

THE EFFECT OF USING WHATSAPP BOT ON ENGLISH VOCABULARY LEARNING

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ABSTRACT

This study tried to design a WhatsApp bot to be implemented in English language vocabulary learning context in Oman. 150 Omani English as a Foreign Language (EFL) students from three different proficiency levels were selected based on random sampling. To measure the effectiveness of the treatment, pretests, posttests, and delayed posttests were conducted, respectively. The TAM 2 extended questionnaire was also used to understand learners' perceptions regarding the use of the WhatsApp bot in the learning process. The results of the study revealed that the WhatsApp bot, on all three levels, works nicely and practically. Although experimental groups, who used WhatsApp bot, at elementary and intermediate levels showed significant differences from the traditional face-to-face classes, pre-intermediate students showed no significant difference between the two mentioned terms. It was also understood that chatbots could be the best supplementary materials assisting teaching in delivering materials.

Keywords: WhatsApp bot, vocabulary, English language vocabulary, Oman.

INTRODUCTION

Artificial intelligence (AI) is among the recent technological advancements that are believed to be significant in solving problems (Schmidt & Strasser, 2022). AI is a technological invention designed to deal with the discipline that focuses on developing methodologies and techniques for high-level reasoning associated with low-level derived features devoid of explicit human control (Healey, 2020). Technology is well-received and increasingly utilized in education (Roos, 2018). Okonkwo and Ade-Ibijola (2021) put forward that the chatbot system is one of the most accepted AI technologies used in teaching and learning operations. This technological device is applied to conversational or interactive instructions to give immediate feedback to the user (Okonkwo & Ade-Ibijola, 2021; Smutny & Schreiberova, 2020).

Chatbot is defined as computer software that stimulates human-like conversations with human users either by way of talking (Brustenga et al., 2018; Pham et al., 2018), in the form of text messages (websites or mobile applications), voice-based (Alexa or Siri) or by intermingling these three techniques (Pereira et al., 2019; Sandoval, 2018). Various types of chatbot software are designed to imitate and perform the tasks that humans initially did. That is, they can be used not only for chatting with users but also to develop tools with a desired function depending on the designer's needs (Riel, 2020; Khan et al., 2019; Wang et al., 2021).

Chatbots have progressively been deployed in various fields, such as commerce, the service industries, and education. Moreover, some studies (Perez et al., 2020; Rapp et al., 2021; Smutny & Schreiberova, 2020; Chairprasurt et al., 2022; Clarizia et al., 2018) show that chatbots are ideal for potentially changing the methods of students' learning and facilitating their access to relevant information according to the educational framework.

Chatbot systems assist students in the context, including providing mobile web applications to aid learning (Okonkwo & Ade-Ibijola, 2021). Others comprise giving such instant standardized information as course contents to students (Cunningham-Nelson et al., 2019), offering questions and answers for practice (Sinha et al., 2020), presenting evaluation criteria (Durall & Kapros, 2020), reminding students of the due dates for assignments, and giving instructions and recommendations (Ismail & Ade-Ibijola, 2019); guiding students to different locations on the campus (Mabunda & Ade-Ibijola, 2019), and issuing students with learning materials (Okonkwo & Ade-Ibijola, 2021) among others.

Okonkwo and Ade-Ibijola (2021) assert that the application of the software for facilitating individualized learning experiences, which is more convenient to students, is beyond compare with that of many other ways of interactions, including the use of email communication, student-to-student interaction, and student-to-lecturer interaction. This assertion is supported by Cunningham-Nelson's et al. (2019) findings that Chatbot equipment permits students to have a more personalized and engaging learning environment.

Several studies on Chatbot technology confirm that the system has more advantages over others in education. Clarizia et al. (2018) and Sinha et al. (2020) demonstrate that Chatbots are more appropriate for answering students' questions. Okonkwo and Ade-Ibijola (2021), Pham et al. (2018), and Zhao et al. (2020) affirm that applying chatbot is the best way to learn how to understand Computer Programming concepts. Durall and Kapros (2020), Rohrig and Heß (2019) find that a chatbot is the most fitting gadget for assessing students' performance abilities and providing administrative services. This system is called a mobile-based chatbot (Kumar et al., 2021). Chatbots used in this area are favorable in facilitating collaborative learning (Schmulian & Coetzee, 2019), multimodal communication (Haristiani et al., 2019), scaffolding, real-time feedback (Gonda et al., 2018), personalized learning (Oke & Fernandes, 2020; Verleger & Pembridge, 2019), scalability, interactivity (Dekker et al., 2020) and fosters knowledge creation and dissipation effectively (Verleger & Pembridge, 2019).

