

Challenges and Motivation: Assessing Gemini's Impact on Undergraduate EFL Students in Classroom Settings

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Received: March 4, 2024

Accepted: May 14, 2024

Online Published: June 20, 2024

doi:10.5430/wjel.v14n5p501

URL: <https://doi.org/10.5430/wjel.v14n5p501>

Abstract

The current study aimed to identify the challenges students encountered when using Gemini to learn English as a Foreign Language (EFL) and how successfully it motivates undergraduate students to learn the language in classroom settings. A pre-post quasi-experimental design was used, and data was gathered through an online questionnaire. One hundred fifty female EFL students participated. The results showed statistically significant differences, at the 0.05 significance level, between the study sample's mean comments about how well Gemini as an AI tool motivates undergraduate students to learn EFL. The observed variations in the study significantly support the post-application stage. However, several challenges were identified in implementing Gemini in EFL, including repetitive words, limited vocabulary (62%), lengthy and non-concise answers (57.3%), uncertainty about information accuracy (49.3%), unclear question format comprehension (42%), and an abundance of similar information sources (39.3%). These findings call for further investigation to maximise Gemini's potential and address both its promises and challenges, ultimately improving the EFL learning experience for all students.

Keywords: EFL, motivation, AI, Gemini, higher education, Saudi Arabia

1. Introduction

Teaching English as a Foreign Language (EFL) is a complex challenge for teachers. These challenges require innovative teaching beyond traditional methods (Arini et al., 2022). Learner-centred approaches, with tasks, interdisciplinary skills, and authentic assessment, can foster a dynamic learning environment for effective integration. Traditional methods often struggle to engage students and sustain their motivation, a critical factor in foreign language learning (Wei, 2022; Goctu, 2016). Motivation impacts students' learning strategies, engagement, perseverance, and overall perspective on learning (Chiu et al., 2023). Motivation is described as a learner's 'willingness or desire to be engaged in or commit effort to complete a task' (Zhou, 2012, p. 1318). However, motivating EFL undergraduate students in face-to-face classrooms can be a complex and enduring challenge (Wolters, 2011). In this context, Artificial Intelligence (AI) tools offer a promising new approach to EFL pedagogy. AI tools can provide personalised feedback, immersive language practice, and interactive environments that can help to motivate learners and improve their language skills (Adolphs et al., 2018; Al-Mawaly & AL-Jamal, 2022; Kim et al., 2019; Putra, 2021; Rau et al., 2018; Wang et al., 2020; Xie et al., 2021). Gemini (Google Bard previously), as an AI tool, leverages advanced natural language capabilities (Adetayo & Oyeniya, 2023; Riyaz & Salim, 2023) to personalise EFL learning through interactive dialogue and immediate feedback (Zhai & Wibowo, 2023). This user-centric design fosters confidence, impartiality, increased motivation, engagement, and topic interest (Riyaz & Salim, 2023). Transcending classrooms, Gemini empowers students with tailored resources and personalised feedback, unlocking a transformative learning experience (Riyaz & Salim, 2023). Gemini's personalised approach signifies a paradigm shift in EFL pedagogy, paving the way for a more effective, engaging, and empowering future.

There is a growing interest in the potential of AI-powered EFL tools in Saudi Arabia. Studies suggest that these tools are well-received by students and can positively impact English language learning (Alhalangy & AbdAlgane, 2023; Makhlof, 2021; Othman, 2023). However, Altasan (2016) cautiously reminds us that complex motivational orientations and other factors are more likely to influence English achievement. Although initial evidence suggests AI tools like Gemini can personalise learning in Saudi EFL contexts, a deeper understanding of their multifaceted impact on learner motivation remains elusive. This research gap presents fertile ground for further investigation, aiming to unlock AI's true potential in shaping the motivational landscape of EFL learning in Saudi Arabia. Therefore, this study addresses the following research questions:

1. How effective is Gemini in motivating undergraduate female EFL students to learn in classrooms?
2. What challenges do undergraduate EFL students face in using Gemini in their classrooms?
3. To what extent does Gemini differentially influence EFL students' motivation to acquire writing, reading, listening, and speaking skills?

Drawing on the research questions, the current study contributes to EFL teaching theoretically and pedagogically. Theoretically, it illuminates the intricate interplay between AI tools, Saudi culture, and learner motivation, refining existing frameworks to encompass AI-supported learning and cultural nuances. Pedagogically, it equips educators with insights on maximising the motivational potential of AI tools like Gemini, informing the development of effective integration strategies, and fostering a more engaging learning environment for Saudi EFL students.

2. Literature Review

This section focuses on the influence of Artificial Intelligence (AI) applications in EFL learning. It explores previous research investigating the impact of AI tools, such as chatbots, virtual reality, and AI-mediated language instruction, on motivating EFL learners. It also highlights the challenges and complexities associated with leveraging AI for motivation in language education.

