Online-Journals.org

iJEP International Journal of Engineering Pedagogy

iJEP | eISSN: 2192-4880 | Vol. 14 No. 4 (2024) | OPEN ACCESS

https://doi.org/10.3991/ijep.v14i4.48461

PAPER

Investigating the Effect of an Interactive Educational Chatbot on Reading Comprehension Skills

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ABSTRACT

This study aimed to investigate the implementation of an interactive chatbot as a facilitator to assess its effects on reading skills. To this end, 60 Omani intermediate English as a Foreign Language (EFL) learners from a higher education institute were selected as the population and divided into two experimental and control groups with an equal number of learners. Several research-based reading tests have been developed, validated, and piloted to ensure reliability, as measured by Cronbach's alpha. The test results for the pre-, post-, and delayed post-tests were 0.889, 0.767, and 0.850, which ensured reliability. Although both groups received instructions and practiced reading skills based on the department's curriculum and delivery plan, an interactive WhatsApp bot was designed to provide additional instructions and exercises for the experimental group for three weeks. A Kolmogorov-Smirnov test was conducted to assess data normality and determine whether parametric- or nonparametric-tests should be used. The results indicated non-normality in all data sets ($p < .05$) except for the pre-test data of the experimental group ($p > .05$); Consequently, the Wilcoxon test was employed to analyze results within the groups, while the Mann-Whitney U test was utilized to compare the groups. The interpretation of the test within the control group revealed that learners performed significantly differently in the post- and delayed post-tests ($Z = –4.80, –2.95 < .05$). Similarly, the results of learners in the experimental group showed that they performed significantly better in the post- and delayed post-tests than in the pre-test ($Z = –4.79, –4.80 < .05$). Finally, the comparison of both groups based on the Mann-Whitney U test revealed that the experimental group outperformed the control group in the post-test and delayed post-test ($U = .00$, $p < .05$). Therefore, it could be concluded that chatbots could be beneficial within the learning process, particularly for improving reading skills. These results are promising for teachers and students who utilize technological devices in their learning and teaching practices.

KEYWORDS

chatbot, English as a Foreign Language (EFL), learning, reading skills

Behforouz, B., Al Ghaithi, A. (2024). Investigating the Effect of an Interactive Educational Chatbot on Reading Comprehension Skills. *International Journal of Engineering Pedagogy (iJEP)*, 14(4), pp. 139–154. https://doi.org/10.3991/ijep.v14i4.48461

Article submitted 2024-02-08. Revision uploaded 2024-03-12. Final acceptance 2024-03-12.

1 INTRODUCTION

Chatbots, often referred to as conversational agents, use natural language processing (NLP) technology to enable human-computer interactions [1], [2]. Due to their ability to mimic human conversations and automate services, chatbots are becoming increasingly common in various industries, including healthcare [3], consumer services [4], education [5], and academic advising [6].

Educational chatbots are becoming increasingly popular due to their ability to engage students and provide a personalized learning experience at an affordable cost [7]. In the context of education, chatbots can facilitate the learning process by instantly providing students with access to course materials [8], assignments [9], practice questions [10], and study materials [11]. Additionally, chatbots can engage with students one-on-one [12] or facilitate group projects for learning [13], [14].

Thomas [15] discussed the advantages of educational chatbots for students and teachers, demonstrating that they are successful educational tools. Their benefits outweigh their drawbacks and provide a more efficient learning environment [16].

Reading comprehension is a skill that focuses on understanding a text, decoding the information needed to acquire knowledge, and deriving pleasure from it. Reading involves various sub-skills, such as skimming, scanning, note-taking, and prediction [17]. Based on communicative language learning (CLL), reading is divided into two main sub-skills: skimming and scanning. Skimming involves reading to grasp the main idea of the text, while scanning involves reading to locate specific information. Both reading strategies require a quick and efficient pace [18]. Skimming and scanning strategies play important roles in helping students address reading comprehension issues [19]. These two text decoding techniques can be enhanced through computer-mediated communication (CMC), such as WhatsApp. By participating in collaborative learning based on content management systems (CMS), students can receive immediate feedback, which is beneficial in the learning process. Some scholars [20] [21] believe that CMS plays a functional role in modeling reading skills such as proofreading, editing, skimming, and scanning.