The present study aims to explore the extent of the impact of chatbot-based learning systems on learning performance and their motivation within the framework of self-determination theory. Consistent with these objectives, Ryan and Deci (2000), Yin et al. (2021), Winkler and Soellner (2018), Liu et al. (2020), and Maroengsit et al. (2019) posit that to identify the prominence of chatbots, it is necessary to examine its significance in supporting learning theory according to other forms of learning settings. Therefore, the study will contribute to the knowledge of chatbot-based learning, functionality, usability, and user satisfaction. It will also update practitioners on the use of chatbots in education.

The following questions will be analyzed comprehensively to strengthen the existing literature on chatbots and to measure the implementation of WhatsApp bots in the English language learning contest.

1. Does the use of WhatsApp bot have a statistically significant effect on Omani elementary, pre-intermediate, and intermediate EFL learners' vocabulary learning?
2. Do Omani students learn the words better using WhatsApp or following the teacher's instructions?
3. Does the use of WhatsApp bot have a statistically significant effect on Omani elementary, pre-intermediate, and intermediate EFL learners' vocabulary retention?
4. What are Omani EFL learners' perceptions of using WhatsApp bots in the EFL context?

LITERATURE REVIEW

Chatbots are agreed to be the most recent ingenious invention that provides valuable explanations for solving many of the problems of applying technology for supporting teaching and learning activities. This can be seen from how Chatbots create an interactive learning session, such as one-to-one interaction between the teacher and the students. The software is also a beneficial instrument for improving students' learning skills at an individual level (Colace et al., 2018).

Chatbot is perfect for allowing the students to comfortably participate in learning activities at their pace without feeling disturbed that they are being waited for by the instructor or their fellow students. Chatbots support students' educational engagements. The system also benefits teachers in the learning environment (Colace et al., 2018).

Chatbots are gaining popularity nowadays, fundamentally becoming unavoidable means of controlling how humans interact with the expanding digital world (Dale, 2016). This AI control will extend from reading and writing to listening and speaking. The availability of online chatbots within most messaging applications and many information-orientated websites such as universities, libraries, and museums all point to the fact that one of the many revolutions that chatbots will bring is the manner of learning a new language by human beings (Fryer et al., 2020). This can be proved by the fact that there has been an enormous increase in the manufacturing of gadgets related to language learning in the online software sector in the past five years (Zhou et al., 2018). However, despite witnessing the recurrent emergence of new gadgets that make even machine translation obsolete means of learning a new language, there is still a strong desire for other means of learning languages (Fryer et al., 2020).

Riel (2020) defines educational chatbots (ECs) as computer programs that aid in achieving educational goals within the parameters of traditional techniques. Many empirical studies have positioned chatbots as personalized teaching assistants or learning partners (Chen et al., 2020; Brustenga et al., 2018). The teaching assistant software provides scaffolding (Tutor Support) through practice activities (Brustenga et al., 2018). Support includes personalized learning, multimodal content (Schmulian & Coetzee, 2019), and instant interaction without time limits (Chocarro et al., 2021). Numerous other benefits have been identified concerning positive experiences (Ismail & Ade-Ibijola, 2019; Schmulian & Coetzee, 2019); such benefits include the ability to improve learning confidence (Chen et al., 2020) motivation, self-efficacy, learning control (Winkler & Soellner, 2018), engagement (Sreelakshmi et al., 2019), knowledge retention (Cunningham-Nelson et al., 2019) and access to information (Stathakarou et al., 2020). Furthermore, ECs were found to provide value and learning choices (Yin et al., 2021), which is beneficial in customizing learning preferences (Tamayo et al., 2020).

Some models of chatbots use MIM applications to turn into kinds of software that are popularly known as messenger bots (Schmulian & Coetzee, 2019). They predominantly work to facilitate twenty-four hours of unbroken interactions and communication automatically. Although MIM applications were not initially meant for pedagogical use, their straightforwardness made them a recognized environment for learning activities (Kumar et al., 2021; Pereira et al., 2019). The recognition of being effective and strategized communication media made chatbots gradually become a ubiquitous channel for imparting enhanced knowledge (Vazquez-Cano et al., 2021; Kumar et al., 2021). Other reasons for the dominance of ECs in learning situations are the facts that they are scalable individually (Chen et al., 2020; Ondas et al., 2019; Chocarro et al., 2021; Stathakarou et al., 2020); they support learning management (Colace et al., 2018); they are excellent in context-sensitive information delivery (Yin et al., 2021); they encourage participation, disclosure of personal aspects (Tamayo et al., 2020; Verleger & Pembroke, 2019; Brandtzaeg & Folstad, 2018; Ischen et al., 2019; Wang et al., 2021). These chatbot functions, which are impossible in face-to-face interaction, make the system more recognizable in the current teaching profession. Additionally, AI has the capacity to provide a chance to diagnose mental fitness (Dekker et al., 2020) based on the fact that it allows for a safe and confidential environment where even when a learner makes mistakes, they can personally learn how to correct them (Winkler & Soellner, 2018).