2.1 Artificial Intelligence in EFL Teaching and Learning

Artificial Intelligence (AI) rapidly permeates our lives, transforming diverse sectors and holding immense potential for revolutionising education, a cornerstone of societal progress. Advancements in AI have yielded novel teaching and learning technologies that are currently undergoing rigorous investigation in varied educational contexts (UNESCO, 2019). Previous research indicated that the implementation of AI applications in EFL instruction has significantly enhanced the reading, writing, listening, and speaking skills of college students (Abdelatif & Siddiqui, 2021; Makhoulouf, 2021; Zhai & Wibowo, 2023) and has the potential to enhance the EFL teaching and learning process (Zitouni, 2022). Many AI applications and programs aspired to be included in education, particularly in learning foreign languages. Every program has a specific purpose, such as improving students' speaking, listening, writing, and communication skills (Ribeiro, 2020). By utilising artificial intelligence, language learning is set to undergo a revolutionary change. AI-driven solutions offer individualised, diverse, and captivating educational experiences that prepare students for the future and enable teachers to create dynamic, flexible classrooms (Abdelatif & Siddiqui, 2021; Baker & Smith, 2019). Educational institutions worldwide increasingly adopt AI applications and embodied social robots as pedagogical tools, fulfilling diverse roles such as instructional assistants, virtual teachers, and peer learning facilitators (Arini et al., 2022).

A burgeoning body of research has explored the potential of AI tools to improve EFL teaching and learning outcomes. Aljohani (2021) looked into how Saudi Arabian EFL instructors and students perceived using AI to enhance English language instruction. The results showed that the perspectives of both teachers and students validated the impact of AI on English instruction in Saudi Arabia. Abdelatif and Siddiqui's (2021) study explored Saudi EFL faculty members' perceptions, competencies, and current practices regarding integrating AI tools in their teaching and learning activities (TLAs) at King Khalid University. They further identified obstacles hindering effective AI utilisation. Key findings revealed a positive perceived usefulness of AI in language TLAs among FLT staff, familiarity with AI primarily in personal life, and low integration of AI tools in language teaching despite positive perceptions. The study emphasised the crucial role of continuous professional development (CPD) in bolstering faculty AI skills and motivation to stay updated with ELT advancements, ultimately promoting effective AI integration in future language learning environments. An exploratory study by Chuah and Kabilan (2021) investigated English as a Second Language (ESL) teachers' perspectives on using chatbots for mobile-based teaching and learning. Notably, teachers perceived chatbots as highly valuable for providing student feedback, highlighting the need for additional training in their implementation. The potential for chatbots to simulate language interaction cycles and foster active learning through enhanced social presence was also recognised. Overall, the findings offer valuable insights into the successful integration of chatbots in language education, considering both the promising affordances and potential constraints identified by ESL teachers.

Significant gains in English competence and positive student attitudes towards AI-based Mobile Learning (AI-ML) tools were also observed. For example, Arini et al. (2022), in their experimental study evaluated the effectiveness of AI-ML for EFL learning among university students in Indonesia. Participants were divided into two groups: one employing traditional methods (control) and another utilising AI-ML (experimental). Findings demonstrated statistically significant gains in English competence for the AI-ML group and positive student attitudes towards the technology. These attitudes reflected two key outcomes: (1) expanded learning opportunities and (2) identifying areas for refining AI-ML implementation. Notably, the study highlights the potential of AI-ML in boosting EFL skills while acknowledging the need for continued development and optimisation.

Grammarly, an AI writing tool, was shown to enhance student engagement. For instance, a study by Nazari et al. (2021) showed significant advantages in several areas over their non-AI counterparts. These areas included engagement in behavioural, emotional, and cognitive aspects; self-efficacy for writing; positive emotions; and reduction of negative emotions. This suggests that AI writing tools can be effective for non-native students in academic writing, potentially through feedback and assessment. Alsadoon (2021) investigated vocabulary acquisition for Arabic EFL learners using an interactive storytelling chatbot. The chatbot incorporated various resources to enhance the target language input. The study aimed to identify the most effective tools for vocabulary learning and retention. Findings revealed that the dictionary played a key role in vocabulary expansion, while L1 translation offered marginally higher (though not significantly different) retention rates. In a quasi-experimental study, Makhoulouf (2021) found that Saudi students at Albaha University had far better speaking abilities due to an AI-based mobile application. Alhalangy and AbdAlgane (2023) emphasised the need for educators and students to be more aware of the potential of AI in the EFL classroom. These studies collectively highlight the potential of AI applications in enhancing EFL learners' learning skills.

2.2 Artificial Intelligence and EFL Learners' Motivation

Student motivation is a key factor in effective language learning, stemming from both intrinsic and extrinsic sources (Goctu, 2016). Intrinsic motivation arises from the learner's internal enjoyment of the activity, while extrinsic motivation is driven by external rewards. Both types influence learning behaviors and skill acquisition. Due to many circumstances, the approaches, procedures, and tactics used in teaching foreign languages have changed over the centuries.

Learning a foreign language is difficult, and students require encouragement and motivation at all stages (İlter, 2009). It has been demonstrated that incorporating AI applications into EFL instruction increases students' motivation. Sumakul and Abdul Hamied (2023) found that motivation can occur when using AI apps, particularly due to factors such as app design and lesson preparation. Wei (2023) found that AI-mediated language instruction led to higher English learning achievement, increased L2 motivation, and enhanced self-regulated learning. This is consistent with the findings of Kreutz and Rhodin (2016), who reported that the use of Information and Communication Technology (ICT) in the EFL classroom increased students' motivation. Vedadi et al. (2019) demonstrated that using multi-sensory augmented reality in English language learning improved students' motivation.

