

Proposal Research Traineeships 2017

1. Title of the Project

The effect of L1 use in L2 tutoring using social robots

2. Coordinators

Dr. Paul Vogt (DCI)

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. One of the advantages of using a robot is that it may converse with the child in both her first language (L1) and second language (L2). This project focuses on robot tutoring Dutch as L2 to preschool children with Turkish as L1, and in particular on the amount and kind of L1 the robot should provide to be most effective.

Following a usage-based theory of child language acquisition, the input children receive is of great importance in their language learning (Lieven & Tomasello, 2008; Tomasello, 2000), especially in the register of language that is most important in learning in school, academic language. In language learning research (Hart & Risley, 1995; Huttenlocher et al., 2010), it was established that the amount of input had a large impact on the vocabulary development of the child. The results of studies on academic language (Demir-Vegter, Aarts & Kurvers, 2014; Aarts, Demir-Vegter, Kurvers & Henrichs, 2016) show that the quality of the input matters too. Lexical richness, syntactical complexity and abstractness of input in L1 turns out to have an impact on the language development and later school success in L2 (Leseman, Scheele, Mayo & Messer, 2007).

In bilingual contexts, 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, Leseman & Mayo, 2010). On the other hand, transfer of skills takes place from structures learned in L1 to L2 (Bialystok, 2007; Scheele, Leseman & Mayo, 2010).

Robot tutors may provide an additional source of input (in L1 and L2) for preschool children learning Dutch as a second language. This may amount in a higher quantity of input, but also in a higher quality (academic language) of input. The advantages of using robots in addition to teachers are that robots are able to provide one-to-one tutoring, consistent behavior and a good model of the target language. Moreover, children tend to consider interacting with robots being less stressful (Alemi, Meghdari & Ghazisaedy, 2015), as a result of which children engage more readily with robots about things they think are boring when interacting with humans (Leyzberg, Spaulding & Scassellati, 2014). In comparison to other digital learning environments, such as avatars or tablet-based applications, robots provide embodiment, which increases learning gains (Kennedy, Baxter & Belpaeme, 2015; Leyzberg, Spaulding, Toneva & Scassellati, 2012).

Another potential advantage of using robots is that they can be programmed to speak multiple languages, something human teachers cannot easily do. However, there is an ongoing debate concerning the amount of L1 a teacher should use in second language education (Swain & Lapkin, 2013). Some scholars argue that teachers should not use L1, while others argue that it should help children, especially when they use

translanguaging (i.e. providing metalinguistic explanations in L1 about differences or similarities between L1 and L2). In this project we aim to investigate to what extent the use of L1 contributes to the learning of Dutch for native speakers of Turkish.

Research questions

1. What are the effects of L1 use on learning Dutch by native speakers of Turkish, particularly concerning the use of translanguaging compared to embedding L2 target phrases in L1 instructions?
2. What are the effects of using L1 on children's engagement with and perception of the robot tutor?

Methods

The project is divided in two parts, each relating to one of the two research questions, which are both answered using a single experiment. The experiment will consist of a single tutoring session, where Turkish children learn some property of Dutch from a NAO robot. Sixty native speakers of Turkish, aged 4-5 years, will be recruited from primary schools in Tilburg. They will be randomly assigned to one of the following three conditions:

1. No L1.
2. Some L1 to provide instructions with embedded L2.
3. Some L1 to provide translanguaging.

The tutoring session will be adapted from one of the lessons developed in the context of the L2TOR project. The exact domain and particular learning targets will be selected after all lessons have been scripted, which is expected to be due in January 2017.

The first part of the project focuses on how L1 can be used in L2 learning, and what effect this may have on the learning outcome. To this aim, a literature review will be carried out to investigate how strategies for using L1 are implemented in human teaching. This will then serve to design the three conditions. To answer research question 1, a pre-test and post-test on the relevant language proficiency will be administered to assess the effect on learning.

The second part focuses more on the human-robot interaction (HRI) aspects of this study, and includes the adaptation of a lesson for this experiment and implements this on the robot. To answer research question 2, 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. In addition, a short semi-structured interview will be administered to investigate the children's perceptions of the robot.

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 role of L1 in second language tutoring, while the other will focus on the HRI aspects of this project. 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 DCI. 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	
2-4	Analysis of L1/L2 use in L2 tutoring, and design strategies for the three conditions.	Design/adapt the basic lesson.	Design of the tutor model.
5-7		Implement and pilot the experiment	Implementation of the experiment.
8-9		Experiment	Data collected.
10-11		Data analysis	Experimental findings.
12		Drafting the paper	

5. Research Trainee Profile

Both trainees will be involved in the literature study, experimental design, data collection and analysis. One trainee will focus primarily on the academic language stimulating behavior, while the other is more concerned with the task of incorporating this into the robot tutor.

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 required.

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).

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