

COMPARISON OF LEARNING WILLINGNESS BY USING ENGLISH CONVERSATION CD TEACHING MATERIALS AND ENGLISH CONVERSATION ROBOT

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ABSTRACT

In this paper, we propose a new method of communication robot as teaching materials of English conversation. We inspect and compare English conversation robot with English conversation CD teaching materials in that respect continual of learning willingness.

Keywords: Robot, English conversation, Learning willingness

1. INTRODUCTION

The number of Japanese companies expanding their operations into overseas markets is on the rise. And so are cross-cultural exchanges, thanks partly to the increasing popularity of the Internet. The language often used in such exchanges is English. The ability to communicate in English is becoming more important than ever before. However, opportunities to speak English on a daily basis in Japan are limited.

Many communications robots have been developed for use in a broad range of fields, including medical, nursing, welfare, and entertainment. However, not many robots are in practical use. Expanding the applications of communications robots will be of great help.

We assume that speaking to robots would provide people with good opportunities to practice their English conversation skills casually. A previous experiment indicated that people are ready to accept robots as an English conversation learning tool [1].

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Here, we compared an existing CD-based English conversation course with a robot called IFBOT by multiple regression analysis and text mining to identify any increase in learning willingness and learning continuity among beginners of English conversation. The results show that the robot was more effective in increasing willingness to practice. This paper describes the details.

2. METHODS OF ANALYSIS

Multiple regression analysis examines the relationship between two variables and is often used for prediction and for factor analysis (to look for causes of a result and explain the relationship between it and the causes) [2]. The variable to be predicted is called a response variable, while a variable used for the prediction is called an explanatory variable. In factor analysis, the response variable represents the result, while an explanatory variable represents the cause. Simple regression analysis uses one explanatory variable. Multiple regression analysis uses two or more explanatory variables.

Simple regression analysis can be expressed by the following linear equation:

$$y = b_0 + b_1x \quad \dots \quad (2.1)$$

where y is the response variable and x is the single explanatory variable.

Multiple regression analysis can be expressed by the following linear equation:

$$y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \dots + b_px_p \dots \quad (2.2)$$

where y represents the response variable; p represents the number of explanatory variables “ x ” ($x_1, x_2, x_3, \dots, x_p$); b_0 is the y -intercept (or constant); and b_1, b_2, \dots, b_p are (partial) regression coefficients.

Text mining is used to statistically analyze text data, such as free description responses, collected in experiments, surveys, or inquiries received at call centers. Typical words used by each of the groups classified by data content, gender, age, or other characteristics are statistically identified to explain the structure of the data to be analyzed.

3. METHODS OF ANALYSIS

We performed experiments with 7 university students as subjects to determine which is more effective in motivating beginners of English conversation: CD-based English conversation material or the IFBOT.

3.1. CD-based English conversation material

The subjects in this experiment were 4 university students (2 men and 2 women). A current CD-based teaching course was used [4]. Each of the subjects received a lesson from portions of the CD and the associated textbook. The subjects were allowed to end their lessons at their own discretion between 10 and 20 min after starting. The subjects has 4 sessions.

3.2. Robot-based English conversation

The subjects in this experiment were 3 university students (1 man and 2 women). Before the experiment, a preparatory conversation exercise was performed over 2 days in Japanese to accustom the subjects to speaking with the robot.

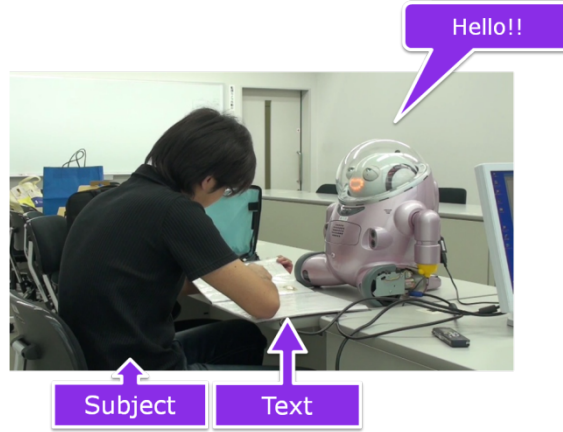


Figure 1: View of experiment

4. METHODS OF ANALYSIS

After the experiment, we asked the subjects to evaluate the teaching material and to provide feedback on the lessons on a scale of 1 to 7. Then we asked them to write their feedback in free text and interviewed them.