Similarly, other research focused on using other AI tools in teaching EFL. For example, Adolphs et al. (2018), who focused on Virtual Reality (VR), found that incorporating it into teaching EFL has positive effects, including boosting learners' motivation to study the language. Kim et al. (2019) observed that students' attention levels, motivation, and self-esteem increased when artificial intelligence chatbots were used in the classroom. Yin et al. (2021) found that university students who participated in chatbot-based learning settings had noticeably higher levels of intrinsic motivation than their non-participating peers. Putra (2021) used Google Meet (GM) to conduct Classroom Action Research (CAR) to boost the students' motivation to learn English while completing their courses online. He found that incorporating general knowledge into the teaching and learning process increased students' motivation to learn English. Students' engagement in class, answers to questions, openness to sharing their thoughts, and ability to correctly build a basic sentence related to the needed work all show that they are motivated to study English. Awada and Diab (2018) found that integrating Google Earth and Wiki tools in EFL classrooms has improved learners' motivation.

Similarly, the use of concept mapping in Google Hangouts peer-tutoring sessions has been shown to enhance motivation. In support of this, Hsu (2019) investigated the impact of pre-task concept mapping on student motivation in a computer-mediated communication (CMC) based EFL speaking course. The study found that concept mapping activities before CMC sessions increased students' reported attention, relevance, confidence, and satisfaction compared to those who completed reflective assignments. These findings suggest that incorporating concept mapping as a pre-task can enhance student motivation for CMC-based speaking activities. The results of AlMukhallafi's (2020) study demonstrated the high efficacy of AI apps in raising students' levels of focus and motivation while learning English. The outcomes further showed a set of tactics that could be used to teach and learn English using artificial intelligence. However, these methods of teaching and learning English were used extremely infrequently. Dewi et al. (2021) concluded that AI could play roles beyond conversational possibilities, such as motivating, guiding, and providing feedback for language development.

2.3 Challenges in Using AI Tools in EFL Learning

While the potential of AI to revolutionise education is undeniable, its implementation necessitates careful consideration of potential drawbacks. This section delves deeper into these challenges, categorised into ethical, pedagogical, and technical domains. Ethical considerations weave throughout the tapestry of AI's integration into education, demanding careful attention to potential pitfalls. The spectre of bias looms large, as AI algorithms can inherit and amplify prejudices in their training data, potentially disadvantaging diverse students (Abbas et al., 2023; McCardle, 2019). Safeguarding against this requires vigilant efforts to identify and mitigate biases, ensuring AI is a force for equity, not inequality. The intricacy between personalised learning and student data privacy poses another ethical challenge. Robust data protection measures and transparent communication become paramount to build trust and prevent misuse (Wang et al., 2023). Finally, the quest for efficiency through AI-powered assessments and personalised learning pathways must not eclipse the irreplaceable role of educators. Striking a balance between AI's capabilities and teacher autonomy, preserving human connection and creativity, emerges as a crucial ethical imperative (Bittencourt et al., 2023; Pokriváková 2022). Addressing these interwoven ethical threads lies at the heart of responsible AI integration in education, ensuring it empowers, rather than undermines, the learning journey for all students. Pedagogically, overdependence on personalised learning platforms risks eclipsing the irreplaceable human touch, compromising holistic development, critical thinking, and emotional support nurtured by educators (Rizvi, 2023). Striking a balance between personalisation and human connection becomes crucial.

Moreover, though efficient, AI assessments may misrepresent student understanding, particularly for unconventional thinkers (Abbas et al., 2023; Xu, 2020). Ensuring their validity and reliability necessitates careful development and calibration. Finally, the digital divide poses a significant barrier, amplifying existing educational inequalities (Papa & Jackson, 2021). Bridging these disparities requires addressing infrastructural gaps, resource inequalities, and digital literacy across diverse contexts, ensuring all students can waltz with the potential of AI-powered learning. The technical landscape of AI in education presents its own set of hurdles. The opaque nature of algorithms can erode trust and hinder understanding of their decision-making, demanding efforts towards explainability for ethical and pedagogical considerations (Xu, 2020). While chatbots hold promise for personalised support and feedback, their limitations in delivering nuanced content and conducting effective assessments necessitate further development and research (Georgescu, 2018; Yang & Evans, 2019). Finally, cultural and language barriers can pose additional challenges for international students, emphasising the need for culturally

sensitive design and localisation efforts to ensure inclusive implementation (Wang et al., 2023). These complex factors demand further investigation into AI's multifaceted impact on EFL learners' motivation.

3. Methodology

3.1 Research Design

A quasi-experimental approach (pre-post) was used to understand the impact of an artificial intelligence application, namely Gemini, on motivating female EFL students to enhance their linguistic skills in speaking, writing, reading, and listening. The researchers opted for a pre-post quasi-experimental design due to the inherent challenges of implementing a true experiment in a classroom setting. Random assignment to control and intervention groups might not be feasible due to logistical constraints or ethical considerations. The pre-post design allows us to assess changes in student motivation before and after using Gemini (Creswell, 2009).

