The Effects of Voice-based AI Chatbot on Korean EFL Students' Speaking Ability and Affective Factors

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Abstract

This study explores effects of voice-based AI chatbot on Korean EFL students' speaking ability and their affective factors: interest, belief, motivation, and anxiety. Participants were 44 freshmen students at a middle school in Korea. They were divided into one experimental group and one control group. During the ten-week experimental period, participants engaged in 10 chat sessions with the voice-based AI chatbot 'Echodot'. To take an examination of effects on the students' speaking ability, they took the NEAT speaking test as pre- and post-tests. As for the affective factors, structured questionnaire-based surveys were conducted before and after the treatment to find out if there are any changes in affective factors. Findings reveal that the AI chatbot effectively contributes to improvement of speaking ability among EFL students. An analysis of survey results indicates affective aspects of AI chatbot-assisted English learning changed positively over time. Accordingly, this study provides valuable insight into the use of AI chatbot in English learning in EFL contexts, suggesting that EFL teachers should try to integrate AI chatbot technology in their classrooms.

Keywords: AI chatbot, Speaking ability, Affective factor, EFL

1. Introduction

As the 4th Industrial Revolution has emerged as the keyword of society in general, and access to diverse and vast knowledge is growing more than ever, there is an increasing demand for changes in the traditional paradigm of school education, which is teacher-centered knowledge transfer education. In the case of English education, the recent rapid development of artificial intelligence (AI)-based translation technology and the release of similar applications are also having a great impact on the English education field. Thus, the exploration of the direction of English education in the future is inevitable.

With the development of AI technologies and virtual assistants, another attention to the use of AI chatbot for EFL learners has been paid. The chatbot, also known as a chatterbot or conversational bot, is a software system that can chat with a human user using a natural language such as English [1]. Learners can communicate with chatbots through not only text input and text output but also voice input and voice output.

Considering that speaking ability has been regarded as the most necessary part in EFL environments [2], it is required to explore the effects of voice-based AI chatbot on Korean EFL students' speaking ability. Also, this study is to examine the effects of English learning

through AI chatbot on students' affective factors, especially interest, belief, motivation and anxiety.

Therefore, the purpose of this study is to examine the effects of English learning through AI chatbot on the English speaking ability of EFL learners. Second, the purpose of this study is to measure the effects of task-based instruction with the chatbot on the affective factors of learners, especially interest, attitudes, motivation and foreign language learning anxiety.

Research questions are as follows:

1) Does AI chatbot affect Korean EFL students' speaking ability?

2) Does AI chatbot affect Korean EFL students' affective factors (interest, belief, motivation, and anxiety) toward English learning?

2. Background

AI chatbots, also called chatterbots and talking bots, are artificial intelligence programs that can communicate with humans [3]. While it is possible to predict that the chatbot will be able to act as a human-like speaker in the future, there are no chatbots with the ability to communicate like humans now. However, in addition to having a fixed dialog conversation with someone other than the native speaker, AI chatbots can be a great English language learning tool for EFL learners who have difficulty in English learning and communication.

The influence of learners' personal dispositions on language learning and acquisition has long been well known [4]. Brown introduced personal dispositions related to language acquisition into affective domains [5]. Representative effective factors affecting language learning and acquisition include self-esteem, willingness to communicate, inhibition, risk-taking, anxiety, motivation and so on. Among these affective factors, this study focuses on the change of belief and learning motivation according to the interest that can be caused in the interaction with the AI chatbot and the foreign language learning anxiety that is expected to have a significant effect on the utterance.

AI Chatbots are new and attractive to learners. The learners are inclined to be more comfortable and less threatened to talk to chatbots than to a human [6]. Chatbots simulate a human conversation using a natural language via textual or auditory methods [7]. Engaging in a human-like conversation, they provide foreign language learners with opportunities to practice their target language. Their potential role as a facilitator or language tutor has consistently been reported in the computer-assisted language learning field [7]. Particularly, learners can interact with chatbots on an individual basis by tailoring them for their own pace of language learning [7][8]. In addition, chatbots provide chances for the learners to practice diverse vocabulary and sentence organization that they would not have an opportunity to use in their real-life situations.

3. Method

3.1. Participant

The study was aimed to investigate the effects of AI chatbot on Korean EFL learners' speaking ability and affective factors. 44 middle school students in Korea participated in the present study. The participants were freshmen in the same school. They were segmented into one experimental group and one control group, and finally, these two were formed: student-AI chatbot (n=22) and student-student voice chat (n=22). They were engaged in different types of chat sessions during the ten-week experimental period. The chat sessions were to be conducted in English as well.

