Design and evaluation of robot-performed gestures to support L2 education

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In the Horizon2020 L2TOR project (http://l2tor.eu), we investigated whether social robots could address the need for innovative technological support in second language (L2) education and, if so, how we can design interactions in such a way that social robots can be effective as tutors. Compared to other technologies, robots have the advantage of being physically present in the educational context, and an important way to leverage this physical presence is using hand gestures. Hand gestures have been shown to facilitate learning from other people, and therefore we set out to study whether this applies to robots as well.

We conducted a large-scale study at primary schools in the Netherlands, in which 194 children of approximately five years old participated. They were divided among one of four conditions: (1) control; (2) tablet only; (3) tablet + robot with deictic gestures; (4) tablet + robot with deictic and iconic gestures. Children not in the control condition attempted to learn 34 different English words with the robot, across seven sessions.

Our results show that children learn from the tutoring interaction, however no benefits were observed of the robot's presence, nor its use of iconic gestures. We further explored potential factors related to the design of the experiment and the gestures and found that only the older children in the study were able to benefit from the robot's gestures, particularly those for measurement words (e.g., big). Based on these findings, we propose several improvements to the process of designing hand gestures for robots.

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