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Dialog chatbot as an interactive online tool in enhancing ESP vocabulary learning

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Abstract

Purpose – Based on an experimental study on English for Specific Purposes (ESP) students, at the Business Department at the University of Bisha, the purpose of the study is to examine the effect of chatbot use on learning ESP in online classrooms during COVID-19 and find out how Dialogflow chabot can be a useful and interactive online platform to help ESP learners in learning vocabulary well.

Design/methodology/approach – The research paper is based on an experimental study of two groups, an experiential group and a controlled group. Two tests were carried out. Pre-tests and post-test of vocabulary knowledge were conducted for both groups to explore the usefulness of using the Dialogflow chatbot in learning ESP vocabulary. A designed chatbot content was prepared and included all the vocabulary details related to words' synonyms and a brief explanation of words' meanings. An informal interview is another tool used in the study.

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Competing interests: The authors declare no competing interests.

Ethical approval: The authors obtained approval from the deanship of scientific research at their affiliated university. xxxxxxx. Further approvals were obtained from the invited universities before the participants were invited to participate in the study.

Informed consent: The participants were informed during the data collection process that the participation was voluntary; all the information was treated with confidentiality.

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The purpose of using the interview with the participants was to elicit more data from the participants about using the chatbot and about how and in what aspects chatbot using the conversational program was useful and productive.

Findings – The findings of the study explored that the use of chatbots plays a major role in enhancing and learning ESP vocabulary. That was clear as the results showed that the students who used the chatbot Dialogflow in the experimental group outperformed their counterparts in the control group.

Research limitations/implications – The study displays an important pedagogical implication as the use of chatbots could be applied in several settings to improve language learning in general or learning ESP courses in particular. Chatbot creates an interesting environment to foster build good interactions where negotiation of meaning takes place clearly seems to be of great benefit to help learners advance in their L2 lexical development.

Originality/value – Examining and exploring whether the use of chatbots plays a major role in enhancing and learning ESP vocabulary in English as Foreign Language setting.

Keywords Chatbot, English for specific purposes (ESP), ESP vocabulary, English as second language (ESL), Online platform

Paper type Research paper

1. Introduction

Teachers always look for new pedagogical strategies and techniques to help their students learn better, faster and more in-depth. We live in a time when education is more readily available than it has ever been, with the help of fast technology development. The integration of technology and learning languages has become fruitful and a fact we cannot escape. Adult learners are often time-constrained and making time for learning is rarely a priority. Chatbots can assist your current students and are not limited by human constraints such as forgetting and recall. New conversational learning technologies (chatbots) can simulate a conversation with a colleague when it comes to learning and training. A training event should appear and feel like a natural conversation between you and a co-worker, so it can be very personal, to the point and enjoyable. A chatbot is a conversational agent (an artificial intelligence [AI] program) that communicates with users using natural language and makes decisions based on predefined rules.

Using chatbots in language teaching and learning has been examined in several studies (e.g. Laurillard, 2002; Smutny and Schreiberova, 2020). The COVID-19 pandemic breakout made all institutions look for various and replacing options and recent academic approaches and strategies to engage students in the learning process and to create good interactive environments for students and teachers. There are a few studies to examine the effect of chatbots on learning English for specific purposes (ESP) in online classrooms during COVID-19 or as promising tool to help students use while learning or communicate with their teachers. Thus, the current study aims at examining how Dialogflow chatbots can be common online platforms to help ESP learners learn vocabulary well.

2. Literature review

2.1 ESP and digital and technology age

Technology with its fast-digital development has a strong and influential role in ESP. It helps to a great extent in creating good, rich and real-life environments to build various interesting ESP projects and produce and design tailor-made curriculums. The need for English for specific situations leads to the spread and the importance of ESP in many disciplines and environments and many ESP projects have been designed within the framework of needs analysis. The emergence of technology gave more strength to ESP with its educational nature that is based on courses designing and providing authentic and natural real life and real-life situations. Many research works have shown how technology, Computer-Assisted Language Learning contributed greatly to the area of ESP in terms of teaching/training, designing and developing or helping ESP learners.

The integration of technology and ESP was productive and the application of technology in the field of ESP (Wang, 2015). Dashtestani and Nadezda (2015) similarly recommended that

"ESP teachers make attempts to use a wide range of technologies in their ESP courses in order to maximise student participation and engagement in language learning". Technology with its nature where ESP teachers and practitioners can bring a good and interactive environment, plays important role in the ESP learners' engagement and participation, especially in the case of using a Course Management System in the ESP discipline (Maulan and Ibrahim, 2012). In modern various contexts where technology is used, learners become more independent and can have good space to interact with their teachers and students.