3.2 Study Sample and Setting

Convenience sampling was employed, where participants were selected based on their availability and accessibility at Taibah University (Cohen et al., 2011). While this approach facilitated data collection within our research constraints, there are several limitations associated with it, particularly the potential for selection bias that restricts the generalizability of findings to the broader EFL student population (Neuman, 2014). However, the chosen sample—female undergraduate EFL students at Taibah University with a shared socio-cultural background and age range (19–22 years)—provided a focused group for this initial investigation. This homogeneity minimises potential confounding variables and facilitates a clearer analysis of their experiences with Gemini. This aligns with the concept of homogenous samples in initial research, particularly studies exploring a specific phenomenon in a focused group (Creswell, 2009; Patton, 2002). Such samples can yield rich and detailed data that can inform further research. One hundred fifty Saudi female undergraduate EFL students in various classes participated and responded to the online questionnaire

3.3 Study Instrument: Development and Administration

A questionnaire was used as a data collection for the current study because “it enables a wider and much larger population to be accessed” (Cohen et al., 2011, p. 280). Also, it has significant advantages in that it may be unbiased, affordable, simple, anonymous, administered, and gathered fast (Dörnyei, 2007). The questionnaire includes a five-point Likert scale (strongly agree to strongly disagree). This format was chosen because ‘are generally useful for getting at respondents’ views, judgments, or opinions about almost any aspect of language learning’ (Brown & Rodgers, 2002, p. 120). The questionnaire was developed to explore the impact of AI applications (e.g. Gemini on motivating female university EFL students to enhance their linguistic skills. The questionnaire was developed to explore the impact of Gemini, an AI application, on motivating university female EFL students to enhance their linguistic skills. It consisted of four sections: 42 closed-ended statements were asked about four English skills: writing (11 items), reading (11 items), listening (9 items), and speaking (11 items). Furthermore, the questionnaire included two open-ended questions at the end. The first question gathers students’ perceptions concerning their challenges in using Gemini to learn EFL. The second question explores how integrating Gemini into English tasks and assignments influenced the motivation and improvement of English language skills: writing, reading, listening, and speaking. The questionnaire was adapted from other relevant studies (Graham et al., 2023; De Smedt et al., 2020; Schiefele et al., 2016; De Naeghel et al., 2012). It is designed to take 8–10 minutes to answer and is distributed and emailed through an electronic link.

3.4 Study Procedures

This study employed a convenience sampling strategy, inviting female EFL students to participate through an online questionnaire. One hundred fifty female students participated. Following initial data collection, participants who expressed willingness to continue were invited to attend a Zoom workshop. The workshop provided information on the study aims, offered training on using Gemini for various tasks (writing, reading, listening, speaking), and addressed ethical considerations. Participants who agreed to continue signed a consent form ensuring voluntariness, confidentiality, anonymity, and the right to withdraw (BERA, 2018). Participants then received a selection of EFL assignments related to their coursework. They joined a dedicated WhatsApp group to communicate with the researchers and get more explanation resources (e.g., videos). The experimental phase lasted approximately three months. At its conclusion, the original 150 participants completed a post-online questionnaire. Figure 1 shows the quasi-experimental stage procedures.