We used a teaching material evaluation sheet [3] for the questionnaire on the teaching material (Table 1) and a separate questionnaire for the feedback on the lessons (Table 2). We extracted some adjectives from the language image scale and used them for this research.

Table 1: Teaching material evaluation items

Fresh	–	Obsolete
Stimulating my curiosity	–	Not stimulating my curiosity
A lot of variation	–	Stereotypic
Intimate	–	Irrelevant
Voluntary	–	Passive
Interesting	–	Boring
Pleasant learning process	–	Unpleasant learning process
Controllable	–	Uncontrollable
Worth trying	–	Not worth trying
Clear objective	–	Unclear objective
Steady and constant	–	Not steady and constant
Increased confidence	–	No increase in confidence
I can learn skills	–	I cannot learn skills
Satisfied	–	Not satisfied

Table 2: Comprehensive feedback evaluation items

Casual	– Heavy
Easy to use	– Difficult to use
Easy to understand	– Difficult to understand
Pleasant	– Unpleasant
Difficult	– Easy
Meaningful	– Tiring
Willing to speak again	– No more
Cute	– Detestable
Happy	– Sad
Friendly	– Rigid
Willing to continue	– No more
Excited	– Bored
Encouraging	– Exhausting
Increased affection	– No affection

5. RESULTS AND VIEWS

5.1. Overall results

Figures 2 and 3 show the average values for each of the evaluation items by comprehensive evaluation and teaching material evaluation. The evaluations of the robot were higher than those of the CD material in most items in both evaluations. The main exceptions were the “Friendly – Rigid” item (Fig. 2) and the “Controllable – Uncontrollable” item (Fig. 3).

The robot received much higher evaluations in “Fresh – Obsolete”, “Stimulating my curiosity – Not stimulating my curiosity”, “A lot of variations – Stereotypic”, “Intimate – Irrelevant”, “Voluntary – Passive”, and “Interesting – Boring”, leading us to believe that the robot was more entertaining and, thus, more attractive to the subjects.

