Advice-Giving between Young Learners in Robot-Assisted Language Learning

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Abstract

Social robots bring new possibilities to education. This paper presents an analysis of young learners' interactions in robot-assisted language learning (RALL) and seeks to describe how they give each other advice in foreign language speaking situations. Especially when a problem arises due to insufficient languages skills, the learners engage in problem-solving negotiations. The data consist of eight video-recorded learning situations where eight pairs of 10 to 12 years old children interact in English as a foreign language (EFL) with a robot. This paper presents microanalyses on advice-giving situations where the learners help each other and succeed in their common task of answering the robot's questions correctly. These microanalyses show that the learners give each other normative and epistemic advice. The results of the present study suggest that interaction problems in RALL situations lead to fruitful problem-solving interactions between the learners.

1 Introduction

Over the last few years, social robots have become increasingly common, and in this development, they have also been introduced as a tool for foreign language teaching. Although social robots have been largely studied, there are relatively few studies on robot-assisted language learning (RALL) [1], [2]. In this paper, we examine advice-giving situations in RALL as part of the research project RoboLang of the University of Turku [3].

We are interested in RALL situations where primary school children interact with a robot during English as a foreign language (EFL) classes. In different phases of the learning situation, the learners often encounter interaction problems with the robot, and the interaction breaks down [4]. The learners therefore find themselves in problem-solving situations. In this paper, we focus on the advice that the learners give each other to solve problematic situations in the child–robot interaction (CRI). Repair and advice have been studied especially in conversation analysis [5]–[7] but have not yet been examined in the context of learner interaction in RALL.

In this paper, our main aim is to analyse the ways in which the learners help each other in CRI. Namely, we examine what kind of advice young learners give one another in RALL. We will start by outlining the literature on social robots in language learning and on advice-giving. We will proceed by describing the data and analysis. Finally, we will go on to discuss the ways young learners help each other to succeed in RALL tasks.

2 Background

2.1 Social robots in language learning

According to recent research, robots provide new opportunities for learning [1], [2]. Robots can have a positive effect on learning outcomes [1], [8]. Their effectiveness may emerge from their social behaviour, especially their multimodal interaction where embodiment and gestures enrich the interaction [1]. Robots can also have a positive impact on the learners' motivation [2], [9]. Robots can arouse learners' curiosity, engage them in realistic dialogue practice and have features that can support learning [8]–[10]. For example, repeatability is helpful for comprehension and pronunciation [10]. The anthropomorphism also encourages speakers to treat robots as real speakers

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while proposing a situation where the learners do not have to worry that the robots might tire, laugh, or scold them [10]. These elements have been found to reduce foreign language anxiety, which can be a crucial obstacle to using the foreign language [1], [9], [11].

2.2 Advice-giving in language learning

Language learning can be perceived as a socio-cognitive process and a social practice [12], [13]. Studying classroom interactions, for example, negotiations of meaning, repair, and advice, is therefore a means of understanding learning [14].

Advice is something that "describes, recommends, or otherwise forwards a preferred course of future action" [5, p. 368]. Advice can be defined as having two dimensions: normative and epistemic [5], [7]. The normative dimension refers to the prescriptive aspect of advice that highlights the preferred course of action [5], [7]. For instance, a health advisor may advise a new mother with an imperative: *No, always be very very quiet at night.* [5, p. 387]. The epistemic dimension, on the other hand, refers to the knowledge asymmetry between the giver and the recipient of the advice, that is, the advisor knows more than the advisee [5], [7]. For example, advice may be given by sharing knowledge: *The hospital recommend that she shouldn't start solids until she's four months.* [5, p. 387].

Further, advice can be divided by its initiator [5]. Advice may be self-initiated, that is, the person experiencing the problem requests advice and starts the situations [5]. For instance, a new mother may ask: *Shall I let her tell me when she's hungry?* and receive advice: *Well yes, that's sensible.* [5, p. 371]. Other-initiated advice is initiated by the advice giver, who may inquire about the need for advice, for example, with a question *Are you doing your exercises?* and after a problem-indicative response continue with an assessment *I think it's quite important to [...]* [5, p. 383].

To our knowledge, advice-giving in RALL has not been previously researched, but previous studies note that the robot may initiate cooperation and collaborative learning between the human participants [8], [15]. It has also been observed that communication breakdowns are common in RALL as there are two major factors contributing to them: the learners' linguistic and the robot's technical limitations [4]. Therefore, advice and collaboration are important for the success of the human–robot interaction. In this study, our research question is: "What kind of advice do young learners give each other in RALL?" More specifically, we set out to explore to what extent learners use self- and other-initiated advice in RALL and how do the forms of advice vary in their normative and epistemic dimensions.