Cunningham-Nelson et al. (2019) point out that the ability of EC to deal with a large number of users' demands concurrently is one of the EC's primary advantages over the traditional teaching method. This is why Colace et al. (2018) view ECs as helpful in controlling a classroom situation involving multiple students,

perfect for augmenting autonomous learning skills (Kumar et al., 2021; Yin et al., 2021). Participating in revealing the benefits of using chatbots, Meyer von Wolff et al. (2020) claim that the systems are appropriate instructional devices to be utilized in higher education by both students and lecturers. They point out that, although the applications may be found to be challenging to operate by the instructors, especially when they do not master the code, the computerization of some of the lecturer/student interactions could provide the educators an opportunity to pay more attention to other pedagogical requirements (Schmulian & Coetzee, 2019; Gonda et al., 2018).

WhatsApp in Education

WhatsApp is a computer application for disseminating information among groups of users concerning their relationships. This feature makes the application ultimate for language teaching and learning (Ahmed, 2019; Mbukusa, 2018; Nuraeni & Nurmalia, 2020). For example, some studies (Dewi, 2019; Hamad, 2017; Kheryadi, 2018; Urien et al., 2019) establish that integrating WhatsApp into the teaching and learning process helps students to build confidence and interest. Such advantages manifest when students use WhatsApp to improve their vocabulary, verbal interaction outside the classroom, and writing skills (Ahmed, 2019).

Tamayo et al. (2020) use a brand of chatbot called EconBot in teaching and learning environments. They find that the students are interested in the learning process in which the EconBot is a supportive conversational tool that gives them independent learning modalities. Similarly, Cetinkaya (2017), Rosenberg and Asterhan (2018) stated that artificial intelligence is used to update WhatsApp so that it becomes an auto-responder. The auto-responder is used to privately access voiced messages using students' mobile devices rather than through the classroom WhatsApp group.

Smutny and Schreiberova (2020) and Fryer et al. (2020) add that chatbots are still not dominating or even meaningfully infiltrating the method of learning languages. Schmidt and Strasser (2022) also believe that AI-based foreign language learning is still in its infancy. According to them, this retardation results from the complexity of such systems, causing the development of AI-based high-level subject learning and practice that adapt to learner heterogeneity to be very slow.

Wang et al. (2021) argue that the applications of chatbots in education and being novel are also impacted by scarcity.

According to Smutny and Schreiberova (2020), Wang et al. (2021), and Winkler and Soellner (2018), language learning is the most trending area that received the most attention in educational chatbot (EC) research (Vazquez-Cano et al., 2021). Hence, it cannot be denied that EC plays a significant role despite its scanty literature outside of these contexts (Schmulian & Coetzee, 2019; Smutny & Schreiberova, 2020), and their presence in the introductory phases (Chen et al., 2020) which makes them limited by scanty examples within the domain of educational field (Stathakarou et al., 2020). However, because their absence in these fields is unavoidable, it is also an ideal potential to discover innovations in educational technologies within all disciplines (Wang et al., 2021). In addition, according to Tegos et al. (2019), research on the integration and use of chatbots in real educational contexts is still valid (Kumar et al., 2021).

METHODOLOGY

Participants

150 Omani EFL learners studying English General Skills were randomly selected based on three English proficiency levels: elementary, pre-intermediate, and intermediate. 50 participants were included in each level, including 25 students in the control group and 25 in the experimental group. The participants were Arabic native speakers passing the preparatory courses for higher education. Elementary students passed the college's placement test, while the other two groups were a combination of those who passed the previous semester or came directly through the placement test. Their age range was between 18 and 20, with both males and females in each class.

Instruments

Tests

To conduct the study, the researcher designed three sets of tests: pretests, posttests, and delayed posttests to monitor participants' knowledge, progress, and retention levels before and after implementing the treatment. A total of 9 tests were conducted in this study. All the tests had an equal number of questions 10 and a combination of fill-in-the-blank and multiple-choice formats. The results of the questionnaires were measured by SPSS software version 16.0.

Prior to the conduction of the tests, these sets were validated by two Ph.D. holders in Applied Linguistics and were additionally piloted by a group of 25 Omani EFL students at the same college. Table 1 shows the reliability of tests.

