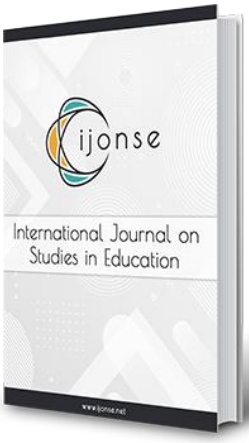

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The Influence of ChatGPT on English Grammar among ESL Learners

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Abstract

The evolution of Artificial Intelligence (AI) learning has been remarkable. In the field of education, it has inspired researchers and educators to explore potential benefits for enhancing learning outcomes. Notably, Generative AI has demonstrated considerable promise as a means of language enhancement. This study seeks to investigate the application of ChatGPT, as a resource for improving the grammar skills of English as a second Language (ESL) students in the Kingdom of Saudi Arabia (KSA). The research involved a sample of 100 BS students from public sector universities in KSA. Prior to the intervention, a preliminary assessment was conducted, and based on the results, the participants were divided into two groups of 50 students each. One group received instruction through traditional classroom methods, while the other utilized ChatGPT alongside their teacher. The intervention lasted for 2 weeks, after which a final assessment was conducted to compare the scores. The findings revealed a significant improvement in the scores of students who engaged with ChatGPT. Furthermore, the students provided predominantly positive feedback regarding their learning experience with ChatGPT. This indicates that ChatGPT serves as an effective and influential AI learning tool for enhancing grammatical efficiency in ESL contexts.

Introduction

Technology serves as a vital channel for empowering both learners and educators (Ali, Alaa, & Shahnaz, 2024). Recently, the integration of Artificial Intelligence (AI) has significantly transformed various fields, particularly in academia. This shift has led to remarkable advancements by redefining conventional practices. The introduction of AI in educational settings has experienced rapid growth, sparking considerable interest among researchers and practitioners regarding its potential to improve learning outcomes. Specifically, generative AI has emerged as a valuable resource for enhancing language skills, providing innovative solutions to longstanding educational challenges (Alsofyani, & Barzanji, 2024). The rapid growth and implementation of machine learning and prompt-based learning, in conjunction with artificial intelligence, have paved the way for innovative approaches in language education (Li et al., 2025). These advancements are particularly relevant in the realm of teaching English as a Second Language (ESL), where effective and adaptable teaching resources can appeal to a wide array of educators and learners. ChatGPT, an advanced AI language model, stands out as a leading technology in this field. Its capacity to produce text that closely resembles human writing and to facilitate interactive conversations offers distinctive opportunities for improving English language proficiency (Ali, 2024)

In the Kingdom of Saudi Arabia (KSA), English does not hold the status of a neutral language; rather, it carries substantial social, political, economic, and religious connotations. Its usage has surged in recent years, driven by globalization and modernization initiatives (Altalhi, 2024). However, this trend faces opposition from certain societal groups, which question the legitimacy of English and seek to adapt it to fit local customs and beliefs. As part of its Vision 2030 modernization strategy, Saudi Arabia aims to equip students with the English language skills essential for global competitiveness while simultaneously nurturing a strong appreciation for their Arabic and Islamic heritage (Ahmed, 2023).

Recognizing the value of English, Saudi Arabia has reformed its higher education system by implementing English Medium Instruction (EMI), akin to practices in other countries (Alzahrani & Alotaibi, 2024). The Saudi government regards English as a global lingua franca and is committed to enhancing English proficiency, advocating for its introduction as a medium of instruction in educational institutions. Furthermore, the government asserts that teaching a single foreign language is the most effective approach to facilitate language acquisition. Despite the Ministry of Education's efforts, the execution of this policy encounters numerous challenges (Aldowsari & Aljebreen, 2024). The current academic landscape in Saudi Arabia urgently necessitates a transformation in curriculum design, teaching methodologies, and learning strategies. The emergence of AI tools, such as ChatGPT, signifies a notable shift in academia, prompting a reevaluation of traditional teaching methods. Consequently, the exploration of AI-based resources is paving the way for innovative approaches to enhance English language proficiency among learners, serving as a complement to conventional educational practices (Alshammari, 2024). A significant area of research in foreign language education is the application of grammar strategies by English as a Foreign Language (ESL) learners.