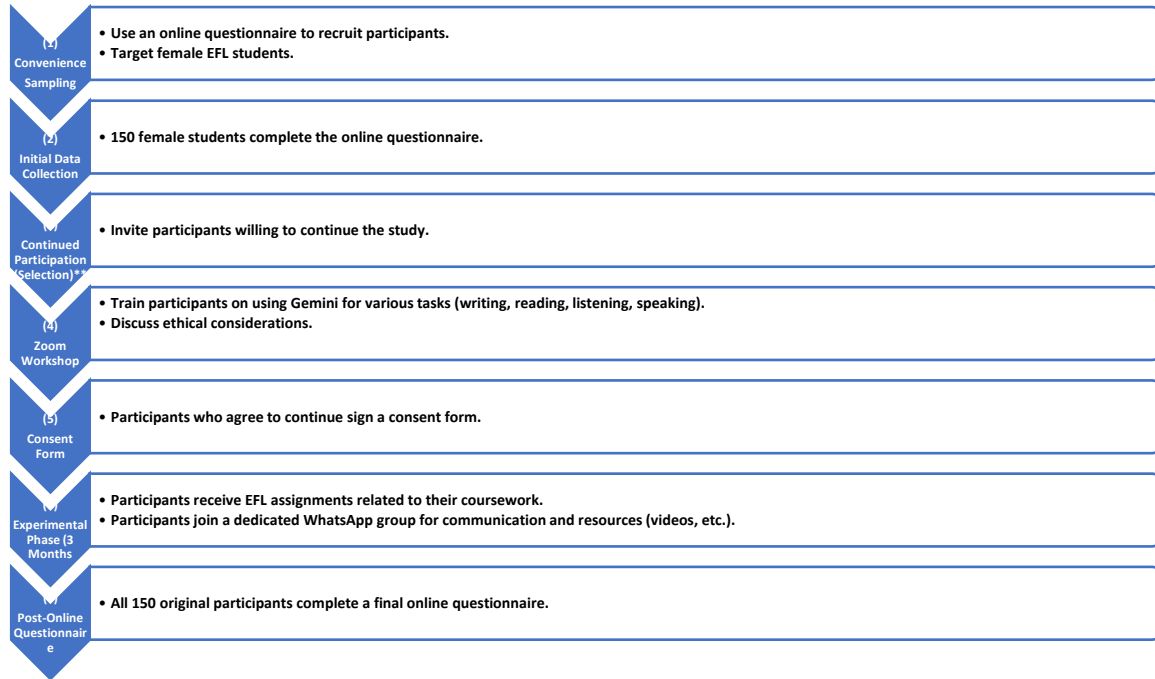


Figure 1. The Quasi-experimental Stage Procedures

3.5 Data Analysis

The study applied a questionnaire, which was analysed quantitatively using the SPSS software, version 23, to answer the research questions. The statistical analysis included the Pearson correlation coefficient to check for consistency validity; Cronbach’s alpha was used to verify the reliability of the research instrument; and Arithmetic means, standard deviations, and t-tests were used to answer the first question about effectiveness, including calculating effect sizes. Two forms of validity were used to confirm the survey’s validity; the face validity of the survey was verified by presenting it to four experienced and specialised judges. Their guidance and suggestions were incorporated, including adding new statements, deleting or modifying unsuitable ones, placing statements in their relevant skill area, and ensuring clarity and linguistic correctness. With respect to consistency validity, the survey was applied to a pilot sample of 20 students outside the main sample. Pearson correlation coefficients were calculated between the statements of the study examining the impact of AI applications (Gemini) on motivating female EFL students to enhance their linguistic skills in speaking, writing, reading, and listening, and the corresponding skill, as well as between the statements, skills, and the total score of the skills. The results are shown in Table 1.

Table 1. Pearson Correlation Coefficients of the Questionnaire Statements on Gemini Applications’ Impact

No.	Skills - Statements	Correlation Coefficient with the Dimension	Correlation Coefficient with the Instrument
First	Writing in English	1	.985**
1.	I enjoy writing in English.	.573**	.487*
2.	I would like to have more opportunities to write in class.	.781**	.702**
3.	I like to express my ideas in writing.	.677**	.731**
4.	I enjoy writing assignments that challenge me.	.737**	.761**
5.	I like to write even if my writing will not be graded.	.664**	.722**
6.	I like to participate in written online discussions.	.677**	.731**
7.	I want the highest score in the class on a writing assignment.	.875**	.885**
8.	I must prove to myself that I can get good writing scores.	.740**	.723**
9.	Being a good writer will help me do well academically.	.958**	.948**
10.	I think it is very useful for me to write in English.	.737**	.721**
11.	I wish I could write a weekly article in a newspaper or magazine.	.958**	.948**
Second	Reading in English	1	.989**
12.	I enjoy reading in English.	.895**	.865**
13.	I can overcome my English reading challenges.	.768**	.761**
14.	I must prove to myself that I can get good reading	.910**	.935**

	scores.		
15.	I think it is very useful for me to read.	.880**	.831**
16.	I read because I like it when others think I am a good reader.	.919**	.948**
17.	I read to learn new information about topics that interest me.	.829**	.838**
18.	I am willing to work hard to read better than other students.	.834**	.792**
19.	Reading in English would widen my knowledge about people in different countries.	.776**	.797**
20.	Reading well in English can help me to develop my talents.	.793**	.784**
21.	Reading classes are boring.	.789**	.731**
22.	I share what I read with my peers and friends.	.834**	.792**
Third	Listening in English	1	.989**
23.	Listening is an important skill in English.	.753**	.722**
24.	I enjoy listening to English podcasts, radio stations and channels.	.753**	.722**
25.	I feel satisfied and confident when I understand what I listen to.	.856**	.885**
26.	I feel excited when I am the only student who answers the listening comprehension questions.	.747**	.723**
27.	English listening materials can arouse my interest in learning.	.931**	.948**
28.	I feel excited about gaining new knowledge and information through listening.	.830**	.844**
29.	I enjoy listening to English to learn about the culture and customs of other countries.	.931**	.948**
30.	My purpose in developing English listening comprehension is to get high scores.	.884**	.860**
31.	Listening tests make me feel nervous.	.701**	.658**
Fourth	Speaking in English	1	.992**
32.	I enjoy speaking in English.	.918**	.897**
33.	I feel happy when the teacher asks me to speak and participate in English in class.	.934**	.932**
34.	I volunteer to present in English in front of the class.	.807**	.797**
35.	I feel worried about making mistakes when speaking English.	.789**	.784**
36.	Speaking tests make me feel nervous.	.737**	.731**
37.	I feel excited when having conversations with native speakers	.669**	.723**
38.	I feel satisfied when I hold a conversation in English successfully	.736**	.722**
39.	I feel confident about my pronunciation when I speak English.	.736**	.722**
40.	English speaking allows me to learn new things.	.897**	.885**
41.	I think that English speaking is one of the important skills to get a job in the future.	.669**	.723**
42.	I learn to speak English only to get a high score on oral tests	.945**	.948**

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 1 above shows that the Pearson correlation coefficients between the questionnaire statements on the impact of Gemini on motivating female EFL students are statistically significant at the 0.01 level. The coefficients ranged between 0.573** to 0.958** for the statements with the total skill score and between 0.487* to 0.948** for the statements with the total skills score, all significant at 0.01 and 0.05 levels. The Pearson correlation coefficients between the skill and the total skills score ranged from 0.985** to 0.992**, all significant at 0.01, confirming the validity of the research instrument.

Research Instrument Reliability: Cronbach's alpha equation was used to calculate the skills and overall skill score reliability coefficients. The research instrument was administered to a pilot sample of 20 participants, and Table 2 displays the reliability coefficients.