D'Eca [22] claims that no perfect method or technique in language learning or teaching can solve all challenges faced by English as a Foreign Language (EFL) users. Among the available technological instruments, WhatsApp can be a helpful tool for motivating learners through interactions beyond traditional classrooms. WhatsApp enables learners to improve their language-learning skills in an exciting and collaborative way. According to [23], the use of WhatsApp in classes could be considered an icebreaker. To this end, WhatsApp enables learners to interact with their peers and teachers, facilitating immediate electronic feedback and avoiding traditional pen-and-paper corrections. In addition, using WhatsApp enables anxious and academically weak students to participate freely in instructed activities and engage in class discussions.

This paper has the following sections: Section 2 is devoted to a literature review on the use of chatbots in the language learning context, the utility of WhatsApp in the language learning environment, and the impact of WhatsApp and chatbots on learners' reading comprehension. Section 3 introduces the study participants, the instruments to be used, their measured reliability, and a detailed study procedure. Section 4 focuses on the statistical analysis and the results derived from the tests, as well as the evidence of the significance of the results. Section 5 presents a detailed discussion of the study's findings and compares them with other studies in a similar area. Section 6 presents the conclusions and research perspectives.

2 LITERATURE REVIEW

2.1 Chatbots in learning language

Chatbots have attracted the interest of researchers studying language learning and teaching because of their ability to converse with users in a target language [24], [25], [13]. The term "chatbot-supported language learning" refers to the use of a chatbot to interact with students using natural language for daily language practice. This includes conversation practice [24], answering questions about language learning (e.g., storybook reading [4]), conducting assessments, providing feedback (e.g., vocabulary tests), and addressing inquiries related to language [25].

Huang et al. [26] state that teachers can create chatbots independently using visual chatbot development tools without prior programming knowledge. For instance, Dialogflow from Google allows customers to integrate preset databases to customize conversational content. Teachers can structure students' learning experiences by aligning them with the intended learning objectives through a customized dashboard on an online chatbot platform, such as BotStar, that allows users to easily create conversational flows using drag-and-drop features. Artificial intelligence and machine learning approaches have recently enhanced chatbots' ability to adapt to unstructured inputs from end users. Active dialogue practice and sufficient immersion in language-learning environments critically influence learners' communication and language proficiency. However, the reluctance of many students to communicate in their second or foreign language poses a persistent challenge for language teachers when incorporating chatbots in educational settings [27], [28]. Chatbot researchers have proposed that creating a more dynamic and authentic language environment through chatbot-supported activities can enhance students' language-learning outcomes. Compared to speaking with a human companion, chatbots have the potential to help students feel less nervous when practicing their language skills [29].

According to the theory of transactional distance, there is a psychological and communicative gap between the instructor and learner in an online learning environment, which leaves room for potential misunderstandings [30]. Learners are more likely to feel satisfied with the learning environment if their transactional distance decreases. By allowing the learner to participate in the course material through discussion, chatbots can help reduce transactional distance. Chatbots are always available to assist students [31]. They allow students to practice their language skills at any time, a task that would be challenging for a human partner to accommodate [32], [33]. Chatbots can provide students with access to a variety of linguistic resources that their human language partners may not be able to access. A well-designed chatbot may include a wide variety of phrases, inquiries, and language to provide more details. Third, chatbots can be tireless helpers, relieving people of monotonous tasks such as maintaining language practice and responding to commonly asked queries [34], [35]. Students can continuously practice their foreign language skills with chatbots as learning partners [34].