Grammar functions as a cognitive mechanism that relies on a variety of knowledge sources, encompassing both lexical characteristics and an awareness of contemporary issues. Mastery of grammar is achieved through the enhancement of decoding abilities and an understanding of linguistic structures (Ali et al., 2024). In the context of Saudi Arabian ESL classrooms, the approach to grammar instruction is often inconsistent, with a significant portion of class time dedicated to rote repetition and teachers taking on the entire responsibility for students' grammatical understanding. Consequently, students find it difficult to assess their own grammar proficiency. Furthermore, as ESL learners are introduced to the English alphabet and phonetics before entering university, English instructors frequently presume that their grammar skills are already established. This assumption can render grammar a particularly challenging domain that requires focused attention and improvement (Alharbi, 2022). This research seeks to explore the effectiveness of ChatGPT as a pedagogical tool for enhancing the grammar skills of ESL students in Saudi Arabia.

Significance of the Study

This research holds high significance in the context of Saudi Arabia. English grammar lessons have been a problematic area for second and foreign language learners. Amongst various other issues, the uninteresting techniques which focus on cramming and only memorizing the rules of grammar demotivate learners. Therefore, they are unsuccessful to develop their grammatical knowledge with conviction. The inclusion of AI can assist

modern learners through interesting and captivating methods which can penetrate into the minds easily. This study will be pivotal to view how ChatGPT serve as a language learning model for English grammar learners.

Research Question

How significantly does ChatGPT influence the grammar of English as a Second Language (ESL) students in Saudi Arabia?

Literature Review

OpenAI launched the inaugural version of ChatGPT, known as GPT-1, in 2018, which was developed based on large language models (LLMs). A year later, this model was enhanced and released as GPT-2, demonstrating significantly improved performance. However, the substantial advancement of ChatGPT became evident with the introduction of the GPT-3 series in 2020, which was made publicly accessible and highlighted the model's true capabilities. This potential was further underscored by subsequent refinements through supervised training and reinforcement learning, leading to the more sophisticated GPT-3.5 and GPT-4 series (Mai, Da & Hanh, 2024). ChatGPT is proficient in a wide range of natural language processing (NLP) tasks, showcasing exceptional skills in understanding and generating natural language, as well as delivering responses that closely resemble human interaction. Additionally, it possesses critical features such as the ability to comprehend various contexts and languages, adapting its responses accordingly, and allowing for fine-tuning across different scales (Ali, Anwar, & Zahid,2025).

ChatGPT functions through a deep learning architecture known as a transformer, which enables it to understand natural language inputs and generate responses that closely resemble human dialogue. The following is a concise overview of its operational framework:

Preprocessing: Initially, the input text is converted into numerical forms referred to as tokens. These tokens encapsulate the meanings of individual words, facilitating more efficient processing by the transformer model.

Encoding: Once tokenized, the input undergoes encoding through layers that employ attention mechanisms. This process emphasizes the most significant elements of the text, allowing the model to concentrate on essential information.

Decoding: The encoded data is subsequently transformed back into natural language via a decoding phase, which also utilizes attention mechanisms to identify the most pertinent details for crafting the response.

Postprocessing: In the final stage, any extraneous tokens or formatting are eliminated, resulting in a coherent and natural-sounding reply for the user.

The transformer architecture empowers ChatGPT to produce nuanced and contextually relevant answers by

drawing on extensive training from a diverse array of internet sources (Su & Yang, 2023). Furthermore, ChatGPT has significantly influenced various domains, particularly in education, where it can be utilized to develop intelligent tutoring systems that offer personalized support to students. It can act as an assistant to educators, enhancing their ability to manage the educational process effectively (Liu, 2024). Consequently, ChatGPT can be regarded as a potent and promising resource in the realm of language education.

Constructivism

The constructivist learning theory highlights the active role of learners in "constructing" their own knowledge and skills through engagement and self-directed exploration. It prioritizes personal comprehension gained through experience and reflection rather than rote memorization. Discovery plays a vital role, as learners connect new information with their existing knowledge base. Social interaction is essential, with the processes of assimilation (integrating new information) and accommodation (modifying understanding) being fundamental to learning.

