

# Chatbots and Korean EFL Students' English Vocabulary Learning

Na-Young Kim

King Jeongjo College of Liberal Arts, Hanshin University

## 챗봇 활용이 국내 영어 학습자의 어휘 습득에 미치는 영향

김나영

한신대학교 정조교양대학

**Abstract** The current study investigates whether artificially intelligent chatbots influence Korean EFL students' vocabulary learning. For eight weeks, 47 college students in Korea participated in this study. They were divided into two groups: one experimental group and one control group. Participants in the experimental group engaged in chat with a chatbot during the eight-week experimental period. Before and after the experiment, pre- and post-tests were administered to see if their English vocabulary improved. Pre- and post- surveys were also performed to understand how the participants perceived chatbot-assisted vocabulary learning. Results show that the experimental group improved their vocabulary skills as a result of engaging in chat with the chatbot. Also, their perceptions of vocabulary learning positively changed, increasing their motivation, interest, and confidence in English. Given that there have been few empirical studies to investigate the effects of chatbots on vocabulary development, the present study can provide insights on the effectiveness of chatbots.

**Key Words** : Chatbots, Korean students of English, English vocabulary learning, EFL settings, EFL students

요 약 본 연구는 챗봇의 활용이 한국 대학생의 영어 어휘 학습에 미치는 영향을 조사한 것으로, 챗봇과의 채팅을 통해 실험 참가자의 영어 어휘 능력이 실제 상승하는지 여부와 영어 어휘 학습에 대한 인식이 어떻게 변하는지 알아보는 데 그 목적이 있다. 47명의 국내 대학생을 실험그룹과 통제그룹으로 나누어 총 8주 동안 실험을 진행하였고, 챗봇 활용의 효과를 파악하기 위해 실험 시작 전과 종료 후 사전 사후 어휘 평가를 실시하였으며, 사전 사후 설문조사를 통해 챗봇을 활용한 어휘 학습에 대한 참가자의 인식 변화를 조사하였다. 본 연구의 주요 결과 및 시사점은 다음과 같다. 사전 사후 어휘 평가 결과, 참가자의 어휘 능력은 실험 전에 비해 실험 종료 후 상승한 것으로 나타났고, 사전 사후 설문 결과, 챗봇의 활용은 참가자의 영어 어휘 학습에 대한 태도를 긍정적으로 변화시키는 데 중요한 역할을 하는 것으로 파악되었다. 테크놀로지의 발달과 함께 최근 영어 교육에 있어 챗봇의 활용이 증가하는데 비해 그에 대한 실증적 연구가 부족하다는 점을 고려해 볼 때, 본 연구가 갖는 시사점이 크다고 할 수 있다.

주제어 : 챗봇, 국내 영어 학습자, 영어 어휘 습득, EFL 환경, EFL 학습자

### 1. Introduction

Chatbots acts as an artificial person which conducts a conversation with real humans. This could be a

text-based conversation, a voice-based conversation, or a non-verbal conversation. They can speak almost every major language using natural language processing (NLP). Their language skills can be

\*Corresponding Author : Na-Young Kim(alicekimyoungkim@gmail.com)

Received December 9, 2017

Accepted February 20, 2018

Revised January 15, 2018

Published February 28, 2018

extremely poor or very intelligent.

As computer programs, chatbots simulate a human-like conversation using a natural language. A variety of terms have been used related to chatbots, including chat bots and chatterbots. Chat bots have been used by technical people. Considering the word 'bot' as a term for 'robotic action', they regard chat bots as a special kind of robots. Chatterbots can refer to chatbots who talk a lot, and they do not have to be very intelligent when processing the user answers. Chatbots are the most popular among these three terms and have the broadest meaning [1].

Chatbots have been introduced for various reasons. Some have been created for fun as entertainers or game players. Others have been meant to give specific information or provide a direct dialogue to specific topics. As a computer program interacting in natural languages with their human users, they have also been developed for education purpose. The emergence of conversational chatbots observed with more academic aims has helped students learn languages. In the field of language learning, their potential role as a tutor has drawn attention [2].