2.2 WhatsApp in the language learning context

A plethora of research has elucidated the benefits of WhatsApp for the expansion of second language (L2) vocabulary. In a study by [36], an experimental group

utilized WhatsApp to send their teacher a sentence-building assignment, while a control group completed the same assignment in a traditional classroom setting. The experimental group outperformed the control group and showed enthusiasm for using WhatsApp. WhatsApp encourages class members who tend to be quiet and insecure to express themselves better.

Çetinkaya and Sütçü [37] compared vocabulary learning on Facebook and WhatsApp while exploring students' perceptions of each platform. Through Facebook and WhatsApp, informational messages about words were distributed, including English definitions, Turkish definitions, and example sentences. Scores from both experimental groups were compared with those of a control group that took the test in a classroom. The WhatsApp group outperformed the Facebook group in this regard. Overall, students in the experimental groups responded well to social networking sites and demonstrated significant improvements in vocabulary compared to the control group.

Awada [38] promoted the development of critical writing skills and enhanced motivation among university students through the use of WhatsApp. The students in both the control and experimental groups were asked to write a critique essay with five components. During the treatment, WhatsApp was used to mediate communication between the teacher and students in the experimental group to enhance collaboration and improve proficiency in critiquing. The experimental group received instructions on designing and writing the critique steps via WhatsApp. In contrast, the control group received traditional instructions that were essential for the critique-writing process. The results of the study revealed that the implementation of WhatsApp helped the experimental group improve their proficiency in critique writing compared to the control group. Moreover, the results showed that using WhatsApp increased motivation among the participants.

Khan [39] conducted a study to measure the effect of WhatsApp on reading motivation and determine the type of motivation that is effective in the Pakistani EFL context. A researcher-designed questionnaire was developed to collect data on this matter. The findings showed a high level of motivation among the study participants. In contrast, he discovered that the university administration, certain professors, and parents did not favor its usage.

In another study, [40] conducted research to determine the effect of using WhatsApp as a facilitator to acquire phonetic rules and improve listening skills. This study was conducted among 45 Turkish students. The students were divided into two groups: Group A (experimental) and Group B (control). An experimental group was added to the channel created by the teacher on WhatsApp. The experimental group received instructions via WhatsApp for four weeks, both inside and outside the classroom. After each week's instruction, the students were asked to complete and share a task through the channel. The study showed no significant difference between the results of the control and experimental groups in the transcription post-tests. Although students in both groups received specific teaching techniques, there were no statistically significant differences at the end of the study. [40] stated that perhaps merging traditional instructional methods with technological advancements may lead to better outcomes.

2.3 WhatsApp and reading comprehension

Khalaf [17] examined the effects of WhatsApp and email on the development of skimming and scanning reading skills in 10th-grade female students aged

15–16 years in Jordan. Students in the control group were exposed to the conventional method instructed by the Ministry; however, the experimental group received the instructions via email, WhatsApp, or a combination of the two platforms. Based on the findings of this study, students in the experimental group outperformed their counterparts in the control group in skimming and scanning activties. In addition, it was found that receiving instructions through both channels was more effective in enhancing scanning skills than skimming within the experimental group.

Another study [41] examined the effects of using WhatsApp to enhance the reading skills of 30 male Saudi English language learners and explored their perceptions of the English language learning process following the integration of WhatsApp in their studies. Interview sessions were conducted in focus groups to assess students' preparedness and anxiety levels regarding WhatsApp. In addition, a pre-test and post-test were conducted to better understand participants' development and progress in reading comprehension skills. To this end, the control group received instructions using the conventional technique, while the experimental group received instructions using the conventional method and WhatsApp interaction. During the 10-week treatment period, the experimental group received a list of words along with an audio clip. The results revealed that the experimental group outperformed the control group on the post-test. Furthermore, WhatsApp has had a positive impact on students' collaboration and their ability to stay connected with their peers. Students' perceptions were positive towards using WhatsApp in the learning process, as they demonstrated increased interest and readiness to use it more frequently.