2.2 Artificial intelligence, chatbot and language learning

The development of information communication technologies has received unprecedented growth including the expansion in the applications of AI. AI is a vibrant field that intersects with other major flourishing domains such as machine learning, deep learning and cognitive computing (Bini, 2018). The evolution of AI has accompanied the rise of numerous web tools, neural networks and virtual applications (Battineni *et al.*, 2019; Jadhav and Thorat, 2020). Therefore, there is evidence that AI systems are changing the nature of education and the process of language learning (Bii, 2013). The variability of AI definitions in the literature is obvious since it has become an integral part of numerous fields including education and language learning. For instance, AI refers to computational programs that help in simulating and mimicking human intelligence, such as problem-solving and learning (Shouval *et al.*, 2020). AI creates naturalistic conversational interactions directed towards comprehensive second and foreign language learning (Divekar *et al.*, 2021). Furthermore, AI deals with the study and design of algorithms that perform tasks or behaviours that a person could improve to require intelligence if a human were to do it. Riedl (2019) has asserted that AI involves intelligent systems, known as intelligent agents, which are also accountable for taking decisions on their own as they could achieve comparable actions to humans such as Alexa, Cortana or Google Assistant. Several AI-designed applications have been identified to support language learners such as interactive conversational tools (i.e. chatbots), three-dimensional face automatic recognition assistants and translation technologies (Blyth, 2018). To be specific, according to Haristiani (2019), a chatbot is a computer program based on AI that can carry out conversations through audio or text which has possibilities for extending language learning.

In conjunction with what is stated earlier, the chatbot is a computer program that simulates human conversation through voice commands or text chats or both. Chatbot, short for chatterbot, is an AI feature that can be embedded and used through any major messaging application. Fei and Petrina (2013) also define a chatbot program as a distinctive program from other computer applications that are built on mimicking intelligent conversation as human users via deploying auditory or textual procedures. Chatbots are known as advanced forms of human–machine interaction with automatic conversational agents which link the users and machines with the assistance of natural language processing (Luo *et al.*, 2019). Considering this term, experts in this field use chatbots to refer to robotic actions since it is a special kind of robot that is designed to stimulate conversation with human users via the Internet (Kim, 2018).

Vocabulary is an essential part of learning a language and to think, learn and express about the world. Expanding the knowledge of words provides unlimited access to new information; particularly in a second or foreign language. There are numerous methods for learning vocabulary, but memorisation is one of the most common that is often practiced in rote learning (Yang and Dai, 2011). In this sense, Chen *et al.* (2020) contended that the memorisation of words is inseparable from the context of vocabulary learning. According to Muhammad *et al.* (2020), Dialogflow is a platform for natural language understanding that facilitates the design and integration of conversational user interfaces into mobile applications, web applications, devices, bots, interactive voice response systems, etc.

3. Methodology

3.1 Research questions

The research article addresses the following questions.

RQ1. Is there any significant difference between the learners who used chatbots and the learners who used the traditional approach in learning Business English?

RQ2. What is the learners' perception of using chatbots in learning business English terms?

RQ3. What are the advantages of using chatbots in learning ESP courses, such as Business English?

3.2 Participants

Two classes at the University of Bisha, Saudi Arabia, were selected to participate in the study. The participants were undergraduate students who were doing their BA program in Business English at the university. Research ethics were maintained throughout this research. The researcher obtained approval letters from the ethics research committee at the University of Bisha numbered (UB-18-2020). The participants enrolled in Business English as one of the courses of the program Business Administration. The course aimed to help them be equipped with English to help them at specific, professional and academic levels. Arabic was the first language of all the participants. All of them were male students. Then, the two classes were randomly assigned to treatment groups, one that practiced chatbots and one that practiced a traditional approach. The participants were 20 in the experimental group and 20 in the control group. The first group was the experimental group which taught the course for 12 weeks with a help of chatbot dialogue. The second group was the control group which was taught English without the support of chatbots. The participants of the two groups had the same level of English proficiency.

3.3 Materials and instrument

Since the study focus was the use and learning of vocabulary by ESP learners of Business English, the materials manipulated in the study include 10 units selected from the common book of Mascull (2010) that is entitled "Business Vocabulary in Use Advanced with Answers". The topics selected were related to the majority of the participants, for instance, meetings, negotiations, career ladder, etc. The designed chatbot content included all the vocabulary details related to words' synonyms and brief explanations of words' meanings.