3.2. Research instrument

The AI chatbot used in this study is called 'Echodot', a voice recognition smart speaker developed by Amazon.com. The device connects to a voice-controlled virtual assistant service that responds to the name "Alexa," and the wake word can be changed to 'Echo,' 'amazon' and 'computer' by the user. Not only the user activates the device with a single call command but also enter the utterance "Alexa, Let's Chat!" to switch to social bots, enabling natural communication. In addition, Echodot can set alarms, play music, play audiobooks, create to-do lists, stream podcasts, weather, traffic and other real-time information. Although it was not developed for learning English, the basic language is English, so the command is carried out only in English, not in Korean.

3.3. Data collection

This study adopted a pretest-treatment-posttest design to examine the effectiveness of chatbot-assisted language learning for Korean EFL students. The main independent variable, AI chatbot, represents the treatment of the experiment. The whole study lasted over the after-school classes of one semester of the 2018 academic year at a middle school in Korea. The experimental group engaged in a chat with voice-based AI chatbot and practiced conversational skills. After the English teacher provided the basic guidance on the use of the chatbot, the students were asked to have a chat with the voice-based AI chatbot freely. Participants in the control group (student-student chat group) were randomly divided into several groups, and they engaged in an oral interaction with the group partners during the experimental period. Participants engaged in 20-minute voice chatting once a week for the duration of the experiment. This is made up of 10 chat sessions in total, with topics relating to the textbook and students' daily lives, including school life and classmates. For data collection, in order to take an examination of its effects on the participants' speaking ability, the materials for this study included pre- and post-treatment speaking tests. In order to compare the group differences and changes in students' affective factors toward English learning, structured pre- and post-test surveys were carried out.

3.4. Data analysis

Data for this study was collected from quantitative methods. First, data were collected for the analysis of the improvement of speaking ability, which compares pre- and post-test scores. Then, data from pre and post-surveys were analyzed to find out if there are any changes in students' affective domains. The scores of the pre- and post-tests were analyzed utilizing SPSS 23.0. Descriptive statistics as well as paired samples t-tests were reported to identify how the synchronous chat sessions had an effect on the differences between the two tests.

4. Results and discussion

4.1. Effects on EFL students' speaking ability

The main purpose of this study was to investigate the effects of voice-based AI chatbot on Korean EFL students' speaking ability. To explore the changes in mean scores of pre- and post-tests, statistical methods adopted were paired samples t-tests. [Table 1] shows the descriptive statistics and t-test results concerning pre- and post-test mean scores.

Table 1. Paired-samples t-tests for changes in affective factors towards English learning

Group	Category	Pre-test		Post-test		t	P
		M	SD	M	SD		
Experimental Group (N=22)	Pronunciation	13.18	4.767	16.36	7.267	-2.628*	.016
	Fluency	13.64	4.924	17.73	8.691	-3.250**	.004
	Language Use	12.73	4.558	18.64	9.409	-4.161***	.000
	Task Completion	12.83	4.558	19.09	9.715	-4.107**	.001
	All Categories	13.0682	4.290	17.9545	8.403	-4.025**	.001
Control Group (N=22)	Pronunciation	12.27	5.284	12.73	6.311	-.568	.576
	Fluency	11.36	4.676	12.27	5.284	-1.449	.162
	Language Use	10.91	4.264	11.82	5.011	-1.449	.162
	Task Completion	11.36	4.676	12.27	6.119	-1.000	.329
	All Categories	11.4773	4.27194	12.2727	4.49266	-2.084	.050

*Note: *p<.05, **p<.01, ***p<.001*

Findings of the paired-samples t-tests indicate that voice-based AI chatbot can yield positive results for EFL students who chat with the chatbot. There were significant mean differences between pre- and post-tests on English speaking ability. That is, voice-based AI chatbot leads to the improvement of the learners' speaking ability. To be specific, in terms of the pronunciation (t=-2.628, p<.05), mean scores were 13.18 on the pre-test while 16.36 on the post-test. The result of fluency also showed significantly positive changes (t=-3.250, p<.01), with the mean scores of 13.64 on the pre-survey and 17.73 on the post-survey. Regarding the language use, a significant mean difference was found between pre- and post-test (t=-4.161, p<.001). The mean scores were 12.73 on the pre-test while 18.64 on the post-test, indicating that the learners in the experimental group use relatively accurate vocabulary and grammar after chatting with the voice-based AI chatbot. In addition, their task completion level jumped from 12.83 on the pre-survey to 19.09 on the post-survey, and it was significant (t=-4.107, p=< .01). Accordingly, given that speaking ability has been claimed to be the most necessary part in EFL environments, great advantages in AI chatbot technologies have been found in that for individual tutoring they give the students realistic opportunities to improve their communicative competence. On the other hand, as for the control group, there was no significant mean difference between pre- and post-surveys related to the pronunciation (t=-.568, p>.05), fluency (t=-1.449, p>.05), language use (t=-1.449, p>.05), and task completion (t=-1.000, p>.05).