According to [42], using WhatsApp as a mobile-assisted language learning tool can enhance learners' English reading and writing skills. 20 EFL undergraduate students from Aden University participated in a WhatsApp English-medium group with the researcher. They engaged in conversations, shared news items, and provided comments over a period of two months. Pre-tests, post-tests, and questionnaires were utilized to gather data on the participants' perceptions of WhatApp's impact on enhancing their reading and writing abilities. The study discovered that WhatsApp was successful in helping participants improve their writing and reading abilities. Their vocabulary, grammar, reading comprehension, and writing abilities improved significantly.

Warman [43] investigated the impact of using WhatsApp in blended learning on students' reading comprehension. Forty Indonesian students participated in this study. The information was gathered through interviews and questionnaires. The results of this study demonstrated that most participants found using WhatsApp in blended learning for reading comprehension to be beneficial, efficient, and convenient for learning English. The results of the interviews also showed that using WhatsApp in blended learning enhances students' academic performance and learning activities. These advantages can be extended to students' learning outcomes, especially in terms of their ability to comprehend what they read.

Silalahi and Pariyanto [44] investigated how Indonesian EFL students perceive WhatsApp as a facilitating tool for enhancing their reading and writing abilities. A 12-item questionnaire was used to gather the students' perceptions on this matter. The results of the study revealed that learners considered WhatsApp to be a positive educational tool that helps improve reading and writing skills. In addition, students believed that implementing WhatsApp supported the development of subskills, such as vocabulary and grammar, and provided an opportunity to discuss the issues with their peers.

2.4 Chatbot and reading skills

The use of chatbots in education has recently been the subject of various studies. These studies examined how chatbots were used by EFL and ESL students in learning English, including their impact on students' speaking and reading abilities [35], their influence on children's reading comprehension [45], [46], and their potential to enhance language learning for students [29].

Kim [35] investigated the effects of chatbots on the English listening and reading abilities of 46 college students. They were divided into two random groups: control ($n = 22$) and experimental ($n = 24$). The experimental group interacted with a chatbot named Elbot for 16 weeks, participating in ten sessions where they discussed their daily lives. Both the pre- and post-tests were conducted before and after using the chatbot to verify the results. The main conclusions are as follows: The participants in both groups significantly improved their reading and listening skills. However, the experimental group showed more significant improvements on the post-listening exam. After conversing with the chatbot, their listening proficiency increased from intermediate to advanced.

Xu et al. [46] conducted a research study to compare the performance of children based on reading comprehension skills in two different settings: human-to-human conversation environments and chabot-assisted settings. The children in the experimental group were given instructions on how to comprehend the story from the chatbot. In contrast, the children in the control group received instructions from a human teacher. The study's results revealed that children who experienced guided communication with conversation agents or human language partners answered the story comprehension questions correctly more often than those who did not. In addition, a post hoc analysis was conducted to measure the comprehension scores of children who engaged in a guided conversation with a conversational agent compared to those who interacted with a human partner. The scores of the students who communicated with the conversational agent were similar to those who communicated with humans.

Ryan and Deci [47], [48], [33], [18], and [49] contend that to assess the significance of chatbots, it is crucial to examine how they support learning theory in various learning environments. As a result, this study will contribute to the existing body of knowledge on chatbot-based learning, functionality, usability, and user satisfaction. Additionally, it will keep experts informed about chatbot utilization in the classroom. Therefore, the objective of the current study was to understand the extent to which a WhatsApp Bot can enhance Omani students' English reading comprehension skills.

The research question addressed in this study is: Does teaching and practicing reading comprehension strategies through a WhatsApp Bot affect the reading ability of Omani EFL learners?

3 MATERIALS AND METHODS

This study used a quantitative method to investigate the research question. This section thoroughly discusses the study's sample population, the development and implementation of the instruments, and the comprehensive procedures used to test the treatment and compare learners' performance in the pre-test, post-test, and delayed post-test. Before analyzing the aforementioned criteria in detail, Figure 1 summarizes this section to enhance the understanding of the methodology.