3 Data and methods

The data for this study were collected in the University of Turku's research project RoboLang in 2019. The data analysed in this study consist of 8 learning situations – approximately 17 minutes each, for a total of 2 hours and 19 minutes – where two learners interact with the robot. The data were collected during EFL lessons in a Swedish-speaking school in Finland. Before the data collection, informed consent forms were obtained from the local school authorities and from the participants' parents. The learning situations were recorded with two cameras and one audio recorder. There were 16 participants, comprising 7 girls and 9 boys. They formed 5 same-sex and 3 opposite-sex pairs. They were 10–12 years old, aged 11.25 on average.

In these learning situations, the learners met the humanoid robot NAO 6 (by SoftBank Robotics) for the first time. The learning application used on NAO was the Elias Robot application by Utelias Technologies. The application is used via a laptop showing images related to the speaking exercises. By using the laptop, the learners can also ask the robot to repeat a word or a sentence and move on to the next exercise. In the pre-programmed lessons, the robot proposes simple repetition tasks using individual words and question–response phrases to teach vocabulary and conversational structures. At the end of the learning situation, the learners have the possibility to discuss the lesson with the robot by asking general questions or questions related to the lesson.

The participants take turns interacting with the robot. The teacher who is present in the RALL

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situation manages the learning situation, for example, by mediating between the robot and the children and providing advice in some interaction breakdown situations. The space is organised so that the robot is in the middle of the teacher and the learners.

Figure 1: Spatial organization of the RALL situations.

The recorded videos were transcribed using a simplified version of the multimodal transcription conventions by Jefferson [16]. The conventions were simplified to focus on the content of the interaction (see section 8 *Transcription conventions*). The speakers were marked by the following codes: T for the teacher, R for the robot and C for the children. From these transcriptions we searched for advice sequences based on Heritage and Sefi's definition [5]. After identifying the advice-giving situations, we effected sequence analysis on them. Next, we will present you the results of our analysis.

4 Results

4.1 Overview

The analysis of the data reveals that the learners encounter interaction problems with the robot. These interaction problems often arise from the pre-programmed structure of the RALL dialogues: learners need to utter the answers expected by the robot in order to proceed in the lesson [4]. Further, these problems arise due to the learners' limited linguistic resources [4]. For example, problems emerge from pronunciation errors or forgetting the target word. These problems emerge either before or during the interaction with the robot. When these kinds of problems occur in human–robot interaction and when the learner talking with the robot does not know how to proceed, the children may help each other. That is, one learner may start to give advice to the other. Advice may be necessary before talking to the robot, for example, when the learner does not remember what he or she needs to say, or after talking to the robot when the robot does not validate the learner's response.

In our data, we identified 320 advice-giving situations. In 71 % of these situations (n = 226), advise was given by the teacher. In 29 % of the cases (n = 94), learners were giving advice to each other. Out of these 94 situations, 53 % were epistemic and 47 % normative pieces of advice. The epistemic pieces of advice include translations, clues, and correct answers, while the normative ones include, for example, imperatives and verbs of obligation. Also, when analysing the sequences, we took note of who initiated the advice. Out of these 94 advice-giving situations between learners, 56 % were other initiated and 44 % self-initiated.

4.2 Microanalyses

Next, we will present three examples of the analysed advice-giving situations. Example 1 shows an other-initiated epistemic advice that takes the form of a simple question-response sequence. In this example, the learners have already repeated the phrases once and are trying to remember the phrase in question from a picture shown on the laptop. The phrase that the robot expects in this situation is a negative response to the question, *Do you have any brothers?*. The negotiation occurs before the interaction with the robot, due to the learner's limited vocabulary.

```
Example 1

1     C1: *presses "next" on the laptop*
2     T:  *sits down*
3     C1: {C2's name} *beckons C2*
4 →   C2: *°vad säger jag°* What do I say?
          *looks at T*
5 →   C1: *°no, I don't°*
          *looks at C2*
6     C2: no, I don't
7     R:  no. I don't
8     C1: *presses "next" on the laptop*
```


(Video 1)

In Example 1, the advice-requesting and advice-giving take the form of a simple open question and the response to it. On line 3, C1 initiates the advice by mentioning C2's name and beckoning with a hand gesture. After this initiation, C2 requests advice by asking quietly, *vad säger jag* (*what do I say*). He directs the question to the teacher with a glance (line 4), but it is the other learner present in the situation, C1, who answers it. In answering the question, C1 gives C2 an epistemic advice by telling C2 the phrase that the robot expects to hear. In this situation, the recipient of the advice recognises his ignorance by asking an open question.