The core principles of this theory include the idea that learners create meaning, learning is inherently social, knowledge is context-dependent, reflection is crucial, and errors are integral to the learning process. In constructivism, learning is a dynamic and evolving journey where individuals build upon their prior knowledge to interpret new information. Social interactions facilitate the understanding and internalization of concepts, underscoring the importance of applying knowledge in practical situations. Reflection enables learners to evaluate their understanding and identify areas for growth. Mistakes are regarded as valuable opportunities for development. In summary, constructivism offers a tailored approach for learners to process and integrate future information.

The core principles of the constructivist learning theory include:
1. Learners actively construct meaning.
2. Learning is a social process.
3. Knowledge is contextually situated.
4. Reflection is a vital component of learning.
5. Mistakes are viewed as opportunities for growth.

The constructivist learning theory emphasizes the active construction of knowledge by encouraging learners to engage with new information, relate it to their existing knowledge, and reflect on their experiences, thereby fostering a deeper understanding. Social interaction is deemed crucial in the constructivist theory of learning because it facilitates collaboration, discussion, and the sharing of perspectives, which enhances comprehension and helps learners internalize concepts more effectively.

The key principles of constructivist learning theory that focus on meaningful learning and the application of knowledge in real-world contexts include the emphasis on learners constructing their own understanding, the social nature of learning, the contextualization of knowledge, the importance of reflection, and the recognition that mistakes contribute to the learning process.

ChatGPT and Saudi Arabia

Mugableh (2024) examined the effects of exercises generated by ChatGPT in comparison to traditional exercises on the vocabulary size and word family strength of Saudi EFL students. The objective of the study was to evaluate how the incorporation of ChatGPT-generated exercises influences vocabulary expansion. A total of sixty male students from Jouf University were selected and assigned to either a control group or a treatment group for this experimental research. To measure vocabulary size and strength, a Computer-Adaptive Test was administered at both the beginning and the conclusion of their participation in an Intensive English Language Program (IELP) course. The analysis revealed notable advancements in vocabulary development for both groups, with the experimental group demonstrating a more significant improvement. This study underscores the potential of ChatGPT in facilitating vocabulary development in second language learners. Alharthi (2024) examined EFL learners' satisfaction with teacher-mediated versus ChatGPT-assisted writing opportunities. Through 64 EFL learners in Saudi Arabia, they found that learners reported greater satisfaction with the teacher's role in all factors except for ease of use. Interactive opportunities with the teacher were rated highest in contributing to learning satisfaction. While learners were 'almost satisfied' with learning content in the teacher-mediated. The study suggests that ChatGPT can supplement learning but should not replace the teacher without proper training.

Alsahli et al. (2025) investigated the application of ChatGPT in assisting medical students with special educational needs (SEN) at universities in Saudi Arabia. A survey conducted with 283 SEN students indicated that perceptions of effectiveness varied according to the type of impairment and the level of education. The results demonstrate differences in how ChatGPT supports communication flexibility, guided practice, feedback, and the use of visual and audio aids, as well as simplified learning. Students with communication challenges rated ChatGPT more favorably for its ability to facilitate simplified learning and provide visual/audio assistance.

Abduljawad (2024) investigated the influence of ChatGPT, an artificial intelligence tool, on the writing skills of ESL students at a university in Saudi Arabia. Employing a mixed-methods approach, data collected from 130 students indicated a notable positive impact on their writing abilities. A focus group discussion with six students revealed benefits such as tailored feedback, enhancement of language skills, vocabulary growth, and increased independence. The results provide important insights for educators on how to effectively incorporate ChatGPT into writing instruction while also addressing its associated challenges.

Methodology

Research Design

This study employs a dual methodology, integrating both quantitative and qualitative approaches. It consists of two distinct phases. The initial phase investigates the impact of ChatGPT on grammar acquisition. To achieve this, two assessments are administered: one prior to the experiment and another following its completion. The participants' scores are analyzed using SPSS 25. The second phase aims to gather the perspectives of participants who utilized ChatGPT for their learning. These learners share their experiences and insights during an interview. The thematic analysis of the interview data is conducted using Claude.ai, a recognized AI application for such

analyses.

Population and Sampling

The population of the study was ESL learners in KSA. The sample comprised 100 learners from 10 government universities. These learners were studying at BS level. Only male institutes were considered as a sample. Both the universities and the learners were picked by purposive method of sampling. The universities were following English Medium instruction (EMI) and were connected with the Ministry of Education.

Research Instrument

The tools for this investigation were tests. They were conducted twice i.e., at the start and end. ChatGPT also served as a tool which was utilized to teach grammar to the learners.