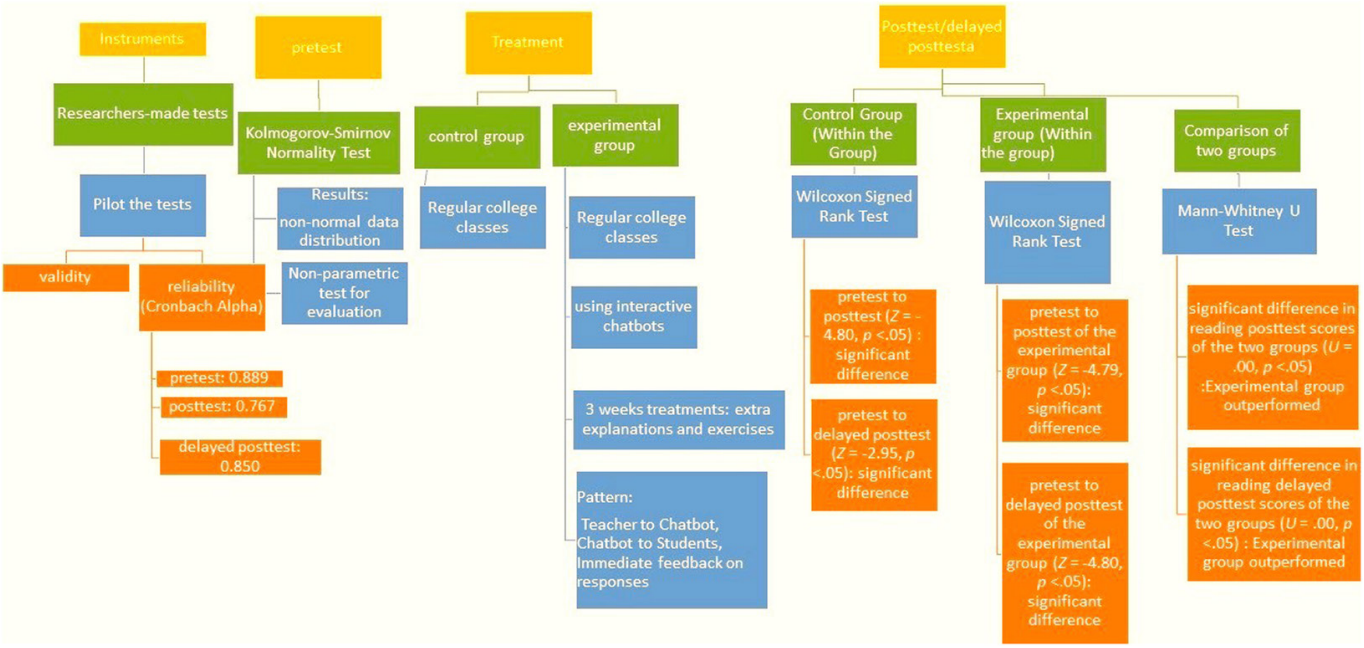

Fig. 1. Block diagram of the proposed methodology

3.1 Participation

The participants of this study were 60 Omani EFL learners randomly selected from the General Foundation Program (GFP) in Oman. The participants' first language was Arabic, and their ages ranged from 18 to 19 years. There was a mix of males and females. Based on the university's placement test, they were selected from an intermediate English proficiency level. During the required foundation year, students are encouraged to learn English as well as other subjects such as mathematics and IT skills. For the present research, the sampled students included those interested in engineering, law, business, IT, and education specialties. To measure the effectiveness of the treatment on students' performance, the 60 students were divided into two groups: a control group and an experimental group, with 30 students in each group.

3.2 Research instruments

The instruments used in the data collection process were as follows:

Reading tests. To measure the impact of the WhatsApp bot on English reading skills among Omani students, the researchers designed reading passages to be conducted as a pre-test, post-test, and delayed post-test to monitor the participants' performance before and after implementing the treatment. Three tests were performed in this study.

