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Influence of Robot Roles on Self-Review

Shunsuke SADA* & Akihiro KASHIHARA
The University of Electro Communications, Japan
1-5-1 Chofugaoka, Chofu, Tokyo 182-8585
*s2330055@gl.cc.uec.ac.jp

Abstract: In recent years, a considerable number of studies have been made on learning with social robots as partner for learners. In these studies, robots are often assigned their roles in advance such as tutor, peer, or learners themselves. On the other hand, the roles assigned to the robots could give learners a cognitive bias to their own thoughts, emotions, attitudes, interaction ways, etc., related to learning. However, such role influence has not been sufficiently explored so far. In this work, we investigate this in the context where learners self-review their own presentation with a social robot. We have conducted a case study with the presentation robot we developed in our previous work. The robot reproduced learners' presentation with two roles that were their peer and themselves. The results suggest that the role of robot as peer brings about more effective self-review in regard to reducing uncomfortableness in self-review and promoting awareness of points to be improved in presentation than the role as learners themselves.

Keywords: social robot, cognitive bias, robot role, self-review, presentation behavior

1. Introduction

In related work on social robotics for learning, robots ordinarily play their own roles such as tutor, peer, and learners themselves, which are assigned in advance for facilitating communication with learners. In communication between human, the role one (communicator) plays often gives the other (communicatee) a cognitive bias towards his/her own thoughts, emotions, attitudes, interaction ways, etc. When a communicator explains something, for example, a communicatee tends to accept the contents. In case a communicator explains the same contents as peer, on the other hand, the communicatee tends to listen to the contents more carefully with some doubt/questions. In this way, the communication modes of the communicatee could change according on the roles of the communicator (Rod D. Roscoe and Michelene T. H. Chi, 2008).

Since robots as learning media possess physical embodiment and anthropomorphic tendency compared to other media such as PC, tablets, etc., they could look like human (S. Kiesler, A. Powers, S. R. Fussell, and C. Torrey, 2008). Even in human (learner)-robot communication, such cognitive bias would be accordingly expected to arise depending on the roles of robot as their learning partner. Understanding the influence of robot roles also makes it possible to design more instructive robots. However, it has not been sufficiently explored so far.

In this paper, we investigate whether robot roles have an influence on learners' thoughts and engagement in the context where learners self-review their own presentation behavior by means of a social robot reproducing it.

2. Self-Review with Presentation Robot

Self-review of presentation involves learners reviewing their presentation by themselves to identify points to be improved. Learners must consider not only what to present but also how to present with non-verbal behavior (presentation behavior), which

includes gesture, gaze, and paralanguage. Presentation behavior is particularly important for communicating the presentation contents.

The general way for learners to self-review is to record a video of their presentation and then to check it out. However, it would be too uncomfortable for them due to their appearance and voice to conduct an in-depth review. In addition, novices have insufficient knowledge about what to review. Towards resolving these problems, we implemented a presentation robot, which stands in for learners and reproduces their presentation including presentation behavior (K. Inazawa, A. Kashihara, 2022).

Figure 1 shows a presentation made by the presentation robot. The robot reproduces learners' presentation as the role of learners themselves. We also designed a presentation behavior model to prepare a checklist for review, which allows learners to become aware of points to be improved. Refer to (K. Inazawa, A. Kashihara, 2022) for the model and checklist in detail.

The results of a case study we conducted suggest that the robot could reduce learners' uncomfortableness to promote their engagement on self-review, and also bring about more awareness of points to be improved in their presentation behavior (K. Inazawa, A. Kashihara, 2022).

Although the presentation robot plays a role of learners themselves in our previous work, we expect it to bring about more effective self-review when it plays a role as peer of learners. That is the main topic of this paper.

3. Influence of Presentation Robot Roles

We have conducted a case study whose purpose was to investigate the influence of presentation robot roles on self-review. We also used three criteria: engagement in reviewing, uncomfortable feeling, and awareness of points to be improved.

The hypotheses we set up in this study were as follows:

H1: The robot as peer promotes engagement on reviewing compared with the robot as learners themselves.
H2: The robot as peer reduces uncomfortable feeling compared with the robot as learners themselves.
H3: The robot as peer enhances awareness of points to be improved compared with the robot as learners themselves.