3.4 Data collection

Since this research is based on an experimental study of two groups, experiential and controlled groups, pre-tests of vocabulary knowledge were conducted for both groups. The sample size of the participants was the same ($n = 20$) in each group. The participants in the study were given the same time and academic level of input. Two researchers conducted the experiment. The meetings with the students were twice a week for the two groups. The participants in the experimental group only were asked to use chatbots during classroom activities and tasks or when they have their outside assignments outside the classrooms. In order to investigate the influence of chatbot use, post-tests were conducted for both groups after 12 weeks.

3.4.1 Data collection tools. 3.4.1.1 The test. The instrument used to collect the data was a vocabulary test. The vocabulary test was created by the authors based on the textbook taught to the students (Mascull, 2010). The test was designed to examine how participants used chatbots to learn new terms in Business English. The Cronbach's alpha was 0.80, which is considered good. The test was made up of 20 items. The pre-test consisted of the same terms that were used in the post-test but in different contexts. The participants were asked to

choose the correct option. Each sentence with the correct option was given one point. Thus, the total points for the test were 20 points.

3.4.1.2 The interview. An interview is one of the tools used to get more data from the participants and to explore more data on the research questions. The purpose of using the interview with the participants was to elicit more data about how and in what aspects using a chatbot conversational program was useful and productive. An interview protocol question was designed and distributed to some participants. For the convenience of the study and participants, the questions of the interviews were written and sent to the participants via Google form. The questions include some hints on the advantages of using the chatbot conversational program. Ten students participated in this interview.

3.4.1.3 Chatbot. The chatbot is a computer program that is available on mobiles as an application and the use of chatbots is becoming easy and interaction can happen anywhere as they are accessible. Participants in this study use their mobiles and check ESP words in the designed chatbot dialogue flow. Figure 1 shows how the chatbot works.

ESL Agent is a program that works on dialogflow on the Google platform, where a group of intent is written on a specific topic. After that, when the student checks the meaning of a specific word, the program searches in the previously entered intent group, and when it finds any match, it responds to the inquiry. Training phrases are examples of what the end user can say, knowing that it is not necessary to identify all possible examples because integrated machine learning extends with other relevant phrases.

3.5 Procedures

Prior to commencing the experiment, the participants took the pre-test to ensure that they were homogenous in terms of their proficiency level. After that, the participants were assigned to the experimental and control groups and attended 12 sessions in the academic year 2020/2021. In the first session, the participants in the two groups took the pretest. In addition, the participants in the experimental group which used chatbots were provided with the necessary information regarding how the software works. Then, the two groups received the instruction for 12 sessions. In the experimental group, the participants received instructions on how to use a chatbot. For each session, the participants were required to use chatbots in the inside classroom and outside classroom activities and tasks. For instance, check the examples (see Figure 2):

In the control group, the same instruction was practiced through the traditional approach. The participants were taught the same content but without using the chatbot. In the last session, the participants in the two groups received the post-test to check and determine how much the participants benefited from the chatbot over the term of applying and checking the ESP vocabulary in the chatbot.