All tests consisted of three tasks, each with eight questions, so the total number of questions in each test was 24. The first task included True, False, and Not Given questions. The second task covered multiple-choice questions, and the last task involved fill-in-the-blanks.

The results of the questions were analyzed using SPSS software version 16.0. Prior to conducting the tests, they were validated by two Ph.D. holders in applied

linguistics and piloted by a group of 25 Omani EFL students at the same college. Table 1 summarizes the main reliability test results.

Table 1. Results of the reliability analysis for the pre-, post-, and delayed post-tests

Cronbach's Alpha	Participants (Total)	Nbr of Items
.889	25	24
.767	25	24
.850	25	24

Table 1 shows that the Cronbach's alpha reliabilities for the pre-, post-, and delayed post-tests are 0.889, 0.767, and 0.850, respectively. Therefore, the numbers indicate a relatively high reliability of the researcher-developed reading tests.

Reading strategies. While learners are studying the Foundation Program, mastering reading strategies is one of the main objectives of the module. Scanning and skimming are the two most crucial reading strategies. The students received training, explanations, and practice on the two skills mentioned above, as well as identifying keywords in the text. During the treatment, along with each text and its questions, the experimental group received a three-paragraph explanation of the three factors mentioned earlier. These explanations were also translated into Arabic.

Reading passages. The reading passages covered in this study were selected from NorthStar 3, the reading and writing module, 4th Edition. Based on these passages, the pre-test, post-test, and delayed post-test were conducted. Pearson Education Limited published this series specifically for the Gulf Cooperation Council (GCC).

WhatsApp bot. The Python programming language was used to design an interactive WhatsApp bot to practice reading strategies and provide additional exercises for the experimental group. The program was then associated with a local phone number. Participants could receive treatment by contacting the relevant number.

The researchers designed 10 interactive questions for each reading passage, including five true/false/not given questions, two multiple-choice questions, and three fill-in-the-blanks questions. In each case, the learners received the text and questions to answer. After replying to the questions, the WhatsApp Bot provided immediate feedback on the answers.

3.3 Procedures

The study was conducted during the regular academic semester in the fall of 2023–2024 at one of the universities in Oman, specifically in the North Al Batinah region, over a period of three weeks and across 10 sessions. The study was initiated with a pre-test conducted in both the control and experimental groups to ensure the homogeneity of participants based on their reading skills and to exclude students who received extreme marks. After the pre-test, the experimental group received clear instructions on using the messages from the WhatsApp Bot, the immediate feedback they would receive, and the infinite number of attempts available for them to try until they found the best answer. The control and experimental groups followed the teachers' instructions to enhance their reading skills. However, the

experimental group received more explanation and practice on reading strategies and texts outside the classroom using a WhatsApp bot. During the treatment, students received 10 reading texts along with brief explanations of related strategies and questions. The WhatsApp Bot has made it easy for students to revisit previous texts and practice them accordingly by sending numbers 1 to 10, with each number associated with a specific text. The bot can provide immediate feedback on whether the answer is correct or incorrect. After three weeks, the researchers conducted a post-test for both groups to measure the impact of additional activities through a WhatsApp Bot on the experimental group. Two weeks after the post-test, a delayed post-test was conducted to measure the long-term effect of the treatment on reading skills performance.

3.4 Ethical considerations

To collect the data legally, the proposal to conduct the study was submitted to the authorities for their review and approval. In addition, clear and practical instructions were provided to the research participants at the outset so that they could review them prior to the data collection procedures. All participants agreed to join the research voluntarily after being categorically informed that their information would be handled confidentially.

4 MAIN RESULTS

In the first step, the descriptive analysis of participants from both groups in the pre-, post-, and delayed post-tests was conducted. The statistics, including the mean and standard deviation (SD) scores of the two groups, are shown in Table 2.