Chatbots use artificial intelligence to process language, allowing them to understand human speech. They decipher spoken or written questions and also give responses with sufficient and adequate information or direction. With the improvement of data-mining, language processing, machine-learning, and decision-making capabilities, and chatbots have become more and more sophisticated and practical [3].

Artificially intelligent chatbots are now helping students of English to improve their English skills. It is obvious that a lot of practice is required to learn a language. For students who learn English as a foreign language (EFL), it is difficult to find a native speaker to practice their English. However, intelligent chatbots, a tireless language tutor, can play that role. Acting as a native speaker, when students talk to them, they understand the students' words and provide a human-like response. As hearing their spoken

responses and seeing their written messages on the screen, EFL students practice their English in an effective way.

There have been some studies on chatbots in EFL settings [1-4]. Kim argued that chatbots enable students to use appropriate words and idioms [1]. Wang and Petrina also suggested that students can learn vocabulary while interacting with chatbots [2]. Accordingly, Fryer and Carpenter claimed that chatbots allow students to practice a variety of words, phrases, and grammatical structures [4]. Curiously however, most of chatbot-related studies have focused on English speaking and writing skills. There has been little empirical research in association with vocabulary acquisition. Therefore, the present study tries to examine the effects of chatbots on Korean college students' English vocabulary learning. Research questions are as follows:

1. What are the effects of chatbots on students' English vocabulary learning?
2. What are the effects of chatbots on students' attitude toward English vocabulary learning?

## 2. Methodology

### 2.1 Participants

Participants in the current study consisted of 47 Korean EFL students taking a general English course taught at a private university in Korea. They were all freshmen students majoring in different academic fields. The participants were randomly divided into two groups: one experimental group (n=24) and the control map group (n=23).

### 2.2 Research Procedures

The focus of this study was to ascertain whether the use of chatbots had a notable effect on EFL students' vocabulary learning. The experiment was administered for eight weeks in 2016 academic year. All participants

were given a pre-survey questionnaire to investigate their perceptions of vocabulary learning. To establish the participants' vocabulary level, a pre-test was then conducted. After the pre-survey and the pre-test, the participants were divided into two groups: one experimental group and one control group.

Only the participants in the experimental group engaged in chat with a chatbot. After downloading the chatbot application program onto their smart phone, all they had to do was register their own account and converse with the chatbot. All of the participants were good at managing this software without any difficulty. During the eight-week experimental period, they held a conversation with the chatbot for 10 minutes every week. Chat topics varied from school life to movies.

Finally, the post-test was administered to assess the participants' vocabulary learning from the use of chatbots. In addition, to examine any differences in their perceptions of vocabulary learning, a post-questionnaire survey was given to both groups.

### 2.3 Materials

A chatbot called Elbot was employed for this study (Fig. 1). This chatbot can simulate a human-like conversation using a natural language. Using artificial intelligence to process language, Elbot understands human messages, deciphers spoken or written questions, and gives responses with appropriate information.

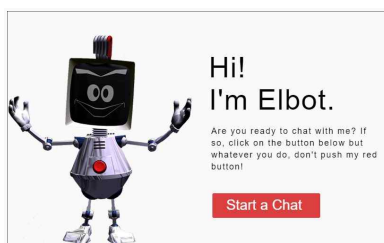


Fig. 1. Chatbot Elbot

As for the test items, this study employed 30 words from the textbook, *Strategic Reading 2*, by Richards and Eckstut-Didier [5], which has been used for

intermediate-level students in Korean EFL settings [6]. There were a total of 30 question items on both pre- and post-tests. According to the previous research [7], balance was considered in the test by allocating three parts of speech: 10 nouns, 10 adjectives, and 10 verbs (Fig. 2).

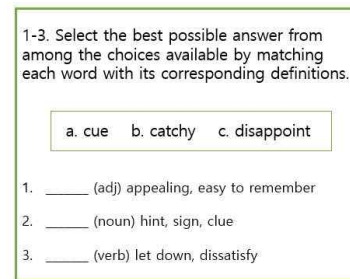


Fig. 2. Vocabulary Test

For the pre- and post-surveys, a 5-point Likert scale was employed. Questionnaires were composed of 15 closed items: motivation (5 items), interest (5 items), and confidence (5 items).