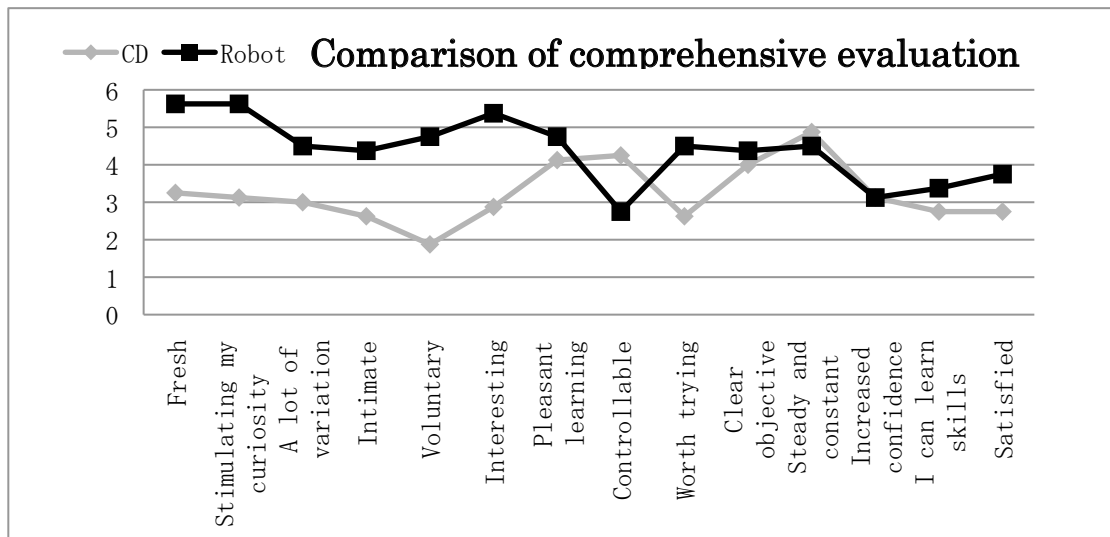


Figure 2: Comparison of comprehensive evaluation averages between CD and robot

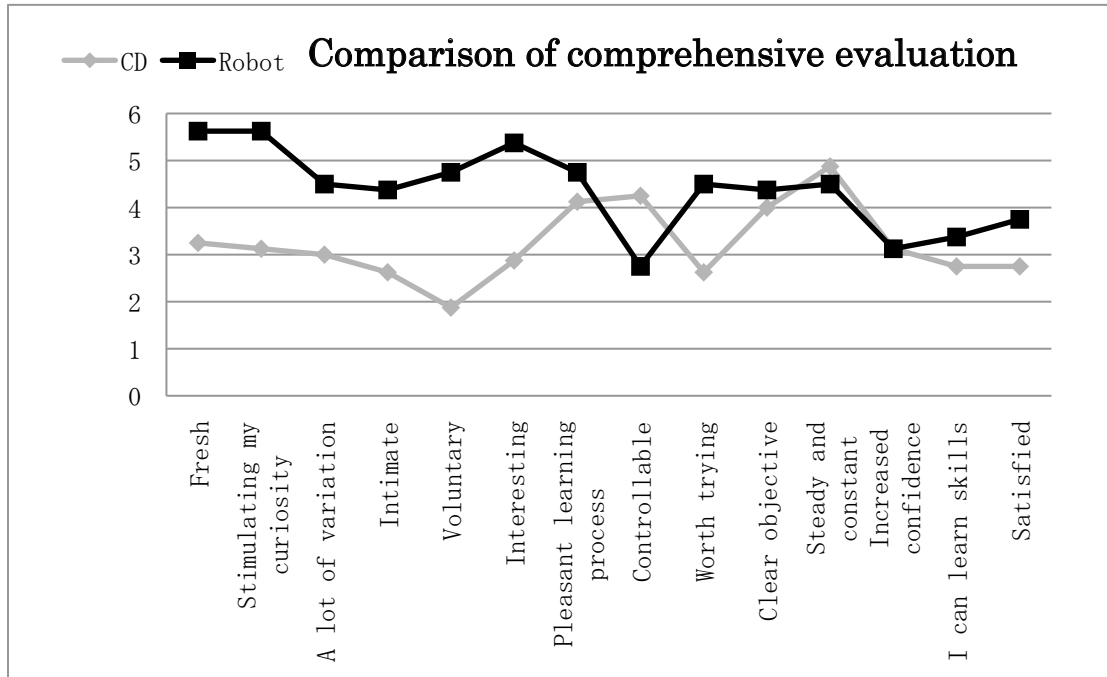


Figure 3: Comparison of teaching material evaluation averages between CD and robot

5.2. Views by multiple regression analysis

We focused on “Willing to continue – No more” and “Willing to speak again – No more”, which are closely related to the increase in learning willingness and learning continuity among beginners of English conversation. We compared the evaluations by multiple regression analysis. We also reviewed the item “Increased affection – No affection”, which is likely to have a strong impact on the evaluation of the robot. We tried 3 methods of selecting variables – variable increase, variable decrease, and stepwise [2] – and decided to use the stepwise method, which allowed us to select the most suitable model.

5.2.1. “Willing to continue – No more”

The “Willing to continue – No more” item was the dependent variable and the teaching material evaluation items and conversation time were the independent variables (Tables 3, 4).

Table 3: IFBOT: “Willing to continue – No more”

Model	Non-standardized coefficient B	Standardized coefficient Beta	P
(Constant)	- 0.864		0.195
Intimate	0.722	0.811	0.001
Voluntary	0.471	0.471	0.006

Table 4: CD: “Willing to continue – No more”

	Non-standardized coefficient	Standardized coefficient	P
Model	B	Beta	
(Constant)	- 3.034		0.000
Clear objective	1.200	1.715	0.000
Stimulating my curiosity	0.805	1.095	0.000
Conversation time	- 0.155	- 0.197	0.005

The value of “Intimate – Irrelevant” in the robot experiment was especially high and had a strong impact on “Willing to continue – No more” (Table 3). “Voluntary – Passive” also had some impact. By speaking voluntarily to the robot and receiving responses from it, the subjects felt intimacy with the robot as a conversation partner and regarded it as a “friend” with whom they could speak in English. As a result, we assume, many subjects felt willing to continue studying English conversation. In fact, during the post-experiment interviews, many subjects responded to the question “What is the robot for you?” by answering “A friend with whom I can speak in English.”

The 2 items “Clear objective – Unclear objective” and “Stimulating my curiosity – Not stimulating my curiosity” in the CD experiment had a strong impact on “Willing to continue – No more” (Table 4). We assume that the subjects may be willing to continue studying if they can find motivations to study, including clear objectives and curiosity stimulus, in the teaching material, as the 2 items have a positive correlation. We assume that the subjects may not be willing to continue studying unless they can see clear reasons to study conversation, as they regard the CD teaching material as a passive learning tool.