Figure 1: Presentation Robot

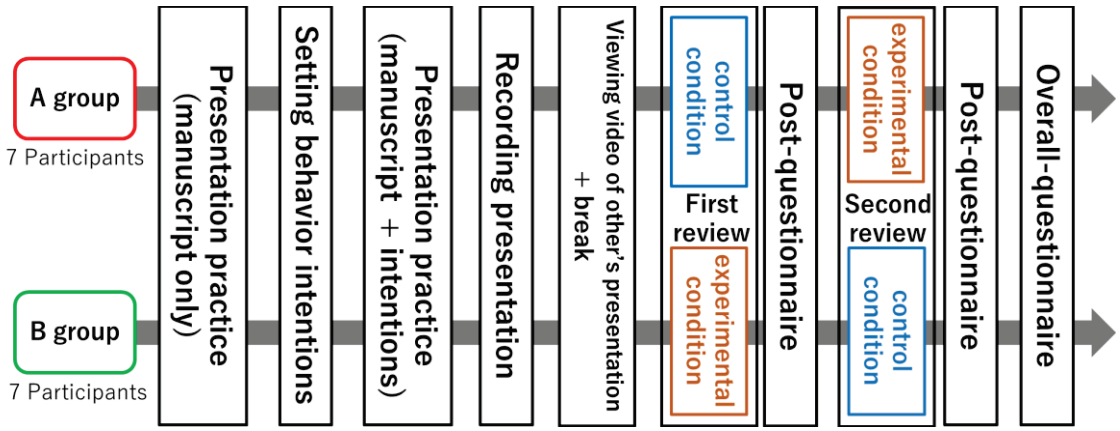

Figure 2: Experimental Procedure

The participants were 14 undergraduate and graduate students in informatics and engineering. We set two conditions: self-review with the robot as participant himself/herself (control condition), and self-review with the robot as peer of participant (experimental condition). Figure 2 shows the procedure of this study, in which the participants were divided into two groups (Group A and B). Each participant reviewed his/her own presentation twice as within-subject design. The robot reproduced his/her presentation in both reviews, but the robot roles, the color, and the voice pitch were different in each review. As for the robot role, we particularly informed him/her in advance that the robot demonstrates peer's presentation in the control condition. In the experimental condition, on the other hand, he/she was informed that the robot demonstrates your own presentation.

The post-questionnaire consisted of 10 5-point Likert scale questions, and the overall-questionnaire consisted of 8 questions that asked which condition allowed the participants to engage/reduce uncomfortableness in reviewing. During self-review, the participants were also required to write down points to be improved for their presentation behavior with the checklist.

4. Results and Discussion

As for the results of the questionnaires about engagement, there were no significant

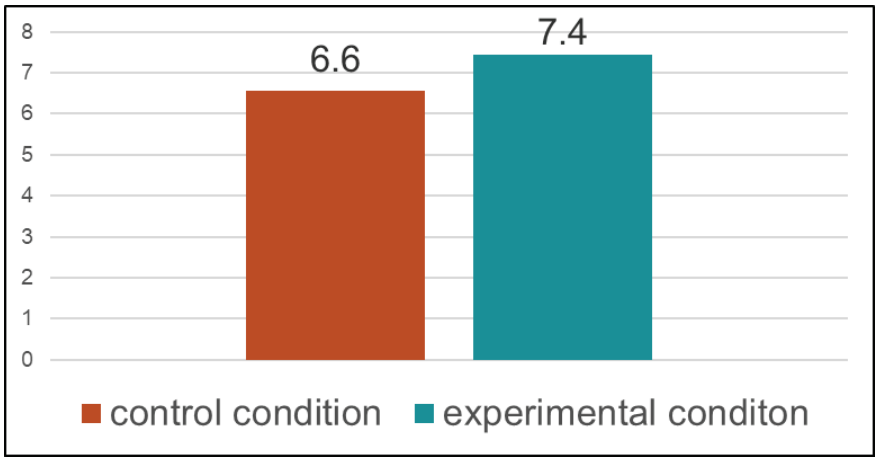

Figure 3: Average Numbers of Points to be Improved