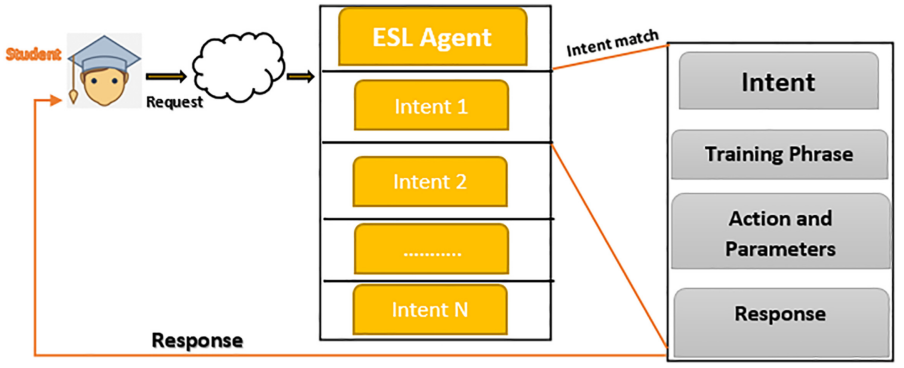

Figure 1.
English as second language (ESL) agent architecture

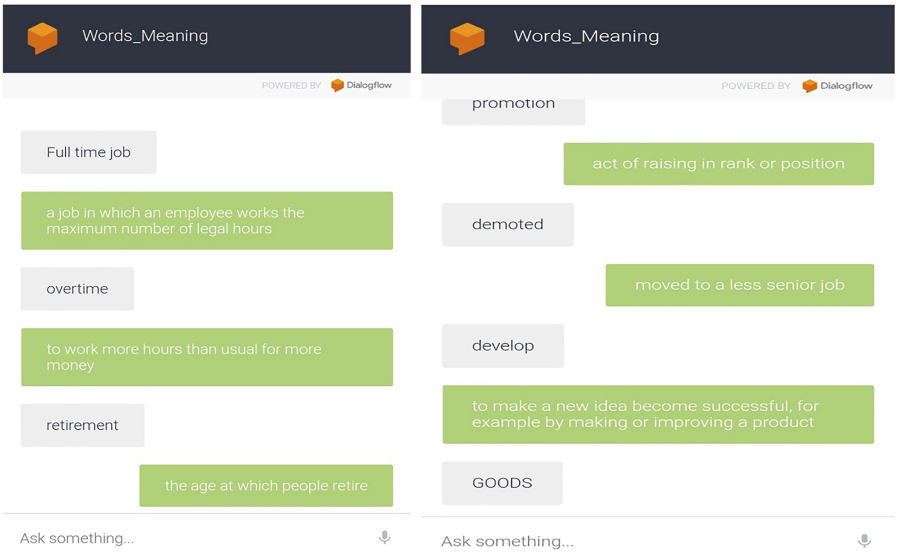

Figure 2.
Students' samples of ESP vouculary meaning search in Chatbot

3.6 Data analysis

In order to analyse the data, Statistical Package for the Social Sciences version 22 was used. First descriptive statistics including mean and standard deviation were calculated for each group. Then an independent-sample *t*-test was employed for comparing the two groups' performance. In order to examine changes in learners' performance from the pre-test to the post-test, a paired-samples *t*-test was used. To explore the learners' perceptions of using the chatbot in learning business English terms, a thematic content analysis was done for open-ended questions and a descriptive analysis was performed for close-ended questions.

4. Results

To answer the first research question, descriptive statistics and *t*-tests were performed. The first research question of the study attempted to explore whether using the chatbot had any significant impact on learning Business English terms. To analyse the data, first descriptive statistics were calculated. Table 1 presents the results.

A *t*-test analysis of the pre-test was used to check whether there was a significant difference between the two groups before the experiment. This analysis indicated that there

Table 1.
Descriptive statistics of the students' performance of pre-test

					Levene's test for equality of variances		*t*-test for equality of means				
Groups	*N*	Mean	Std. deviation	Std. error mean	*F*	Sig	*t*	Df	Sig. (2-Tailed)	Mean difference	η^2
Chatbot group	20	9.05	3.74833	0.83815	0.000	1.000	−0.240	38	0.812	−0.30000	0.039
Control group	20	9.35	4.14570	0.92701							

was no significant difference in the level of the two groups ($p = 0.812$). The magnitude of the differences in the means (mean difference = −0.300) was small ($\eta 2 = 0.039$).

To answer the first research question of whether the participants' learning business English was improved as a result of the intervention of using a chatbot, the mean and standard deviation across posts showed variation in the participants' performance. Results are presented in Table 2.

As shown in Table 2, there was a statistically significant difference between the mean score of the experimental and control group after being treated with the instructions; t (38) = 2.90, $p = 0.006$, two-tailed. The magnitude of the differences in the means (mean difference = 3.15) was large ($\eta^2 = 0.42$).

The second research question was about the learners' perceptions of using chatbots in learning business English terms. Qualitative and quantitative analyses of the interview questions were performed. The qualitative analysis was done using thematic content analysis for open-ended questions. The quantitative analysis was done using descriptive analysis for close-ended questions.

Regarding their answers to the first question of whether they found chatbots easy or difficult. All of them stated that it was easy to be used. The second question was about if they thought that chatbots can be used in other courses. In total, 80% agreed that chatbots could be used in other courses, and 20% felt that they might be used. The third question was about using chatbots in other courses. All the respondents stated that they used chatbots in other courses. The fourth question asked the respondents to determine whether the chatbot helped them to remember words better. In total, 80% of them stated that chatbot helped them remember words better and 20% of the respondents stated that chatbot might be the reason for remembering words. The fifth question was about using chatbots for their future academic career. In this case, 80% of the respondents stated that they would use a chatbot in their future academic career, and 20% of the respondents stated that they might use chatbot in their future academic career.

The second part of the interview contained open-ended questions. The first question in this part was about the benefits of learning Business English terms. The respondents stated that they recognised the meanings of the terms, and it helped them so much to get the meaning of the words quickly. In addition, chatbots explained words that have different meanings in an easy and organised way. The second question was about the faults of chatbots. They stated that chatbots were nice tools to be used and only a few faults that had been noticed. First, some terms were not included in the chatbot. Second, chatbots need an Internet connection. The third question was about their suggestions to improve the chatbot. They suggested that more words should be added. Also, they suggested chatbots can be designed as an application and used anywhere when there is an Internet connection. They urged us to use chatbots in all other courses.