These comparisons led us to believe that the explanatory variables differed between the robot and the CD because the subjects regarded the tools differently. They regarded the robot as a “friend”, and therefore they felt as though they were having conversation with a friend, and highly evaluated “Intimate – Irrelevant” and “Voluntary – Passive”. In contrast, the subjects regarded the CD material merely as a learning tool. We believe that it is important for CD teaching materials to motivate learners by stimulating their curiosity or by setting clear objectives.

5.2.2. IFBOT “Willing to speak again – No more”

The “Willing to speak again – No more” item was the dependent variable and the teaching material evaluation items and conversation time were the independent variables (Tables 5, 6).

Table 5: IFBOT: “Willing to speak again – No more”

	Non-standardized coefficient	Standardized coefficient	P
Model	B	Beta	
(Constant)	- 6.107		0.000
Stimulating my curiosity	1.333	0.869	0.000
Intimate	- 0.429	- 0.469	0.000
Pleasant learning process	0.571	0.313	0.000
Worth trying	0.024	0.022	0.000
Increased confidence	0.643	0.651	0.000
Conversation time	0.607	0.665	0.000

Table 6: CD: “Willing to speak again – No more”

	Non-standardized coefficient	Standardized coefficient	P
Model	B	Beta	
(Constant)	3.444		0.000
Fresh	0.117	0.425	0.000
Voluntary	- 0.413	- 0.975	0.000
Controllable	- 0.311	- 1.543	0.000
Worth trying	0.474	1.594	0.000
Satisfied	0.036	0.118	0.000

The items “Stimulating my curiosity – Not stimulating my curiosity”, “Increased confidence – No increase in confidence”, and “Conversation time” in the robot experiment had a strong impact on the subjects’ willingness to speak again (Table 5). We assume that the unusual occasion of speaking to the robot stimulated the subjects’ curiosity and their willingness to speak again. We also assume that response from the robot to English spoken by the subjects increased the subjects’ confidence and self-esteem. The positive impact of the conversation time indicates that the subjects spoke to the robot repeatedly when the robot misunderstood what the subjects said to it, raising their willingness to speak.

The item “Worth trying – Not worth trying” in the CD experiment had a positive impact, while “Voluntary – Passive” and “Controllable – Uncontrollable” had a strong negative impact (Table 6). The subjects regarded the CD material as a “passive” and “uncontrollable” tool (Fig. 3). These 2 results suggest that if the subjects feel that the CD material is worthy of trying, they will be willing to try again because, we assume, unlike the subjects’ view of the CD teaching material as a passive tool, the subjects tried to control the robot, raising their willingness to try again.

As in 5.2.1, the explanatory variables differed between teaching tools because the subjects regarded the tools differently. The robot stimulated the subjects’ curiosity and increased their willingness to speak, as the subjects anthropomorphized the robot and tried to make friends with it. Meanwhile, raising the “worthiness” and sense of achievement with the CD teaching material could lead to more willingness to try again.

5.2.3. “Increased affection – No affection”

The “Increased affection – No affection” item was the dependent variable, and the teaching material evaluation items was the independent variables.

Table 7: IFBOT: “Increased affection – No affection”

	Non-standardized coefficient	Standardized coefficient	P
Model	B	Beta	
(Constant)	- 3.173		0.005
Intimate	0.800	0.792	0.000
Pleasant learning process	1.355	0.670	0.001
Voluntary	- 0.364	- 0.320	0.012

The impact of the robot on the item “Pleasant learning process – Unpleasant learning process” was strong, followed by “Intimate – Irrelevant” (Table 7). As in 5.2.1, the subjects regarded the robot as a friend, and felt that the conversation offered a pleasant moment to share with the robot. We assume that such feeling led to the increased affection.

6. RESULTS AND VIEWS OF TEXT MINING

We divided the results of the post-experiment interviews and free description questionnaires into the robot and CD groups, and extracted typical words from each (Figs. 4, 5).

Typical words extracted in the robot experiment included “pleasant”, “facial expressions”, “conversation”, and “speaking” (Fig. 4). We assume that the subjects enjoyed the English conversation with the robot and practiced as through they were talking with a friend, as the robot was designed to change its facial expressions.