Table 1. The Reliability between the First and Second Administration of the Vocabulary Tests at Different Levels

	Cronbach's Alpha	N of Items
Test Elementary	.82	2
Test Pre-intermediate	.85	2
Test Intermediate	.89	2

The reliability of the tests was checked in a pilot study with 25 participants by the test-retest method. As can be seen, the test enjoyed a high reliability index for the elementary ($R = .82$), pre-intermediate ($R = .85$), and intermediate levels ($R = .89$).

Pathway Series Books

The participants of the study must be able to pass all the assessments related to the Pathway Series, developed by National Geographic Learning. There are two books at each level; one is designed for reading and writing skills, and the other for listening and speaking skills. Each book has different units, and each unit is divided into three lessons, including lessons A, B, and C. This study focused on Lessons A and B. Before the beginning of each lesson, 10 new vocabulary words are introduced to be covered weekly; therefore, this study covered 20 words from each level, with a total number of 60 for all levels.

Whatassbot

Using Python programming Language, a WhatsApp bot was designed for vocabulary learning. The program, then, was associated with a local phone number. The words were written in the bot database and were updated every three days to meet the course's delivery plan deadline by the college. The information students received included the word, a part of speech, a short definition, a synonym, an antonym, and a sentence example. (Appendix 1)

The Extended Technology Accepted Model Questionnaire (TAM2)

The last instrument used to determine the students' perceptions regarding WhatsApp bot implementation originated by Davis (1986) and was extended in 2000 (Venkatesh & Davis, 2000). The last one was used in this study. This questionnaire has seven aspects, organized through 25 items for the participants to select based on the Likert scale. Those seven aspects are perceived ease of use, usefulness, attitude, perceived behavior control, behavioral intention, self-efficacy, and personal innovativeness (Belda-Medina & Calvo Ferrer, 2022). The results of the questionnaires were measured by SPSS software version 16.0. (Appendix 2)

Table 2 shows that the Cronbach's Alpha reliability of the perception questionnaire with 25 items was found to be .89, which shows a rather high reliability index. There were 25 items in this questionnaire, so the range of scores could be from 25 to 125.

Table 2. Reliability Analysis for the Perception Questionnaire

Cronbach's Alpha	N of Items
.890	25

Procedures

The study was conducted in Fall Semester 2023, during the normal classes. The experimental groups received the new words and the related materials using a WhatsApp bot, while the control groups continued learning vocabulary according to their teachers' instructions.

Before the implementation of treatment, all the groups in 3 levels were given the pretest and told that they were participating in this study voluntarily. The treatment took two weeks, and the posttest was implemented. After another two weeks, the delayed posttests were conducted to measure vocabulary retention. All these tests were given 15 minutes to be completed.

Data Analysis

The following table shows the descriptive statistics for the pretest and posttest scores of elementary, pre-intermediate, and intermediate Omani EFL learners.

Table 3. Statistics for the Pretest/Posttest of the Three Levels

	N	Minimum	Maximum	Mean	Std. Deviation
Elm_Pre_Exp	25	.00	5.00	2.56	1.293
Elm_Post_Exp	25	5.00	9.00	6.80	1.118
Preint_Pre_Exp	25	1.00	6.00	2.92	1.351
Preint_Post_Exp	25	5.00	9.00	7.04	1.274
Int_Pre_Exp	25	1.00	8.00	4.00	1.707
Int_Post_Exp	25	6.00	10.00	8.24	.879
Valid N (listwise)	25				

Table 3 shows the pretest and posttest scores for the elementary, pre-intermediate, and intermediate groups are 2.56, 6.8, 2.92, 7.04, and 4, 8.24, respectively.

Table 4. Wilcoxon-Singed Rank Test for the Vocabulary Learning within Each Level

	Elementary	Pre-intermediate	Intermediate
Z	-4.396b	-4.391b	-4.421b
Asymp. Sig. (2-tailed)	.000	.000	.000

The Wilcoxon signed-rank test (Table 5) shows that there is a statistically meaningful difference between the pretest and posttest of the vocabulary scores at the (1) intermediate level ($Z = -4.39, p < .05$), (2) pre-intermediate level ($Z = -4.39, p < .05$), and (3) intermediate level ($Z = -4.21, p < .05$). Therefore, using WhatsApp bot had a statistically significant effect on Omani EFL learners' vocabulary learning in all three proficiency levels.

This study's second research question aimed to find any statistically significant difference between the time when the teacher teaches the words in the face-to-face classes with the use of WhatsApp bot on Omani elementary, pre-intermediate, and intermediate EFL learners' vocabulary learning. The following table shows the descriptive statistics of the pretests and posttests of the two groups.