### 2.4 Data Analysis

The data collected from the present study were analyzed using SPSS version 18.0. Descriptive statistics such as means and standard deviations were calculated. Paired samples *t*-tests were then performed to check whether there were any changes between the pre- and post-tests. An independent *t*-test was also run to investigate whether there were any mean differences between the experimental and control groups. Significance level was set at .05.

## 3. Results

### 3.1 Effects on Vocabulary Learning

To investigate participants' vocabulary development, there were pre- and post-tests. Both descriptive statistics and paired samples *t*-test results are shown in Table 1.

Table 1. Changes in Vocabulary Learning

		Pre-test (n=47)		Post-test (n=47)		<i>t</i>	<i>p</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Experimental	Noun	9.25	2.05	9.83	0.82	1.358	.188
	Adjective	8.71	2.26	9.71	1.00	2.892	.008
	Verb	8.27	2.53	9.65	1.20	3.304	.003
	Total	26.31	6.52	29.19	2.83	2.673	.014
Control	Noun	8.87	2.55	8.52	3.41	-.749	.462
	Adjective	8.48	2.69	8.22	3.38	-.526	.604
	Verb	8.11	2.91	8.00	3.50	-.189	.852
	Total	25.50	7.96	24.85	10.20	-.442	.663

While no significant changes were found in the control group, findings of the current study revealed statistically significant mean differences for the experimental group between pre- and post-tests, indicating the vocabulary development as an outcome of engaging in chat with a chatbot. The total mean score revealed a significant difference between the pre- and post-tests ( $t=2.673$ ,  $p=.014$ ), with the score of 26.31 on the pre-test compared to 29.19 on the post-test.

To be specific, participants in the experimental group significantly improved their vocabulary knowledge in terms of two parts of speech: adjective ( $t=2.892$ ,  $p=.008$ ) and verb ( $t=3.304$ ,  $p=.003$ ). As for adjective words, the mean score on the pre-test was 8.71 while on the post-test was 9.71. About verbs, the mean score improved from 8.27 on the pre-test to 9.65 on the post-test.

Table 2. Group Differences in Vocabulary Learning

		Experimental (n=24)		Control (n=23)		<i>t</i>	<i>p</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Pre-test	Noun	9.25	2.05	8.87	2.55	.566	.574
	Adjective	8.71	2.26	8.48	2.69	.318	.752
	Verb	8.27	2.53	8.11	2.91	.203	.840
	Total	26.31	6.52	25.50	7.96	.384	.703
Post-test	Noun	9.83	0.82	8.52	3.41	1.796	.085
	Adjective	9.71	1.00	8.22	3.38	2.030	.053
	Verb	9.65	1.20	8.00	3.50	2.136	.042
	Total	29.19	2.83	26.85	10.20	1.969	.060

In order to investigate if there were any mean

differences between the experimental and control groups, an independent t-test was also conducted. In the pre-test, as shown in Table 2, there were no significant differences between the two groups, indicating that all participants were homogeneous at the start of the study.

However, the post-test results show that there were mean differences between the experimental and control groups. Particularly, a significant group difference was observed on the post-test in regard to verb words ( $t=2.136$ ,  $p=.042$ ), with the mean score of 9.65 for the experimental group and 8.00 for the control group. Regarding adjective words, although the mean difference between two groups did not reach the statistical significance, it can be described as marginally significant – not significant, but getting there ( $t=2.030$ ,  $p=.053$ ).

To sum up, there were significant mean differences between pre- and post-tests in the experimental group, indicating that engaging in chat with a chatbot helped EFL students to improve their vocabulary skills. In addition, findings of group comparison analysis revealed that the chatbot encouraged the students to more develop vocabulary words regarding verbs.

Findings of the study are in accordance of previous studies. Fryer and Carpenter claimed that students can be provided with an opportunity to use a wide range of vocabulary words and phrases [4]. According to them, chatbots are beneficial for students' vocabulary learning, providing quick and effective feedback about spelling. Moreover, since this artificially intelligent system can hold extensive conversations using different types of vocabulary on various topics, students can develop their English vocabulary effectively while interacting with the chatbot [2]. In her study, Kim also claimed that chatbots can enable EFL students to learn and use more appropriate words and idioms [1]. Considering that there is little empirical chatbot research in association with vocabulary acquisition, the current study can provide baseline data for the future research.