Typical words extracted in the CD experiment included “English conversation”, “listening”, “myself”, “learning practice”, and “working on + none” (Fig. 5). We assume that the subjects participated in the experiment with the perception that the CD teaching material was a self-complete and passive learning tool designed to put skills into their heads or to help them memorize English conversation. For this reason, we assume, the subjects of the CD experiment could not increase their willingness to work on learning.

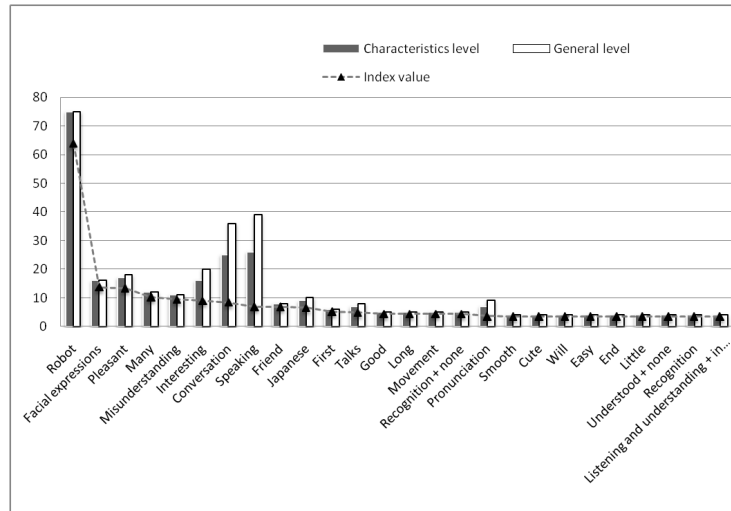


Figure 4: Robot: Typical words extracted

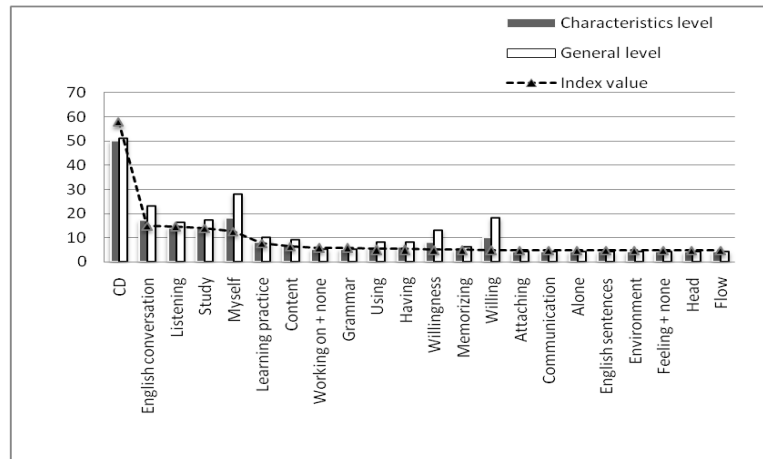


Figure 5: CD: Typical words extracted

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7. SUMMARY

These results suggest that the robot was more effective than the CD teaching material in increasing both willingness and continuity to learn among beginners of English conversation.

The subjects tended to regard the robot and the CD material differently: they regarded the robot as a friendly conversation partner. The subjects in the CD experiment regarded the experiment as an English conversation lesson, while the subjects in the robot experiment regarded it as a time for conversation with a friend. We assume, for this reason, that the subjects in the robot experiment felt willing to speak more, raising their continuity and

willingness to learn English conversation. In contrast, the other subjects regarded the CD merely as teaching material. For this reason, we believe that learning continuity and willingness among beginners using CD-based materials will not increase unless the subjects are very willing or have a strong necessity to study English conversation.

Although the item "Satisfied" was evaluated somewhat higher for the robot, the difference was much smaller than in the other items (Tables 1, 2). The CD material was evaluated higher than the robot in the item "Controllable – Uncontrollable". We assume that this was because the subjects felt that the CD material could be used at their own convenience regardless of time and place, resulting in little difference in the evaluation of overall satisfaction.

If affection for robots is proven to increase people's continuity and willingness to learn, we believe that communications robots will not only provide motivation to learn, but also open up new possibilities.

We performed the English conversation experiments over 2 days with each tool. We plan to investigate any differences in learning effects and any changes in perceptions of the 2 tools over longer experimental periods.

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