Table 5. Statistics for the Pretest and Posttest Scores of the Elementary Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	5.00	2.60	1.354
ContPost	25	2.00	6.00	4.92	.909
ExpPre	25	.00	5.00	2.56	1.293
ExpPost	25	5.00	9.00	6.80	1.118
Valid N (listwise)	25				

Based on Table 5, the mean scores for the pretest and posttest of the control group were 2.60 and 4.92, while the mean scores for the pretest and posttest of the experimental group were 2.56 and 6.80, respectively. Since the design of the study was quasi-experimental with a pretest and posttest, the pretest scores of the participants were taken as the covariate, so analysis of covariate (ANCOVA) was used for the group comparison. Table 6 below shows the result of the ANCOVA test.

Table 6. ANCOVA for the Comparison of the Elementary Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	49.420a	2	24.710	26.040	.000	.526
Intercept	274.583	1	274.583	289.359	.000	.860
pretest	5.240	1	5.240	5.522	.023	.105
groups	44.640	1	44.640	47.042	.000	.500
Error	44.600	47	.949			
Total	1811.000	50				
Corrected Total	94.020	49				

As Table 6 shows, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary learning scores at the elementary level, $F(1,47) = 47.04$, $p < .05$, partial $\eta^2 = .50$. Therefore, using WhatsApp bot had a statistically significant effect on Omani elementary EFL learners' vocabulary learning in comparison to the teacher's instructions.

Table 7 shows the descriptive statistics of the pretests and posttests of the two groups for pre-intermediate learners.

Table 7. Statistics for the Pretest and Posttest Scores of the Pre-intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	6.00	2.76	1.562
ContPost	25	2.00	7.00	5.16	1.143
ExpPre	25	1.00	6.00	2.92	1.351
ExpPost	25	5.00	9.00	7.04	1.274
Valid N (listwise)	25				

The mean scores for the pretest and posttest of the control group were 2.76 and 5.16, while the mean scores for the pretest and posttest of the experimental group were 2.92 and 7.04, respectively. To compare the scores between the groups, ANCOVA was used accordingly. Table 8 below shows the result of the ANCOVA test.

Table 8. ANCOVA for the Comparison of the Pre-intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	58.311a	2	29.156	24.388	.000	.509
Intercept	257.700	1	257.700	215.557	.000	.821
pretest	14.131	1	14.131	11.820	.001	.201
groups	41.302	1	41.302	34.547	.000	.424
Error	56.189	47	1.196			
Total	1975.000	50				
Corrected Total	114.500	49				

Based on Table 8, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary learning scores at the pre-intermediate level $F(1,47) = 34.54, p < .05$, partial $\eta^2 = .42$. Therefore, using the WhatsApp bot had a statistically significant effect on Omani pre-intermediate EFL learners' vocabulary learning in comparison to teacher's instructions.

The following table shows the descriptive statistics of the pretests and posttests of the two groups for intermediate-level learners.

Table 9. Statistics for the Pretest and Posttest Scores of the Intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	1.00	6.00	3.40	1.258
ContPost	25	3.00	7.00	4.48	1.122
ExpPre	25	1.00	8.00	4.00	1.707
ExpPost	25	6.00	10.00	8.24	.879
Valid N (listwise)	25				

Based on Table 9, the mean scores for the pretest and posttest of the control group were 3.40 and 4.48, while the mean scores for the pretest and posttest of the experimental group were 4 and 8.24, respectively. The comparison of two groups at the intermediate level revealed the following data in Table 10 based on ANCOVA:

Table 10. ANCOVA for the Comparison of the Intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	190.948a	2	95.474	129.796	.000	.847
Intercept	171.510	1	171.510	233.166	.000	.832
pretest	14.228	1	14.228	19.343	.000	.292
groups	150.568	1	150.568	204.695	.000	.813
Error	34.572	47	.736			
Total	2248.000	50				
Corrected Total	225.520	49				

Table 10 revealed that there was a statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the intermediate level, $F(1, 47) = 204.69$, $p < .05$, partial $\eta^2 = .81$. Using WhatsApp bot had a statistically significant effect on EFL learners' vocabulary learning at the intermediate level in comparison to teacher's instructions.

The following table shows the descriptive statistics for the pretest and delayed posttest scores to measure the use of WhatsApp bot and vocabulary retention.

Table 11. Statistics for the Pretest/Posttest of the Three Levels

	N	Minimum	Maximum	Mean	Std. Deviation
ELM_ExpPre	25	.00	5.00	2.56	1.293
ELM_Exp_Delayed	25	2.00	5.00	3.64	.700
Prei_ExpPre	25	1.00	6.00	2.92	1.351
Prei_Exp_Delayed	25	2.00	5.00	3.84	.850
Int_ExpPre	25	1.00	8.00	4.00	1.707
Int_Exp_Delayed	25	3.00	8.00	5.96	1.457
Valid N (listwise)	25				

Based on Table 11, the pretest and delayed posttest scores for the elementary, pre-intermediate, and intermediate groups are 2.56, 3.64; 2.92, 3.84; and 4, 5.96, respectively.