Research Process

To initiate the research data collection is significant. For the very reason, two tests were executed at the beginning and end of the experiment. First test was a placement test and the test takers were placed into two groups (Control and experiment) on the scores they achieved in the test. It was ensured that both groups possess learners with mix abilities to avoid biasness in sampling distribution. At the end, a final test was conducted and results were compared. The time for both tests was 30 minutes. Both the tests had 5 comprehension passages (5) questions each passage. The test sheets had clear instructions, time duration and other details for candidates to avoid confusion.

Learning Process with ChatGPT

The participants in the treatment group engaged in learning through ChatGPT. The learning protocols had already been established. Initially, teachers provided relevant prompts to ChatGPT to facilitate its self-learning for generating appropriate responses. Subsequently, learners were instructed to use ChatGPT to comprehend the assigned passage. Throughout the treatment period, the teacher served as a prompt facilitator and guide, assisting students in clarifying any complexities they encountered. As a sophisticated learning model, ChatGPT did not require additional training to enhance its understanding of the prompts it received, enabling it to deliver accurate outputs.

ChatGPT supported the learners in several ways:

- It addressed challenges within the comprehension text by offering explanations and simplifying complex sentences, thereby fostering coherence in learning.
- It assisted with vocabulary by providing synonyms and contextual applications of words, which improved the learners' vocabulary comprehension.
- It summarized the key ideas of the text, offering both summary points for individual sections and the entire

passage, which aided in the retention of information.
- ChatGPT highlighted significant elements of the paragraph, delivering essential information and connecting learners to the overarching theme (refer to Appendix 1).

Research Variables

This study encompassed a range of variables. The independent variable identified was ChatGPT, while the dependent variable was the learning outcomes. ChatGPT, recognized as the leading AI application, has undergone extensive training and validation by experts, establishing its reliability through numerous trials. The confounding variables included the attitudes of teachers, intellectual levels, and demographic factors. To mitigate these influences, only instructors with substantial experience—specifically, those who had taught English for a minimum of eight years—were selected for the experimental process. The participants in this research were drawn from a science background, suggesting a uniformity in their intellectual capabilities. Additional moderating factors considered included age, gender, ethnicity, prior academic performance, English proficiency, classroom environment, instructional methods, testing duration and format, as well as digital literacy. All participants were Saudi males aged between 14 and 15, each having demonstrated strong performance in their previous academic year and having commenced English language instruction in grade 5. The classroom environment was conducive to learning, with instruction delivered in English. Both the initial and final assessments for each group were allocated 45 minutes, comprising three comprehension passages with seven questions each, mirroring the format of their prescribed English textbook. The total daily class duration was 50 minutes, conducted in the morning. Notably, all learners in the experimental group had prior experience using ChatGPT and exhibited a high level of digital literacy.

Results

This section tows out the analyzed data by reselecting the findings acquired by applying *t*-tests (paired and independent-sample). Tables 1–3 parade the performance of the control and experimental groups in the *t*-tests. The contrast of the two student groups under examination was viewed at two varied points, i.e., the start and the end. Besides, skewness along with kurtosis was used for data validity.

Comparing the Treatment Circumstances and Initial Assumptions

Before conducting illative analyses to compare treatment circumstances, early assumptions were calculated. This also was comprised of examining the skewness and kurtosis of the constructs. The standard deviation gauges the intensity or extent of variability within and among the samples. Thus, it is a prevalent tool across statistical analyses and holds significant weight across disciplines. It also contributes crucial insights into data variability and distribution. The following is the key to the terms mentioned in the tables of the analysis:

Mean Value	M-V
Standard Deviation	S-D
Skewness	S-S

Kurtosis	K-S
Shapiro-Wilk	S-W
Control Group	C
Experimental Group	E
Confidence Interval	C-F
Lower Limit	L-L
Upper Limit	U-L
Cohen's *D*	C-D

Table 1. Statistics Presentation of Pre- and Post-Testing: C and Groups (no. of participants = 50), including S-S and K-S

		M-V	*S-D*	*S-S*	*K-S*	*S-W*
C	Pre-test	6.01	1.18	0.49	0.49	2.10
	Post-test	8.14	1.01	0.21	0.37	2.84
E	Pre-test	6.10	1.19	-0.08	-0.59	2.78
	Post-test	17.22	0.41	0.27	-0.17	2.11

Table 1 reports the data for the pre- and post-test of two participating groups (C and E). Some important analyses like M-V, S-, S-S, and K-S are mentioned. Adding on, the S-W values for the two participating groups are wrote done. The value of S-W justifies the normality of the data. The data is taken as normal if it is between -2 and +2 for S-S. The S-W test was also inconsequential. This guaranteed that the two participant groups were distributed normally. Going on, the overall analyses were done by the 5000 bootstrap method which is a popular and authentic way to look for the sample distribution's estimation.