Table 2. Cronbach’s Alpha Reliability Coefficients for Skills and the Overall Skill Score

No.	Skill	Items Number	Reliability Coefficient
1	Writing in English	11	0.93
2	Reading in English	11	0.94
3	Listening in English	9	0.94
4	Speaking in English	11	0.92
Total Tool Reliability		42	0.97

Table 2 shows that the total Cronbach’s alpha reliability coefficient reached (0.97), with the reliability coefficients for the skills ranging between (0.92 and 0.94). The reliability coefficient for writing in English was (0.93); for reading and listening skills, it was (0.94); and for speaking skills, it was (0.92). These high-reliability coefficients indicate that the research instrument is reliable.

4. Results

4.1 The Effect of Gemini App on EFL Students’ Motivation

The researcher calculated the mean responses of the study sample regarding the effectiveness of Gemini, as an artificial intelligence application, in motivating university students to learn English as a Foreign Language (EFL) in both pre- and post-application, as shown in Table 3 below:

Table 3. Mean Responses of the Study Sample on the Effectiveness of Gemini in Motivating EFL Learning

Skill	Pre-Application Mean Score	Pre- Application Standard Deviation	Post-Application Mean Score	Post-Application Standard Deviation
Writing in English	2.57	.264	3.97	.633
Reading in English	3.10	.344	4.03	.508
Listening in English	3.17	.332	4.28	.501
Speaking in English	3.09	.331	3.92	.474
Total Score	2.97	.227	4.04	.447

Table 3 shows differences in the mean responses of the study sample regarding the effectiveness of Gemini, as an artificial intelligence application, in motivating university students to learn English as a Foreign Language (EFL) pre- and post-application. The mean score for the pre-application was (2.97) with a standard deviation of (0.227). For the post-application, the mean score was (4.04) with a standard deviation of (0.447). The pre-application mean scores for the skills ranged between (2.57 – 3.17), while the post-application mean scores for the skills ranged between (3.92 – 4.28).

To demonstrate the significance of the differences between the mean scores, the researchers used a paired-sample t-test to show the significance of the differences between the mean responses of the study sample regarding the effectiveness of an artificial intelligence application in motivating university students to learn English as a Foreign Language (EFL) as shown in Table 4 below:

Table 4. Paired-sample t-test for the Effectiveness of Gemini in Motivating EFL Learning

Skill	Application	t-Value	df	Sig. (2-tailed)	Effect Size	Level
Writing in English	Pre	-25.290	149	.000	2.07	Large
Writing in English	Post					
Reading in English	Pre	-17.053	149	.000	1.39	Large
Reading in English	Post					
Listening in English	Pre	-22.020	149	.000	1.80	Large
Listening in English	Post					
Speaking in English	Pre	-16.888	149	.000	1.38	Large
Speaking in English	Post					
Total Score	Pre	-24.959	149	.000	2.04	Large
Total Score	Post					

Table 4 shows statistically significant differences at the significance level (0.05) between the mean scores for the effectiveness of Gemini, as an artificial intelligence application, in motivating university students to learn English as a Foreign Language (EFL) in both pre-and post-application, favouring the post-application for the total score and all skills. The t-value for the total score was (24.959) with a significance level of (0.00). The t-values for the skills ranged between (16.888 and 25.290) with a significance level of (0.00), which is less than (0.05). The effect size for the total score was (2.04) with a large effect level, and the effect sizes for the skills ranged between (1.38 – 2.07), with a large level of effect.

4.2 Student Challenges in Utilising Gemini for Learning EFL Skills

The researchers analysed responses from the study sample to address the challenges students face using Gemini to learn EFL. The researchers employed quantitative and qualitative analysis based on the frequencies and percentages. The challenges were identified, and their frequencies and percentages were calculated. The specific details of these challenges and their statistical analysis are presented in Table 5.

Table 5. Frequencies and Percentages of Challenges Faced by Students Using Gemini in Learning EFL

No.	Difficulty Identified	Frequency	Percentage
1	repetitive words, basic vocabulary	93	62
2	Lengthy, non-concise answers	86	57.3
3	Uncertainty about the correctness of information	74	49.3
4	Difficulty in understanding the question format	63	42
5	Excess and similarity of information sources	59	39.3

Table 5 presents the frequencies and percentages of student-reported difficulties encountered using Gemini for EFL learning. The primary challenge identified was the occurrence of repetitive words and basic vocabulary usage, recorded with a frequency of 93 (62%). The next significant issue was the delivery of lengthy, non-concise answers, observed 86 times, constituting 57.3% of responses. Thirdly, students expressed uncertainty regarding the correctness of the information, which was noted 74 times (49.3%). Additionally, difficulties in Gemini’s understanding of question formats were reported 63 times, accounting for 42% of the responses. Lastly, the issue of excessive and repetitive information sources was encountered, with a frequency of 59 and making up 39.3% of the responses.

4.3. Integrating Gemini into English Tasks and Its Influences on the Improvement of Students’ English Language Skills

The survey also explored how integrating Gemini into English tasks and assignments influenced the motivation and improvement of English language skills: writing, reading, listening, and speaking. The researchers employed quantitative analysis based on the frequencies and percentages. These English language skills were identified, and their frequencies and percentages were calculated. The specific details of these English language skills and their statistical analysis are presented in Table 6.