### 3.2 Perceptions of Vocabulary Learning

Another purpose of the present study was to explore whether there were any changes in students' perceptions on English vocabulary learning. Survey questionnaires were given to all participants in both two groups before and after the experiment. Results were positively observed overall for the experimental group as presented in Table 3.

Table 3. Changes in Perceptions

		Pre-survey (n=47)		Post-survey (n=47)		<i>t</i>	<i>p</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
		Experimental	Motivation	3.04	0.69		
Interest	2.88		0.61	4.33	0.64	7.000	.000
Confidence	2.04		0.69	3.04	0.81	4.440	.000
Control	Motivation	3.30	0.76	3.13	0.69	-.890	.383
	Interest	2.83	0.72	2.91	0.60	.463	.648
	Confidence	1.61	0.78	2.13	0.92	2.517	.020

There were significant changes in participants' perceptions of English vocabulary learning as a result of engaging in chat with a chatbot, in terms of motivation ( $t=6.234$ ,  $p=.000$ ), interest ( $t=7.000$ ,  $p=.000$ ), and confidence ( $t=4.440$ ,  $p=.000$ ).

Specifically, results indicated that chatbot program was effective in increasing the participants' motivation in vocabulary learning, with the mean score of 3.04 on the pre-survey and 4.21 on the post-survey. As for interest, the mean score on the pre-survey was 2.88, while it was 4.33 on the post-survey. As far as confidence concerned, the mean score improved from 2.04 on the pre-survey to 3.04 on the post-survey.

Curiously, participants in the control group also improved their confidence in vocabulary learning ( $t=2.517$ ,  $p=.020$ ), with the mean score of 1.61 on the pre-survey and 2.13 on the post-survey. According to Hyland, the more students study, the more confident they become about English [8]. The participants' confidence might just grow as they learn a language.

Table 4. Group Differences in Perceptions

		Experimental (n=24)		Control (n=23)		<i>t</i>	<i>p</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Pre-survey	Motivation	3.04	0.69	3.30	0.76	1.237	.222
	Interest	2.88	0.61	2.83	0.72	.252	.802
	Confidence	2.04	0.69	1.61	0.78	2.014	.050
Post-survey	Motivation	4.21	0.72	3.13	0.69	5.216	.000
	Interest	4.33	0.64	2.91	0.60	7.882	.000
	Confidence	3.04	0.81	2.13	0.92	3.616	.001

In order to figure out if there were any perception differences between the experimental and control groups, an independent *t*-test was run. In the pre-survey, as shown in Table 4, there were no statistically significant differences between two groups, indicating that all participants were homogeneous at the beginning of the study.

On the contrary, the post-survey results show that there were significant mean differences between the experimental and control groups. In particular, statistical significances were observed with regards to motivation ( $t=5.216$ ,  $p=.000$ ), interest ( $t=7.882$ ,  $p=.000$ ), and confidence ( $t=3.616$ ,  $p=.001$ ). To be specific, results indicated that chatbot program was more effective in increasing the participants' motivation, interest, and confidence in English vocabulary learning.

Findings of the current study reveal that students who engaged in chat with a chatbot became more motivated to learn English vocabulary, more interested in vocabulary learning, and more confident in English vocabulary. Particularly, compared to the control group, those in the experimental group more increased their motivation.

In line with the previous studies [1, 2, 4, 9], students' attitudes toward English learning positively changed. Students' affective factors such as motivation and confidence are crucial factors when learning a foreign language because negative feelings hinder the learning process [10]. In this realm, the current study provides evidence that chatbots can be beneficial to Korean EFL students, positively changing their perceptions of English vocabulary learning.

#### 4. Conclusion

English learning is becoming more important [11–14]. The present study reports the effects of chatbots on Korean EFL students' English vocabulary learning. Major findings are as follows: First of all, students' vocabulary skills regarding noun, adjective, and verb improved as a result of engaging in chat with a chatbot. Particularly, the chatbot enabled the students to develop vocabulary words regarding verbs more effectively than did those in the control group.