Table 2. Independent-Sample t-Test Pre-Test Results (CNG and EXG), N = 100

Variable	E (50)		C (50)				*95% C-F*		
	M-V	*S-D*	*M-V*	*S-D*	*t (118)*	*P*	*L-L*	*U-L*	*C-D*
Pre-test	6.10	1.24	6.66	1.23	-3.17	.005	-1.33	-0.11	0.011

To extract an analysis from the sample data representing both participant groups, an independent-sample *t*-test was employed through SPSS 25 (see Table 2). The values of the mean for C and E are 6.01 and 6.10, respectively. This corroborates that a slight difference lies in terms of the performance between the two participant groups. The S-D measuring the range to which the sample data diverge from their particular means was marginally lower for the C (S-D = 1.18) compared to the E (S-D = 1.19). This S-D's comparison affirms that a minimal difference lies in the data dispersion around the mean. The homogeneity assumption's variance was inveterate, denoted by an F-value of 0.016 along with a *P*-value > 0.05, signifying that the variance of the pre-test scores remained consistent across both groups. The independent-sample *t*-test conducted on the pre-test data further revealed no notable disparities between both groups, portraying that the groups were comparable in their performance prior to the intervention. However, the *t*-test statistic ($t = -3.17$) gave a *P*-value of 0.005, which is less than the alpha level of

0.05. This suggests that the two sample groups represent distinct populations. The confidence interval for the *t*-test, with a lower value of -1.33 and an upper value of -0.11, implies that the true population parameter (such as the mean difference between the groups) likely falls within this range. The absence of zero within this interval indicates that the observed effect is statistically significant at the chosen confidence level. Moreover, the effect size, as measured by Cohen's *D*, was calculated to be 0.011. According to Cohen's (1988) guidelines, this value suggests a medium magnitude of dissimilarity in the pre-test values of the experimental and control groups

Table 3. Independent-Sample T-Test Post-Test Results (C and E), N = 100

V	E (50)		C (50)				95% C-F		
	M-V	*S-D*	*M-V*	*S-D*	*t (118)*	*P*	*L-L*	*L-L*	*C-D*
Post-Test	17.22	0.41	9.35	1.05	-24.71	.005	-5.11	-4.989	7.90

The performance of the C and the E was assessed through a comparative analysis (see Table 3), revealing that the M-V of the E (17.22) is significantly higher than the M-V of the C (8.14). This distinguished variance proposes the high effectiveness of the intervention tool. Observing the standard deviation (S-D = 0.41) of the E indicates a wider dispersion of data points from the mean, presenting the superior performance of the E compared to the C (1.01). The homogeneity assumptions' variance was validated, as evidenced by an F-value of 1.331 with a *P*-value > 0.05, representing that the variance in post-test scores was consistent across both groups. The *t*-test statistic (t = -24.71) strongly supports the conclusion that the two groups represent distinctly different populations, with the E exhibiting a significantly higher mean than the CLG. The confidence interval for the *t*-test, ranging from -5.11 to -4.989, suggests that the true population parameter likely falls within this range. The exclusion of zero within this interval confirms the statistical significance of the observed effect at the chosen confidence level. Moreover, effect size, as measured by C-D, was 7.90, indicating a large magnitude of difference between the groups, as per Cohen's (1988) guidelines.

Discussion

This study demonstrates that ChatGPT significantly improves learners' understanding of grammar. The enhanced performance observed among learners can be attributed to the tool's capacity to generate human-like responses through a systematic approach that includes pre-processing, encoding, decoding, and post-processing of instructions (Su & Yang, 2023). Mastering English grammar poses challenges, particularly for those learning it as a second or foreign language. Nevertheless, ChatGPT offered a variety of practice texts tailored to the learners' proficiency levels, thereby providing the experimental group with a notable advantage. This finding is consistent with Lin and Chen (2024), who affirmed that ChatGPT serves as an effective resource for enhancing English grammar skills.