Table 12. Wilcoxon-Singed Rank Test for the Vocabulary Retention within Each Level

	Elementary	Pre-intermediate	Intermediate
Z	-2.878b	-2.327b	-4.021b
Asymp. Sig. (2-tailed)	.004	.020	.000

The Wilcoxon signed-rank test (Table 12) shows that there was a statistically meaningful difference between the pretest and posttest of the vocabulary scores at the (1) elementary level ($Z = -2.87$, $p < .05$), (2) pre-intermediate level ($Z = -2.32$, $p < .05$), and (3) intermediate level ($Z = -4.02$, $p < .05$). Therefore, it can be concluded that WhatsApp bot had a statistically significant effect on Omani EFL learners' vocabulary retention.

The following table shows the descriptive statistics of the pretests and posttests of the two groups for the elementary level.

Table 13. Statistics for the Pretest and Posttest Scores of the Elementary Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	5.00	2.60	1.354
ExpPre	25	.00	5.00	2.56	1.293
Cont_Delayed	25	2.00	4.00	3.44	.583
Exp_Delayed	25	2.00	5.00	3.64	.700
Valid N (listwise)	25				

Based on Table 13, the mean scores for the pretest of the control and experimental groups were 2.60 and 2.56, while the mean scores for the delayed test of the control and experimental groups were 3.44 and 3.64, respectively. Table 14 below shows the result of the ANCOVA test.

Table 14. ANCOVA for the Comparison of the Elementary Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.651a	2	.325	.773	.467	.032
Intercept	134.382	1	134.382	319.481	.000	.872
pretest	.151	1	.151	.358	.552	.008
groups	.491	1	.491	1.168	.285	.024
Error	19.769	47	.421			
Total	647.000	50				
Corrected Total	20.420	49				

As Table 14 shows, there was not any statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the elementary level, $F(1,47) = 1.16, p > .05$, partial $\eta^2 = .02$. Therefore, the use of WhatsApp bot did not have a statistically significant effect on EFL learners' vocabulary retention of elementary students.

The following table shows the descriptive statistics of the pretests and posttests of the two groups of pre-intermediate level.

Table 15. The Descriptive Statistics for the Pretest and Posttest Scores of the Pre-intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	.00	6.00	2.76	1.562
ExpPre	25	1.00	6.00	2.92	1.351
Cont_Delayed	25	2.00	4.00	3.36	.568
Exp_Delayed	25	2.00	5.00	3.84	.850
Valid N (listwise)	25				

In Table 15, the mean scores for the pretest of the control and experimental groups were 2.76 and 2.92, while the mean scores for the delayed test of the control and experimental groups were 3.36 and 3.84, respectively. Table 16 below shows the result of the ANCOVA test.

Table 16. ANCOVA for the Comparison of the Pre-intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3.049a	2	1.524	2.872	.067	.109
Intercept	139.765	1	139.765	263.275	.000	.849
pretest	.169	1	.169	.318	.575	.007
groups	2.949	1	2.949	5.556	.023	.106
Error	24.951	47	.531			
Total	676.000	50				
Corrected Total	28.000	49				

As Table 16 shows, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the pre-intermediate level, $F(1, 47) = 5.56, p < .05$, partial

$\eta^2 = .10$. Therefore, the use of WhatsApp bot had a statistically significant effect on EFL learners' vocabulary retention of pre-intermediate students.

The following table shows the descriptive statistics of the pretests and posttests of the two groups for intermediate learners.

Table 17. Statistics for the Pretest and Posttest Scores of the Intermediate Level

	N	Minimum	Maximum	Mean	Std. Deviation
ContPre	25	1.00	6.00	3.4000	1.25831
ExpPre	25	1.00	8.00	4.0000	1.70783
Cont_Delayed	25	2.00	7.00	4.6800	1.14455
Exp_Delayed	25	3.00	8.00	5.9600	1.45717
Valid N (listwise)	25				

In Table 17, the mean scores for the pretest of the control and experimental groups were 3.40 and 4, while the mean scores for the delayed test of the control and experimental groups were 4.68 and 5.96, respectively. Table 18 below shows the result of the ANCOVA test.