However, the recipients of the advice often try to avoid recognising their ignorance and the knowledge asymmetry in the situation, for example, by displaying knowledge themselves. An illustration of this is given in Example 2, where the learner tries to recall a target word.

Example 2

```
1      C11: *presses "next" on the laptop*
2 →    C11: *det var mor var det* It was mom, wasn't it?
            *looks at C12*
3 →    C12: *nods* juu Yeah.
4 →    C11: °jag tror det° I think so.
5      C11: mother
6      R:   mother
7      C11: *presses "next" on the laptop*
```

(Video 6)

In Example 2, the request for advice, in this example also the initiation of the advice sequence, is not an open but a closed question. The request is formulated as an assertion, *det var mor* (*it was mom*), and an added tag question, *var det* (*wasn't it*). C12 confirms the proposition twice – with a nod and an affirmation, *juu* (*yeah*). This type of advice is also epistemic, but the recipient has demonstrated his own knowledge by providing a proposition in the request. C11 only asks for confirmation of knowledge, and therefore, the epistemic asymmetry between the advisor and the advisee is not as substantial as in Example 1. Further, C11 affirms his knowledge again in his response to the advice with *jag tror det* (*I think so*).

In Example 3, the learning situation is starting, and the learners are repeating target words after the robot. The robot provides two alternatives for the word, but the learner only needs to repeat one of them.

Example 3

```
1      C15: *presses "next" on the laptop*
2      R:   mother. mom
3      C16: moder mom
4      C16: moder
5 →    C15: °säg på nytt bara° Just say again.
6      C16: moder
7      R:   *nods*
8      C16: moder
9 →    C15: *°säg bara mom°* Just say mom.
            *looks at C16*
10 →   C16: mom
11     R:   mother. mom
12     T:   jes Yep.
13     C15: *presses "next" on the laptop*
```

(Video 8)

In Example 3, C16 begins by repeating both alternatives and then chooses the first one, *mother*. However, C16 pronounces the word incorrectly; the unfamiliar EFL phoneme /ð/ is replaced by the familiar phoneme /d/. On line 5, C15 initiates advice by encouraging C16 to repeat the word. This advice takes the form of a strong normative advice – an imperative *säg på nytt bara* (*just say again*). C16 acts on the advice but the robot still does not validate the answer and only nods its head. This is a sign that it is detecting voice without understanding it. When the situation does not resolve itself by simple repetition of the word, C15 offers advice a second time. This time, the normative advice form is joint to a proposition to use the other, simpler alternative *mom* that does not include the problematic phoneme /ð/. The advice is therefore an imperative, *säg bara mom* (*just say mom*) where the advisor provides an alternative course of action. When C16 accepts the advice by conforming to it, the robot immediately accepts the word.

5 Discussion

Combining the study of interaction with social robots, our research shows that it is most often the

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teacher who gives advice in RALL, but that the young learners give each other advice as well. When a learner is experiencing a possible problem in the CRI, they or their peer learner may initiate advice sequences which can include both normative and epistemic forms of advice. In learner-learner situations, there were no significant differences in the proportions of who initiated the advice (44 % self-initiated and 56 % other-initiated) or which dimension of advice was used (47 % normative and 53 % epistemic).

It seems that working with the robot creates learning situations which allow peer interaction and collaboration between young learners. This may be because the learners treat the learning situation with a robot as a shared task and not an individual one, even though they take turns in answering the robot. Consequently, the learners work together to solve the conversational breakdowns in CRI, give each other advice and engage in cooperative learning. As the scope of this study does not allow comparison between RALL and non-RALL foreign language learning situations, further research is needed to determine the robot's influence on the peer interaction.

In this study, we found that social robots can provide practice for foreign language interaction itself but also for problem-solving and for peer interaction (see also [8]). Our results suggest that social robots may enable meaningful learning interaction even when the interaction with the robot breaks down; the interaction problems in RALL can lead to fruitful problem-solving interactions between the learners. RALL situations may therefore be profitable even when the interaction seems cumbersome. Consequently, the robots' limitations should not deter from using social robots as tools for language learning. This study provides an introductory glimpse into peer interaction between learners in RALL – a topic that could help us gain a better understanding of the possibilities of social robots and collaborative language learning.

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8 Transcription conventions

The recorded videos were transcribed with simplified conventions of Jefferson [16].

`C1`	Child 1
`T`	Teacher
`R`	Robot
`**`	Gesture marked with the corresponding stretch of talk
`.`	Micropause
`°°`	Low volume
`{C2's name}`	Anonymised name
What do I say?	Translation from Swedish
→	Point of interest

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