Table 6. Integrating Gemini into English tasks and its improvement of English language skills

No.	Skill	Frequency	Percentage
1	Writing	63	42
2	Reading	56	37.3
3	Listening	20	13.3
4	Speaking	11	7.4

Table 6 presents the frequencies and percentages of Integrating Gemini into English tasks and improving students’ English language skills. According to the study results, writing was identified as the skill most positively affected by Gemini, achieving the highest rank with a frequency of 63 responses (42%). Reading was the second most improved skill, with a frequency of 56 and making up 37.3% of the responses. Listening skills followed, with 20 instances (13.3%). At the same time, speaking saw the least improvement, ranking at the bottom with a frequency of 11 and only 7.4%. This data underscores the differential impact of Gemini on the various aspects of English language proficiency.

5. Discussion

5.1 The Impact of Gemini on EFL Student Motivations to Learn

Artificial intelligence tools like Gemini become increasingly integrated into EFL classrooms. Understanding their multifaceted influence on learner motivation becomes crucial in navigating the unfolding landscape of language education. This study first explored the effectiveness of Gemini’s app in igniting and sustaining motivation among university EFL learners. The results are compelling, revealing statistically significant and robust improvements across all core EFL skills post-Gemini integration. These advancements, evidenced by significant pre- and post-test differences at the 0.05 level, favouring the post-application phase, suggest a powerful motivating influence attributed to Gemini. These findings resonate with several established theoretical frameworks that suggest the positive effectiveness of AI applications and programmes in nurturing language learning motivation (Arini et al., 2022; Berenji & Saeidi, 2017; Pataranutaporn et al., 2022). Notably, Gemini appears to address these crucial elements by offering distinct advantages. First, personalised learning: Gemini’s ability to tailor content and interactions to individual needs and interests fosters a heightened sense of engagement and learner autonomy, as proposed by Riyaz and Salim (2023). This aligns with Harackiewicz et al.’s (2016) emphasis on “students’ interest” as a key motivator, suggesting that AI may be cultivating genuine curiosity and a desire to learn within students to provide personalised learning services. Second, interactive and immersive environments: Gemini’s conversational nature and potential for multimedia integration pave the way for dynamic and engaging learning spaces, potentially reducing anxiety and boosting enjoyment, as highlighted by Riyaz and Salim (2023). This resonates with their emphasis on positive emotions like enjoyment and curiosity as motivators, implying that Gemini may transform EFL learning into a more playful and interactive experience (AbdAlgane & Othman., 2023). Third, adaptive difficulty and feedback: Gemini’s ability to adjust difficulty levels and provide personalised feedback can potentially lead to a sense of accomplishment and confidence, further fueling motivation (Riyaz & Salim, 2023). This argument aligns with Dweck’s (2006) concept of a growth mindset, where challenges are viewed as opportunities to learn and grow, a perspective potentially fostered by Gemini’s adaptive approach.

5.2 Challenges to Use Gemini in EFL Learning

Although the potential benefits of AI in EFL have been proven (Alhalangy & AbdAlgane, 2023; Toboula, 2023). Abalkheel (2022) and Zitouni (2022) have emphasised some challenges. The current study revealed several challenges faced by the study participants regarding implementing Gemini in EFL learning. The most prevalent difficulty (62%) lies in Gemini’s occasional output of errors, repetitive words, and basic vocabulary, potentially hindering exposure to advanced language structures and concepts. This aligns with Jong’s (2010)

cognitive load theory, suggesting that information overload exceeds working memory capacity. In this regard, Chen et al. (2018) found that extensive mental effort can deplete working memory resources, leading to decreased performance. Lengthy, non-concise answers (57.3%) further exacerbate this by demanding excessive cognitive processing, taxing learners' attention and retention (Cowan, 2010).

Additionally, uncertainty about information correctness (49.3%) raises concerns about learner agency and trust (Benson, 2012). Gemini's lack of transparent source citations can impede independent learning. Even understanding question formats poses a challenge (42%), highlighting the gap between user expectations and Gemini's capabilities (Su et al., 2020; Kocielnik et al., 2019). Meurisch et al. (2020) highlighted the need for a clear understanding of user expectations in proactive AI systems, as discrepancies can negatively impact acceptance. Finally, excess and repetitive information sources (39.3%) contribute to cognitive load and limit exposure to diverse perspectives. Addressing these challenges will be crucial for maximising Gemini's potential. Prioritising conciseness, incorporating source verification mechanisms, and improving natural language processing abilities are key steps towards a more effective and engaging EFL learning experience. Ultimately, by acknowledging the limitations and exploring solutions, we can unlock the true potential of AI tools like Gemini to empower EFL learners on their journey towards language mastery.

5.3 Motivational Effects of Gemini on EFL Skill Acquisition

This study further delves into how Gemini differentially impacts learners' motivation to acquire various EFL skills (writing, reading, listening, and speaking). The findings paint a nuanced picture, with writing taking the lead due to AI dialogue apps such as Gemini, which can improve word usage, self-revision, and writing fluency (Basri et al., 2019; Nagata et al., 2019). Yang et al. (2022) further supported this notion, showing that AI chatbots can encourage students to engage in conversation and improve task success rates. Abdalkader (2022) also found a positive effect on writing fluency when using AI applications. These findings suggest that AI dialogue apps, such as EFL writing skills, can support, foster, and motivate complex tasks (Dörnyei, 2009).