Table 18. ANCOVA for the Comparison of the Intermediate Level

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	37.760a	2	18.880	13.627	.000	.367
Intercept	100.475	1	100.475	72.517	.000	.607
pretest	17.280	1	17.280	12.472	.001	.210
groups	12.979	1	12.979	9.368	.004	.166
Error	65.120	47	1.386			
Total	1518.000	50				
Corrected Total	102.880	49				

As Table 18 shows, there was a statistically significant difference between the control and the experimental groups regarding their vocabulary scores at the intermediate level, $F(1, 47) = 9.36, p < .05$, partial $\eta^2 = .16$. Therefore, the use of WhatsApp bot had a statistically significant effect on EFL learners' vocabulary retention of intermediate students.

Question 4 was raised to find the EFL learners' perceptions concerning using chatbots in language learning. The following table shows the descriptive statistics of the test perception questionnaire.

Table 19. Statistics Analysis for the Perception Questionnaire

	N	Minimum	Maximum	Mean	Std. Deviation
Sum	75	50.00	83.00	72.84	9.98
Valid N (listwise)	75				

Based on Table 19, the minimum and maximum scores are 50 and 83, and the mean and standard deviation scores are 72.84 and 9.98, respectively.

Table 20. Item Analysis for the Perception Questionnaire

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Status
item1	75	1	4	3.09	Average
item2	75	1	4	3.15	Average
item3	75	2	3	2.73	Average
item4	75	1	4	3.33	Average
item5	75	1	4	3.11	Average
item6	75	2	3	2.93	Average
item7	75	1	5	2.88	Average
item8	75	2	4	3.13	Average
item9	75	1	4	3.49	High
item10	75	1	3	2.71	Average
item11	75	1	3	2.83	Average
item12	75	2	4	3.07	Average
item13	75	1	4	3.24	Average
item14	75	2	3	2.73	Average
item15	75	1	3	1.84	Average
item16	75	1	3	2.01	Average
item17	75	1	4	3.31	Average
item18	75	1	4	3.19	Average
item19	75	1	3	2.95	Average
item20	75	1	3	2.71	Average
item21	75	1	4	3.20	Average
item22	75	1	4	2.96	Average
item23	75	1	4	3.04	Average
item24	75	1	4	3.31	Average
item25	75	1	4	1.91	Average
Valid N (listwise)	75				

The items were in a Likert-scale format, from strongly disagree (1) to strongly agree (5). The researchers divided the scores (1 to 5) by three: Up to 1.66 shows low, from 1.67 to 3.33 shows average, and from 3.34 to 5 shows high motivation strategy scores. As Table 20 indicates, only item 9 (using chatbots in language learning allows the learners to study outside of the classroom) showed high perception, and the rest showed average perception. Among the average perceived ones, item 4 (I find chatbots in language learning to be flexible to interact with) was the highest, and item 15 (I am completely satisfied in using chatbots for language learning.) was the lowest.

DISCUSSION

The current study focused on designing a WhatsApp bot to measure its effects on vocabulary learning among Omani EFL students. In addition, the paper tried to compare the vocabulary tests among the students who received the words through WhatsApp bot or the teacher to measure the effective way to assist the language learners further.

After conducting 9 pretests, posttests, delayed posttests, and some statistical analysis, it was revealed that using the WhatsApp bot helped students of elementary, pre-intermediate, and intermediate to learn the words better in experimental groups in comparison to the control group. In addition, the study found that the experimental groups in preintermediate and intermediate levels outperformed their counterparts in vocabulary retention

tests, while in the pre-intermediate level, no significant differences were found between experimental or control groups. The following comparison of results between this study and others was elicited.

The results of this paper align with the findings of Yin et al. (2021), who developed a study based on chatbot learning to measure students' performance and motivation. Although the study showed students' improvements in the learning context, the results were not considered significant. Other studies by some chatbot specialists (Cheng et al., 2022; Chen et al., 2020) found that chatbot-based learning significantly affected the participants' achievements.

Abbasi and Kazi (2014) found that the students' memory retention and learning results of those who used chatbots during the learning process were remarkable, aligning with the current study's findings.

The findings of this study are for and against the results of As Sabiq and Fami (2020). They found that the chatbot was successful in the academic environment as supplementary teacher assistance. They helped the teachers to facilitate the delivery of materials and assessments. Based on their findings, using chatbots beside teacher-based instructions could improve the students' engagement and enthusiasm in the learning process.

The findings of the current study are against the findings of Chaiprasurt et al. (2022), who focused on using chatbots in learning to measure the motivation of the participants and stated that there was a huge gap between normal classes and chatbot usage. Their results revealed that the level of engagement among the participants increased dramatically. Tangkittipon et al. (2020) also showed a higher level of engagement after implementing chatbots, while participants of this study did not show such a type of excitement. The results are against the study by Folstad et al. (2014), whose findings revealed that the participants showed a positive attitude toward implementing new technology in learning environments.