A notable aspect examined in this research was ChatGPT's ability to supply practice passages to users. This feature enabled learners to engage in repetitive grammar practice by interacting with diverse texts, thereby familiarizing them with answering comprehension questions. Furthermore, the feedback generated by ChatGPT could be

utilized by educators for further simplification and clarification, thereby enriching the overall learning experience. The tool also played a crucial role in vocabulary development, offering synonyms, contextual antonyms, and simplified meanings of sentences. This supports the findings of Mugableh (2024), who emphasized that contextual vocabulary is essential for text comprehension. Additionally, ChatGPT introduced learners to cultural contexts, tones, and grammatical nuances, thereby fostering a more comprehensive understanding. The personalized grammar options provided by ChatGPT contributed to enhancing learners' grammar stamina by presenting a variety of grammatical materials, which in turn improved their concentration and focus. Abduljawad (2024) investigated the influence of ChatGPT, an artificial intelligence tool, on the writing skills of ESL students at a university in Saudi Arabia and echoed this notion, suggesting that exposure to different types of passages, essays, and articles can enhance grammar stamina, as indicated in various studies.

Viewing from constructivism perspective, the major features of constructivism are the learners construct meaning by a social proves. Here we can see that the outward tool ChatGPT helped learners to socialize amongst their peers. Learners discussed and collaborated perfectly. The aspect found in this study joins with the study by Abduljawad (2024) who investigated the influence of ChatGPT, an artificial intelligence tool, on the writing skills of ESL students at a university in Saudi Arabia and found that learners learnt by social collaboration. Then constructivism believed that knowledge is situated in context. The context given by ChatGPT improves learners' knowledge in this research. Alharthi (2024) also in his investigation examined EFL learners' satisfaction with teacher-mediated versus ChatGPT-assisted writing opportunities and concluded that the better performance of learners was dependent on context of learning. Finally, in constructivism mistakes are taken as a chance to grow. This is clearly viewed in this study were the learner's mistakes helped them to enquire different grammar prompts from ChatGPT which improved their grammatical ability.

Conclusion

ChatGPT has shown considerable promise as a transformative resource for language learning. To assess its effectiveness in improving grammar skills within Saudi Arabian English as a Foreign Language (ESL) classrooms, a controlled experimental design was utilized. The research involved two distinct groups: one that received traditional instruction and another that combined ChatGPT interactions with standard teaching methods. Both groups engaged with the same materials and activities over a three-week duration. At the end of this period, a grammar comprehension test was administered, and the results were analyzed for comparative evaluation. Additionally, a series of interviews were conducted to gather students' insights regarding the usefulness of ChatGPT in their educational experience.

The results indicated a significant enhancement in grammar proficiency for the group that employed ChatGPT alongside traditional teaching methods. The interview responses supported these findings, with students highlighting benefits such as improved learning outcomes, greater grammatical accuracy, increased engagement, user-friendliness, and reliability. These outcomes emphasize ChatGPT's potential as a robust AI-driven educational tool that can substantially enhance language instruction in ESL settings. The integration of AI into educational methodologies presents a promising pathway for advancing language skills and enriching the overall

learning experience.

However, the study was constrained by its focus on a single gender, specific school grade, and nationality. Future investigations should examine the use of ChatGPT or other AI technologies among a more diverse demographic, encompassing various educational levels, university students, and female learners, to enable comparative studies. Furthermore, replicating the research in different national and cultural environments would yield valuable insights into the broader applicability of AI tools in education. As AI continues to play an increasingly significant role in educational discussions, it opens up numerous opportunities for research and instructional innovation.

Pedagogical Implications

This study holds strong implications in connection with pedagogy. This research can be beneficial for the learners to make them autonomous and self-motivated for grammatical learning. Some other implications can be the development of collaboration and cooperative ambiance amongst learners. Also, some strong implications direct towards the inculcation of technology for perfect learning at other levels and genres of English. This research can also help in active learning and personalized learning for future endeavors.

Limitations

This research had certain limitations. The study was conducted in Saudi Arabia only. Moreover, only grammatical aspect of English language was focused. Going ahead, there are many learning models available but due to the imitations of access only free version of ChatGPT was used. Moreover, male students were considered as a sample of the study.

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