4.2. Effects on EFL students' affective factors

Another purpose of this study was to examine the effects of voice-based AI chatbot on EFL learners' affective factors towards English language learning. In order to compare the changes between pre- and post-surveys, paired-samples t-tests were conducted before and after the treatment. [Table 2] shows the descriptive statistics and t-test results regarding pre- and post-surveys.

Table 2. Paired-samples t-tests for changes in affective factors towards English learning

Group	Category	Pre-survey		Post-survey		t	P
		M	SD	M	SD		
Experimental Group (N=22)	Interest	2.94	1.026	3.36	1.041	-2.998**	.007
	Belief	2.74	.972	3.25	1.051	-2.575*	.018
	Motivation	3.06	1.090	3.56	1.119	-2.439*	.024
	Anxiety	2.78	.686	2.20	.835	2.770*	.011
	All Categories	2.78	.647	3.10	.677	-2.751*	.012
Control Group (N=22)	Interest	2.74	.694	2.78	.756	-.721	.479
	Belief	2.60	.922	2.56	.3830	.526	.605
	Motivation	3.24	.825	3.23	.878	.077	.939
	Anxiety	3.30	.252	3.25	.615	.391	.700
	All Categories	2.97	.561	2.96	.467	.251	.804

*Note: *p<.05, **p<.01*

As for the experimental group, there were significant mean differences between pre- and post-surveys regarding interest, belief, motivation, and anxiety. The students' affective factors toward English learning changed positively as time passed. To be specific, regarding participants' interest in English learning, the significant mean difference was found between pre- and post-surveys (t=-2.998, p<.01). The mean scores were 2.94 on the pre-survey while 3.36 on the post-survey, indicating that the students in the experimental group became more interested in English learning after chatting with the voice-based AI chatbot. Students' belief about the improvement of speaking ability also showed significantly positive changes (t=-2.575, p<.05), with the mean scores of 2.74 on the pre-survey and 3.25 on the post-survey. That is, the students involved in chatting with the voice-based AI chatbot believed that they were improving their speaking ability more effectively than before. Moreover, their motivation level jumped from 3.06 on the pre-survey to 3.56 on the post-survey, and it was significant (t=-2.439, p=< .05). This indicates that the EFL students were more motivated to acquire English speaking ability as a result of having a chat with the voice-based AI chatbot. Finally, as for the anxiety, a significant mean difference was found between pre- and post-surveys (t=2.770, p<.05). This shows that human-AI chatbot interaction reduces learners' level of anxiety in English class.

However, in the case of the control group, there was no significant mean difference between pre- and post-surveys concerning the participants' interest (t=-.721, p>.05), belief (t=.526, p>.05), motivation (t=.077, p>.05), and anxiety (t=.391, p>.05). This seems to be because there is still a considerable amount of anxiety or fear due to students' poor English speaking skills and introversion in the context of speaking in front of other classmates.

5. Conclusion

Major findings of this study are as follows: First, voice-based AI chatbot can effectively contribute to the improvement of speaking ability among Korean EFL learners. Voice-based AI chatbot enables students to practice oral output, engaging in an oral interaction between interlocutors. They now provide EFL students a means of practicing English, without regard for time and location. Consequently, these speech-enabled interactive programs allow EFL

students to participate in meaningful interaction, which can be helpful for improving their oral output [9]. That is, negotiation of meaning, a particular way of interaction which helps the students improve their language skills [10], can now take place during oral interaction with voice-based AI chatbots. Given that improvement of speaking ability is essential for effective foreign language learning, it can be suggested that chatbot-assisted language learning can result in successful foreign language learning for EFL learners. In addition, survey on the affective factors indicated that integrating AI chatbots into foreign language learning can be effective in improving EFL learners' beliefs, enhancing their motivation, promoting interest and decreasing anxiety in English conversation.

This study shows the possibility of using AI chatbot as a source of new language input and facilitating output in an EFL educational environment with limited opportunities for authentic input and output for real interaction. First, cutting-edge new technologies can contribute to reducing barriers to learning English as a foreign language and the cost of private tutoring. Second, it can ultimately contribute to reducing foreign language communication barriers in cultural exchanges with other countries. In this sense, it can contribute to overcoming the social and institutional constraints faced by domestic English education.

Finally, the learning task designed using AI chatbot can be used as a valuable basic data for presenting the direction of the improvement of foreign language curriculum during the 4th Industrial Revolution. More specifically, it can provide a method of utilizing new technology in ICT (Information and Communication Technologies)-based pedagogy or a new English pedagogical paradigm. In addition, it will be the foundation for lowering the affective filters to acquiring productive language skills and practical improvement of learning English.

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