing the preferences of contemporary learners for using robotics technology in the classroom/laboratory. The aim of piloting was to evaluate the effects of robotic mediated learning on pupils’ engagement and achievement of learning objectives, and the amount of teacher assistance required.

Single centre, single subject experimental design using an ABAB design. In the ABAB design alternating treatment conditions (intervention and control) are compared for one individual whose behaviour is continuously monitored (repeated measures). For this study, the control or baseline condition (A) was the teacher’s usual teaching methods. The intervention (B) was the use of the robot to achieve the same learning objective(s).

Statistical analysis was carried out by comparing scores from control sessions with those from intervention sessions for each participant using a non-paired test.

There were 89 participants and each participant would have two matched scores entered into the analysis: their total scores from the control sessions and their total scores from intervention sessions. Then the intervention could be compared with the control using a paired t test.

The pilots involved 89 trainees where 35,9% were female and 64,1 % - male students. The age range varied from 4 years old to 19 with higher participation of trainees of age 10 and 13. The abilities scores varied from 18 to 100 in SABS scale with no particular frequency at any level.

### **General conclusions**

The analysis of overall country pilot data revealed that engagement is statistically significantly higher in the robot condition compared to control condition, while the progress towards learning goals, engagement and trainer assistance needed varies on the pilot site context:

- Trainees’ progress was statistically significant in Bulgaria and Poland pilots. Pilots were implemented with Lego EV3 Mindstorms robot (BG) and NAO (PL).

- Trainees' engagement was higher and trainer assistance was required less in the Bulgaria and Italy pilots. Pilots were implemented with Lego EV3 Mindstorms robot (Bulgaria) and both Mindstorms and NAO (Italy).
- Considering specific learning areas: statistically significant improvements in progress were obtained using problem solving (BG and TR cases), while engagement increased during problem solving at the Turkey, Lithuania, Poland sites and in the speech learning area in the Bulgaria site. Reduced teacher assistance for trainees was indicated in imitation sessions at the Bulgaria, Turkey and Poland sites, whereas in the Poland case problem solving also served to reduce needed assistance.

The study suggests considering problem solving as the most relevant learning approach working with students with learning disabilities. From the present study it can be concluded that the use of robots may be considered not detrimental to both engagement and learning achievement compared to more traditional interventions. In this view, the results may open new educational scenarios for students with learning disabilities.

### **Robot acceptance**

The modified version of the ATD-PA was used to assess teachers' attitudes towards the use of the robotic platforms in their daily activities.

Firstly, the perception of the EDUROB system is relatively positive in terms of effectiveness in helping professionals achieving the students' goals.

Secondly, technological competence and lack of continuous support (as measured respectively by the items related to ease-of-use and support) may make the use of any robotic platform (NAO and Lego) difficult, decreasing the likelihood of EDUROB uptake in the future by potential stakeholders. Assuring either remote or onsite support would increase the likelihood that early adopters keep using the devices. Further, training courses should provide at least basic indications on how professionals may deal with robot breakdowns and malfunctions.

### **Future:**

Special education teachers and technical staff in the piloting sessions were impressed from the achieved positive impact on the students while comparing the results from sessions "A" and "B". Some, particularly in Bulgaria, Turkey and Lithuania also reported that robotic mediated sessions should be in the individual and group learning plan for students with learning disabilities.

NAO Robot might be used as an assistive technology in individual cases.

## 1 References

LEGO official producer website: <https://education.lego.com/en-us/products/lego-mindstorms-education-ev3-core-set-/5003400>

Open Roberta Lab - The cloud-based and open-source IDE for EV3 <http://lab.open-roberta.org/>

NAO official producer (Aldebaran) website: <https://www.aldebaran.com/en/cool-robots/nao/find-out-more-about-nao>