Table 2. Descriptive statistics of the students' performance of the post-test

					t-test for equality of means				
Groups	N	Mean	Std. deviation	Std. error mean	T	Df	Sig. (2-Tailed)	Mean difference	η^2
Chatbot group	20	14.85	3.63137	0.81200	2.90	38	0.006	3.150	0.426
Control group	20	11.70	3.21346	0.71855					

Note(s): *$p < 0.05$

5. Discussion

Adapting technology in learning L2 in general, or ESP field, is increasing. The purpose of the current study was to examine the impact of implementing a chatbot in learning ESP vocabulary (Business English vocabulary). With respect to the impact of implementing chatbot in learning Business English, the analysis of the data indicated that the experimental group outperformed their counterparts in the control group. The finding of this study is in line with several previous studies and recent studies. Recently, for instance, Bailey and Almusharraf (2021) examined how productive using a chatbot is in learning L2. They checked the incorporation of a digital storytelling chatbot system and investigated how students' perceptions of the story bot interactions. The study found that story bots helped the students to meet their goals to learn L2 and increased their participation. In a similar vein, Wollny *et al.* (2021) recently explored the positive use of chatbots as a promising tool in education in terms of skill development, education efficiency, learners' motivation and education availability.

The understanding of the ESP vocabulary well and being developed with the help of chatbot approved that the integration of digital and technological software and applications can act as a gateway for better understanding ESP vocabulary and language skills and improving ESP materials. For instance, Butler-Pascoe (2011) gave importance to technology integration with ESP for better course design and development. Using chatbots as a tool was positive in acquiring ESP vocabulary and this supports teachers to use various digital and online tools in improving learners' skills in L2 or ESP vocabulary and courses' contents. Similarly, many studies approved that ESP learning is enhanced by the use of technology. For, instance, the use of wikis in ESP instruction was positive and learners were active in learning ESP patterns (Felea and Stanca, 2014). Moreover, with their communicative nature like chatbots, using blogs has been productive and useful in learning ESP textbooks and developing ESP knowledge. In the same way, using blogs was useful and positive in learning ESP especially in developing the learners' classroom communication and in improving learners' autonomous and independent learning (Chong, 2010). Similarly, a designed model for developing a chatbot was assessed and it was found that the chatbot was useful as an extra tool to carry out academic and administrative tasks and facilitate communication between students and academic staff (Mendoza *et al.*, 2022).

Most of the interview responses of the experimental group were supportive towards the use of chatbots. Most of the participants suggest that chatbot was useful, and they find it a good tool to help them engage and learn ESP English vocabulary. They found it easy to use as the chatbot was directed and focused on ESP Business English words and no challenges or difficulties were noticed while practicing and learning ESP vocabulary. The responses showed that chatbots and any technological application integration can be beneficial and such a study can be a starting point for more focused fieldwork studies to explore the effectiveness of technology integration in ESP and in educational pedagogy in general. Most of the participants were with idea of teaching all ESP courses and other courses in the future with the use of some applications, programs and softwares as chatbots. This study supports the fact of the upcoming smart tools and software with high and advanced technology in relation to AI that would lead to a new revolution and trend in learning and future academic research and online applications such as chatGPT (O'Connor, 2022).

6. Conclusion

The research discussed the implementation of chatbots in learning ESP vocabulary. It was found that using ESP vocabulary within the technology environment (chatbot) had an increasing influence on ESP learners. Performance results of the ESP vocabulary in the pre-test and post-test revealed that the experimental group significantly outperformed the control group in learning ESP words in the post-test. The study shows clearly that the use of chatbots

acts well in enhancing and learning ESP vocabulary. This suggests that ESP teachers should make use of chatbots applications and other digital and distance technology in teaching ESP vocabulary and in engaging ESP students in learning better. Using chatbots offers several opportunities for language learners as well as teachers. Therefore, the study displays some suggestions that can be applied to improve language learning using chatbots. First, interaction tasks where negotiation of meaning takes place clearly seem to be of great benefit to help learners advance in their L2 lexical development. Chatbot creates an interesting environment to foster such interactions. Based on the theory of noticing and attention, the study suggests that cognitive factors such as attention and depth of processing are the key elements to be used to facilitate L2 vocabulary development through synchronous interactive tasks using chatbots. Further studies with a larger sample in EFL and ESL contexts would be useful to highlight and assess the positive pedagogical implications of chatbot use in enhancing vocabulary learning and the skills of English.

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