As indicated in Table 2, the mean scores for the control group's pre-, immediate post-, and delayed post-tests were 4.60, 9.30, and 5.90, respectively. The mean scores on the experimental group's pre-, immediate post-, and delayed post-tests were 4.93, 18.46, and 17.30, respectively. Before testing the related research hypothesis, it is necessary to determine the normality of the data distribution for the pre-test, post-test, and delayed scores. The normality test is vital because it plays a crucial role in selecting parametric or nonparametric tests for data collection [50]. To accomplish this, the researcher conducted a Kolmogorov-Smirnov test, and the results are summarized in Table 3.

Table 2. Descriptive statistics for the pre-test, post-test, and delayed scores of the two groups

	N	Min	Max	Mean	SD
Con_Pre	30	.00	11.00	4.600	2.485
Con_Post	30	7.00	14.00	9.300	1.744
Con_Delayed	30	3.00	9.00	5.900	1.322
Exp_Pre	30	1.00	12.00	4.933	2.702
Exp_Post	30	17.00	20.00	18.466	.9732
Exp_Delayed	30	15.00	19.00	17.300	1.290
Valid N (listwise)	30				

Table 3. Results of the Kolmogorov-Smirnov test of normality

	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Con_Pre	.169	30	.028
Con_Post	.302	30	.000
Con_Delayed	.203	30	.003
Exp_Pre	.123	30	.200
Exp_Post	.241	30	.000
Exp_Delayed	.206	30	.002

As displayed in Table 3, the normality of the distribution was not confirmed for any of the score sets ($p < .05$), except for the pre-test of the experimental group ($p > .05$). Therefore, the nonparametric Wilcoxon test was used to compare the pre-test, post-test, and delayed post-test scores within each group. Table 4 displays the results of the inferential test for the control group.

Table 4. Results of the Wilcoxon test for the control group

	Con_Post – Con_Pre	Con_Delayed – Con_Pre
Z	–4.805	–2.956
Asymp. Sig. (2-tailed)	.000	.003

The Wilcoxon signed-rank test in Table 4 shows a statistically significant difference between the pre-test and post-test scores of the control group ($Z = –4.80$, $p < .05$). There was also a statistically significant difference between the pre-test and delayed post-test in the control group ($Z = –2.95$, $p < .05$). Table 5 compares the scores of the experimental groups.

Table 5. Results of the Wilcoxon test for the experimental group

	Exp_Post – Exp_Pre	Exp_Delayed – Exp_Pre
Z	–4.797	–4.801
Asymp. Sig. (2-tailed)	.000	.000

In Table 5, the Wilcoxon signed-rank test revealed a statistically significant difference between the pre- and post-test scores of the experimental group ($Z = –4.79$, $p < .05$). There was also a statistically significant difference between the pre-test and delayed post-test in the experimental group ($Z = –4.80$, $p < .05$). Table 6 compares the scores of the control and experimental groups.

Table 6. Results of the Mann-Whitney U test for the comparison of the two groups

	Post Score Comparison	Delayed Score Comparison
Mann-Whitney U	.000	.000
Z	–6.725	–6.708
Asymp. Sig. (2-tailed)	.000	.000

As shown in Table 6, there was a statistically significant difference between the reading post-test scores of the two groups ($U = .00$, $p < .05$). There was also a statistically significant difference between the reading delayed post-test scores of the two groups ($U = .00$, $p < .05$). Therefore, the participants in the experimental group performed better on the reading post- and delayed post-tests.

5 DISCUSSION

The primary objective of the current study was to assess the impact of AI design and implementation on English language learning. To achieve this goal, a WhatsApp bot was developed using programming languages to assess the impact of receiving instructions through the bot on the enhancement of reading skills among Omani EFL students at the intermediate proficiency level. Although the statistical analysis revealed that both groups had progressed in their reading skills after receiving different types of instructions, the experimental group showed better performance than the control group. Therefore, the WhatsApp bot is crucial for enhancing and strengthening learners' reading abilities.