CONCLUSION

The results of this comprehensive study on using WhatsApp bots determined that using such types of bots will facilitate the language learning process. Statistics revealed that the results of students in experimental groups of two levels show a significant effect of receiving instructions by WhatsApp bot. However, it was not approved in one of the levels. The logical explanation to justify the positive impact of WhatsApp bot is that, in the face-to-face instructions by the teacher, students are listeners, and they do not write materials taught by the teacher; however, since the new generation is interested in using mobile phones, most of the time, then sending the instructions for them through phone is helpful, accessible, and in case they are more of visual learners, then beneficial too.

The study has some implications for the teachers and learners concurrently. Based on the results of this study, it was approved that using bots in language learning can help the students improve their vocabulary level, so these bots will give them permanent access to the materials that assist them in progressing faster. In addition, teachers can use these bots to provide extra training, assessment, or materials to their students as supplementary tools, as the role of technology and artificial intelligence cannot be neglected in people's daily routines and academic lives.

This study has some limitations, concerns, and suggestions for further research.

- The population of this study was selected among Omani EFL candidates in one of the institutions in Oman, which makes the generalizability of the study difficult. Considering other proficiency levels of students, such as upper intermediate, advanced students, and higher education students, will reveal comprehensive results in designing and developing suitable educational technological tools.
- Since each institution has technological support and devices, further research in other locations in Oman or other countries may design a better map of technological effects on education.
- The application used in this study was a WhatsApp bot to learn vocabulary. Further research can be done to measure the effect of bots in other applications such as Messenger, and other skills, such as grammar, punctuation, and writing, to exemplify a few of them, can be beneficial.
- And finally, this bot was a one-way instruction from the host to the students. It would be fantastic if further interactive bots were designed so the learners could communicate and further analyze their language productions and mistakes.

BIODATA and CONTACT ADDRESSES of AUTHORS



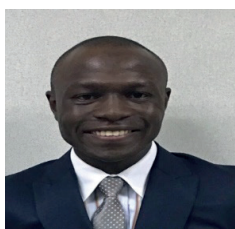
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APPENDIX 1

Samples Screenshot of the WhatsApp Bot

advice of a qualified engineer.
Synonym: designer

🗨️ **Word:** model
Part of speech: noun
Definition: it is an object that shows what something looks like or how it works
Example in sentence: The two houses were built after the same model.
Synonym: copy

🗨️ **Word:** famous
Part of speech: adjective
Definition: known about by many people in many places
Example in sentence: Many famous people have stayed in the hotel.
Synonym: well-known
Antonym: unknown

🗨️ **Word:** history
Part of speech: noun
Definition: all the things that

🗨️ **Word:** sequence
Part of speech: noun
Definition: the order that something happens or exists in, or it is supposed to happen or exist
Example in sentence: We go to the classroom in sequence.
Synonym: chain
Antonym: stoppage

🗨️ **Word:** engineer
Part of speech: noun
Definition: someone whose job is to design or build roads, bridges, machines
Example in sentence: You need the advice of a qualified engineer.
Synonym: designer

🗨️ **Word:** model
Part of speech: noun
Definition: it is an object that shows what something looks like or how it works

+ 🗨️

APPENDIX 2

The Perception Questions

1. I find chatbots easy to use
2. Learning how to use chatbots is easy for me
3. It is easy to become skillful at using chatbots in language learning
4. I find chatbots in language learning to be flexible to interact with
5. The interaction with chatbots in language learning is clear and understandable
6. Using chatbots in language learning would increase the students' learning performance
7. Using chatbots in language learning would increase academic productivity
8. Using chatbots would make language learning easier
9. Using chatbots in language learning allows the learners to study outside of the classroom
10. Using chatbots in language learning is useful for context-based interactions as in real life
11. Chatbots enable students to learn more quickly in language learning
12. Chatbots make it easier to innovate in language learning
13. The advantages of chatbots in language learning outweigh the disadvantages
14. I believe that using chatbots will increase the quality of language learning
15. I am completely satisfied in using chatbots for language learning
16. I am very confident in using chatbots in language learning
17. Using chatbots in language learning is a good idea
18. I am positive towards using chatbots in language learning
19. Using chatbots in language learning is fun
20. I intend to use chatbots in language learning frequently
21. I intend to learn more about using chatbots in language learning
22. I feel confident in using chatbots in language learning
23. I have the necessary skills for using chatbots in language learning
24. I like to experiment with new technologies in language learning
25. Among my peers, I am usually the first to explore new technologies