Reading and listening follow, thriving on Gemini's curated content and learner control. These findings align with those of Hazaea and Alzubi (2018) and Nachoua (2012), who both found that the use of mobile technology and Computer Assisted Language Learning (CALL), respectively, can enhance learner autonomy and motivation in reading and listening. Similarly, Yang et al. (2022) and Kim and Jeongjo (2018) demonstrated the positive impact of AI chatbots on motivation and performance in EFL vocabulary learning. These findings suggest that AI dialogue apps' interactive and personalised nature can engage and motivate EFL learners in various language skills. Regarding speaking, there is a fascinating contrast; despite Gemini's pronunciation practice and prompts, its primarily text-based approach appears to limit its impact on this skill, potentially due to the lack of dynamic, conversational interaction, as highlighted by Hsu et al. (2021) and Benson (2012). This suggests a yearning for human connection inherent to spoken language development. Gemini lacks emotional intelligence, making establishing the emotional connection and rapport that can be vital in language education challenging. Human teachers often provide encouragement, motivation, and emotional support that AI may not replicate. Understanding this differential impact unlocks exciting possibilities for optimising Gemini's integration. Incorporating voice-enabled conversations, personalised spoken fluency feedback, and collaborative activities could address speaking limitations.

Additionally, research exploring learner preferences and adapting Gemini's functionalities to individual learning styles could enhance its motivational potential across all skills. We can bridge the gap between AI assistance and human connection by embracing this multifaceted influence and its theoretical underpinnings. In this context, Yang et al. (2022) highlighted the essentials of a guided approach to ensure appropriate conversation levels and characteristics. Despite these limitations, the overall potential of AI dialogue apps in EFL classrooms is promising.

6. Conclusion

This study explored the multifaceted influence of Gemini, an AI application, on university EFL learners' motivation, uncovering promising potential and areas requiring development. While the findings exhibited notable improvements in female students' motivation across all EFL skills, particularly writing, identified challenges necessitate further optimisation. Information overload, accuracy concerns, limited interaction, repetitive content, and difficulties understanding question formats emerged as key areas for future research and improvement. Addressing these challenges through concise responses, source verification mechanisms, question formulation training, and diversified content is crucial to unlocking Gemini's full potential for creating engaging and empowering EFL learning experiences. While this study highlights Gemini's promising potential to enhance motivation and language development, it also underscores the need for continuous improvement. Through targeted development and further research addressing the identified challenges, we can unlock Gemini's full potential as a powerful tool for supporting EFL learners' journey towards language proficiency. By incorporating diverse research methods and expanding the scope of inquiry, we can create a more comprehensive understanding of Gemini's impact and effectively leverage its capabilities to benefit EFL learners.

6.1. Research Strengths and Limitations

This study possesses several strengths that contribute to its overall value and credibility. Firstly, the pre-post quasi-experimental design offers a robust approach to gauging the causal impact of Gemini on EFL learner motivation. By measuring motivation levels before and after the intervention, the study establishes a temporal link between Gemini's introduction and potential changes in motivation rather than simply correlating the two. This design provides stronger evidence for Gemini's effectiveness compared to correlational studies. Secondly, the study's focus on specific EFL skills (writing, reading, listening, and speaking) grants a nuanced understanding of how Gemini influences language development. By analysing skill-specific data, the research reveals where Gemini has the most significant impact and

identifies areas where further optimisation might be beneficial. This fine-grained approach provides valuable insights for tailoring future iterations of Gemini to address the specific needs of each skill domain. Finally, the study employs statistically robust analysis, solidifying the generalizability of its findings within the specific research context. This quantitative rigour enhances the credibility of the conclusions and allows for their potential application to similar EFL contexts.

However, it is crucial to acknowledge the study's limitations; firstly, the single-study nature inherently limits the generalizability of the findings. Replicating the study with larger and more diverse samples across different educational contexts and participant demographics would strengthen the overall conclusiveness and broaden the applicability of the results. Secondly, relying on self-reported data for motivation assessment introduces potential bias and subjectivity. While self-reports provide valuable insights into individual perceptions, they may be susceptible to memory recall errors, social desirability bias, and individual interpretations of motivation. Future research could incorporate multimodal methods such as task engagement measures or physiological data to triangulate findings and objectively assess motivation changes. By acknowledging these strengths and limitations, the study contributes valuable insights into the potential of Gemini while setting the stage for further research to refine its effectiveness and expand its reach within the EFL learning landscape.

6.2 Suggestions for Further Research

Given the promising impact of Gemini on EFL learners' motivation across diverse skills, particularly writing, the researchers recommended conducting several studies: first, qualitative studies, using in-depth interviews or focus groups to explore student experiences with the Gemini app, uncovering both positive and negative aspects that influence motivation. Second, investigate student attitudes towards using the Gemini app in EFL classes to reveal valuable insights into its perceived usefulness and acceptability within the learning environment. Third, conducting longitudinal studies to examine the long-term impact of the Gemini app on motivation and language skills over an extended period would provide valuable insights into its sustainability and effectiveness. Finally, cross-cultural comparisons to explore the impact of Gemini in different cultural contexts and educational settings could reveal nuances in user behaviour and motivations across diverse populations.

Acknowledgments

We greatly appreciate the valuable contributions of EFL faculty members in the department of Language & Translation at Taibah University who encouraged their female students to participate in the study.

Authors contributions

Both authors contributed equally.

Funding

NA

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained

Ethics approval

Ethical Approval was obtained.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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