Findings of this research make a stark difference from a number of previous studies [15], providing empirical evidence that chatbots can be beneficial for English vocabulary learning. Pedagogical implications can also be drawn from the findings for teachers in EFL settings who are interested in technology-assisted language learning to facilitate their students' vocabulary learning. The current study opens up new possibilities for the use of chatbots for English vocabulary development. EFL students can improve English vocabulary in terms of nouns, adjectives, and verbs by engaging in chat with chatbots.

There are limitations and suggestions for the future research. Above all, the experimental group engaging in chat with a chatbot only featured 24 participants. The results of this study, therefore, cannot be generalized. Second, this study did not consider the students' learning styles. Since every student learns differently, an individual's learning style should be considered. Particularly, technology literacy and adaptability should also be accounted for in future studies. Lastly, only one control group was included in the current study. Future research should include an additional experimental group to determine whether the use of other technology tools would affect English vocabulary learning similarly to chatbots.

#### REFERENCES

- [1] N. Y. Kim. (2017). Effects of different types of chatbots on EFL learners' speaking competence and learner perception. *Cross-Cultural Studies*, 48, 223–252.
- [2] Wang, Y. F. & Petrina, S. (2013). Using learning analytics to understand the design of an intelligent language tutor? Chatbot Lucy. *International Journal of Advanced Computer Science and Applications*, 11(4), 124–131.
- [3] Braun, A. (2003). *Chatbots in customer communication*. Berlin: Springer.
- [4] Fryer, L. & Carpenter, R. (2006). Emerging technologies bots as language learning tools. *Language Learning & Technology*, 10(3), 8–14.
- [5] Richards, J. & Eckstut-Didier, S. (2003). *Strategic reading 2*. New York: Cambridge University Press.
- [6] Cook, J. (2015). Negotiation for meaning and feedback among language learners. *Journal of Language Teaching & Research*, 6(2), 250–257.
- [7] J. U. Yun & J. I. Han. (2015). Effects of vocabulary task types on EFL learners' vocabulary learning. *Foreign Languages Education*, 22(3), 27–55.
- [8] Hyland, K. (1997). Is EAP necessary? A survey of Hong Kong undergraduates. *Asian Journal of English Language Teaching*, 7(2), 77–99.
- [9] N. Y. Kim. (2017). A study on different types of speech acts in voice-chat between EFL students and a chatbot. *Studies in English Education*, 22(3), 81–109.
- [10] Alemi, M. Meghdari, A. & Ghazisaedy, M. (2014). Employing humanoid robots for teaching English language in Iranian junior high-schools. *International Journal of Humanoid Robotics*, 11(3), 1–25.
- [11] N. Y. Kim. (2017). Effects of English programs in the workplace on employees' English learning: A case study on in-company English programs in Korea. *Journal of Convergence for Information Technology*, 15(5), 71–77.
- [12] J. Park. (2016). Way of training English teacher's of verbally talented children for convergence-based education in the digital age. *Journal of the Korea Convergence Society*, 7(6), 185–192.
- [13] B. W. Kim. (2016). A study on convergence of mobile learning UX platform service for English learning. *Journal of the Korea Convergence Society*, 7(5), 155–160.
- [14] J. I. Yi & J. S. Han. (2017). A study on developing a learning material screening system for improving foreign language learning efficiency. *Journal of Convergence for Information Technology*, 7(1), 87–92.
- [15] N. Y. Kim. (2016). *Effects of different voice-chat conditions on Korean EFL learners' speaking ability,*

*oral interaction, and affective factors.* Unpublished  
Doctoral Dissertation, Seoul: Ewha Womans University.

김 나 영 (Kim, Na Young)

[정회원]



- 2017년 2월 : 이화여자대학교 영어 교육학과 (문학박사)
- 2015년 3월 ~ 현재 : 한신대학교 정조교양대학 외래교수
- 관심분야 : 영어 교육, 멀티미디어를 활용한 영어 교육, 기업 교육

▪ E-Mail : [alicekimnayoungkim@gmail.com](mailto:alicekimnayoungkim@gmail.com)