

Proposal Research Traineeships 2018

1. Title of the Project

Teacher-based design of social robots for L2 education

2. Coordinators

Dr. Paul Vogt (DCA)

Dr. Rian Aarts (DCU)

3. Project Summary

In recent years, there has been an increased effort in developing robot tutors to educate both children and adults (Castellano et al., 2013). One application domain for robot tutors is second language tutoring to preschool children (Belpaeme et al., 2015; Fridin, 2014). This could either be tutoring a popular second language such as English to native speakers of, for instance, Dutch or tutoring the official school language to children from immigrant families.

In our earlier research, we have focused on the engagement of preschool children while interacting with a social robot (Baxter et al., 2017). In the next step, we have investigated the effect of L1 use in teaching L2 vocabulary of 4-6 year old Turkish children. In the current proposal, we want to focus on the implementation of social robots in L2 educational environments by investigating the needs and possibilities for their use in the classrooms.

Turkish children in the Netherlands are growing up in a bilingual context. In this context, there seems to be a situation of competition for scarce resources; the time available for language learning has to be divided between the two languages (Scheele et al., 2010). On the other hand, transfer of skills takes place from structures learned in L1 to L2 (Scheele et al., 2010). Research established that the amount of input had a large impact on the vocabulary development of the child (Hart & Risley, 1995). Moreover, studies on academic language (e.g., Aarts et al., 2016) show that the quality of the input matters too. Lexical richness, syntactical complexity and abstractness of input in L1 turn out to have an impact on the language development and later school success in L2 (Leseman et al., 2007).

Social robots in the classroom may provide an additional source of input in the second language of the child and may thus enlarge the quantity of input in the L2, but also in a higher quality (academic language) of input. While much progress has been made in designing robots as language tutors (e.g., De Wit et al., under review; Vogt et al., 2017), the development of educational programs for Turkish children living in the Netherlands has proved more complicated than anticipated because of the large variation in L2 (Dutch) proficiency of this community. Up to now the lessons in our projects were designed based on those that were designed by pedagogical experts from academia within the context of the L2TOR project. However, it may be more instructive to start designing the educational material based on the needs and potential uses in the classroom as assessed by primary school teachers themselves. Very few design studies have so far involved primary school teachers in designing the educational materials that social robots can offer. In this project, we aim to bridge this gap by designing and testing a social robot that can be used in a bilingual educational situation in order to stimulate second language learning of young Turkish children.

Research questions

1. How can social robots be implemented in classroom with the aim of stimulating L2 learning of bilingual children, according to teachers?

2. What are the effects of the implementation of social robots according to the outcome of RQ1, on L2 learning of bilingual children?

Methods

The project is divided in two parts, each relating to one of the two research questions. The first question will be answered by using a qualitative study, while the second question will be answered using a single experiment.

The first part of the project focuses on investigating the viewpoints of teachers in bilingual classrooms regarding the possible role of social robots. In our current research, a number of primary schools with a bilingual population participates. The teachers of these schools have met the social robot Robin and they have seen how the robot interacts with children. These teachers will be asked about their ideas on how a robot could be used in their work with bilingual children. Their needs for 'assistance' in teaching L2 to these children, their ideas on where and how a social robot can help and the goals that can be achieved, will be collected. From the data analyses of this first part of the project, guidelines and principles for the design of an implementation of the robot will be distracted.

The second part focuses more on the human-robot interaction (HRI) aspects of this study, and includes the setting up of the implementation of the robot. To answer research question 2, the implementation will be experimentally evaluated in the schools. The interactions between robot and children will be recorded on video. The videos will be analyzed qualitatively concerning the levels of engagement between child and robot. Next to that, the implementation will be evaluated by investigating whether or not goals have been achieved.

Collaboration and project results

The research trainees will closely collaborate in data collection and analysis, but each with their own focus. One trainee will focus on the qualitative part of the study and will put most effort in the teacher interviews. The other student will focus on the HRI aspects of this project and will put most effort in implementing the findings from the first part by programming the social robot. This collaboration also nicely integrates research approaches from the two departments involved. The project incorporates language acquisition research of both departments: educational aspects and academic language from DCU, and the European funded L2TOR project on second language learning using social robots from DCA (and DCC). The research trainees are also expected to collaborate with L2TOR partners from Utrecht University (regarding pedagogical issues) and Koç University (Istanbul, regarding Turkish-specific issues). The L2TOR project will support all technological developments required for this project.

The project will result in an initial draft for a publication to be submitted to a journal on child language development or educational robotics. In addition, the project will yield experimental findings that can be incorporated in the L2TOR project, which aims to develop a robot tutor that be valorized in commercial applications in the years to come.

4. Project timeline

Month	Trainee DCU	Trainee DCI	Milestone
1		Literature study	
2	Setting up the teacher interview		
3-4	Carrying out and analyzing the interviews		Answer RQ1
5-7		Implementation in robot	Design of implementation
8-10		Experiment	Data collected.
11		Data analysis	Answer RQ2
12		Drafting the paper	

5. Research Trainee Profile

Both trainees will be involved in the literature study, design, data collection and analysis. One trainee will focus primarily on the qualitative part with teacher interviews, while the other is more concerned with the task of incorporating the findings into the robot tutor. However, the trainees will be working together and sharing responsibility for both parts of the project.

We are seeking two enthusiastic students, preferably at the Research Master or Master levels (though excellent Bachelor students are also considered), who have excellent communication skills and preferably some background in language acquisition and -at least- affinity with human-robot interaction. For at least one of the trainees, basic programming skills (or the willingness to acquire these) are desired.

Applications, including a motivation letter and a resume, should be sent to both Rian Aarts (A.M.L.Aarts@uvt.nl) and Paul Vogt (P.A.Vogt@uvt.nl).

References

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