The results of the study align with those of [42], who investigated the impact of WhatsApp on developing the reading and writing skills of male EFL students. The results showed a significant improvement in students' reading skills. He believed that this was mainly due to the interactions and activities carried out through WhatsApp in the experimental group. In another study with similar results to the current study, [41] attempted to conduct research in Saudi Arabia to measure the impact of using WhatsApp in an EFL environment with a focus on reading skills. The results revealed that the experimental group outperformed the control group in the post-test. This indicates that utilizing WhatsApp in the context of English language learning assisted them in enhancing their reading skills.

In addition to the studies mentioned above, [17] conducted a study on Jordanian EFL learners to measure the effect of WhatsApp on their skimming and scanning skills. The study results are consistent with those of the current researcher, indicating a significant improvement in skimming and scanning abilities among the experimental group that utilized WhatsApp during the learning process. In a similar study, [44] attempted to measure Indonesian EFL learners' perceptions of WhatsApp use during the learning process. The results showed that most students believed that WhatsApp could be a good and practical tool for enhancing their reading skills.

In a study conducted by [51] on Iranian EFL students using instant messages to receive vocabulary and measure its effects on reading comprehension, the results revealed no significant or positive changes in the reading abilities of the experimental and control groups. [52] conducted a study in Malaysia to measure various aspects of WhatsApp's effects on students' reading comprehension. The study's findings in a section requiring students' responses on the pedagogical opportunities provided by WhatsApp stated that students did not believe that WhatsApp could effectively provide a conducive learning environment to enhance their reading skills. This contrasts is contrary to the findings of the current study.

This study has some limitations that may be beneficial for researchers interested in working in similar areas:

– To generalize the findings of this study on implementing artificial intelligence (AI) in a language learning context, further research studies can be conducted to design a comprehensive map of the attitudes, motivations, and perceptions of numerous EFL students and teachers from various regions and institutions in Oman.

- The study focused on utilizing the WhatsApp bot for developing one specific skill: reading. Further studies could explore the implementation of WhatsApp bots in different language skills and sub-skills, including writing, listening, and grammar.
- The current study did not focus on gender-based analysis of AI implementation in language learning. Further studies could be recommended to assess EFL students' willingness to use technology based on gender.
- Since the primary students in this study were intermediate EFL learners, further studies could explore various English proficiency levels to assess their abilities, attitudes, and performance in utilizing and depending on artificial intelligence.
- Finally, implementing AI in other subjects, such as mathematics or physics, would be a good idea to ensure its practicality in education.

6 CONCLUSIONS

Selwyn and Grant [53] believe that conducting empirical studies to measure the effects of new tools in a natural learning context with authentic participants is inspiring. Therefore, to measure the impact of using a newly designed interactive WhatsApp bot to enhance the primary reading strategies of learners, such as skimming, scanning, and identifying keywords for various types of questions that correspond to the learning objectives of the curriculum, 60 Omani EFL learners participated in the study. They were divided equally into two groups: control and experimental. Both groups received similar results in the pre-test to ensure the homogeneity of their reading abilities. During the treatment, the experimental group received additional instructions and practice sessions through a WhatsApp bot that provided immediate feedback, while the control group continued with traditional face-to-face instructions. The post-test results indicated that the WhatsApp bot had a significant impact on the reading abilities of the experimental group. Furthermore, the delayed post-test demonstrated the high retention abilities of students in utilizing the WhatsApp bot for mediation purposes.

This study has implications for both teachers and students. The results suggest that utilizing an interactive WhatsApp bot is advantageous for students in enhancing their reading skills. Teachers can consider utilizing commonly and readily available technologies such as WhatsApp bots, to engage with students academically and help them develop learning strategies without being constrained by time or location. It will save a lot of time, especially for individuals with low academic performance. Students also benefit from this type of interaction with materials as they can practice more institutions in their free Additionally, they will be able to share their knowledge with their peers.

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