



The Effectiveness of Using Computer-Assisted Learning and Chat GPT in Enhancing English Language Learning

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Abstract:

This study examined the effectiveness of combining Computer-Assisted Learning (CAL) and ChatGPT in enhancing English language learning, particularly grammar achievement and vocabulary acquisition among university students. A quasi-experimental pre-test/post-test design was employed with 30 undergraduate students from the Arab American University, divided into an experimental group ($n = 15$) and a control group ($n = 15$). The experimental group learned through CAL tools and ChatGPT, while the control group received traditional instruction.

Data were collected using a grammar test, a vocabulary test, and analyzed using t-tests in SPSS. Results revealed significant improvements in the experimental group's grammar and vocabulary performance compared to the control group. Statistical analysis confirmed that the differences between the two groups were significant ($p < 0.05$), indicating that the integration of CAL and ChatGPT can effectively support English language learning.

Keywords: Artificial Intelligence, ChatGPT, Computer-Assisted Learning, English Language Learning, Grammar Achievement, Vocabulary Acquisition.

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Introduction and Research Problem

The introduction of Artificial Intelligence (AI) in the educational field has radically changed the old learning paradigms, particularly in the language learning process. Particularly, Computer Assisted Learning (CAL) has been introduced as a useful resource to improve language acquisition offering personalized and interactive learning. (Chakravarthy, 2019). Technology integration in education has caused tremendous changes in the traditional learning techniques especially in the acquisition of languages.

Computer-Assisted Learning (CAL) has become a new revolution that is improving the learning process by offering interactive and customized learning. Davis (2016) says that CAL helps students learn a language through providing instant feedback, personalized activities as well as interactive multimedia tools, which accommodate various learning styles. As artificial intelligence (AI) developed, the opportunities of digital learning have grown as the possibilities of interactive and dynamic language learning were introduced with the use of applications like ChatGPT. Although CAL has provided a huge advantage to language learning, AI-driven applications like ChatGPT are taking language learning a notch higher as they provide the experience of real-time and interactive learning. Tools based on artificial intelligence, e.g., ChatGPT, have become the subject of significant attention in the education sector as they can resemble human dialogue and offer language assistance on demand. The research indicates that chatbots based on AI can promote the level of engagement, motivation, and fluency in English through providing real-time feedback and adaptive experiences in learning (Johnson & Lee, 2020). ChatGPT is an open-source program created by OpenAI that is known to help learners enhance their writing, reading, and speaking abilities by a means of the dialogue-based learning process (Brown and Green, 2017).

These characteristics render it a worthy addition to conventional classroom teachings and self-directed learning. In addition, various empirical studies have also found the effectiveness of the CAL and AI technologies such as ChatGPT to support the learners in the in English language learning. Students who used AI-based language learning

applications showed a greater level of engagement and language competence than those depending on only traditional methods according to the research conducted by Roberts and Jones (2019). In a similar way, Wang and Chen (2018) study found that the use of AI chatbots in English language learning settings was highly effective in enhancing the comprehension of learners and their communication skills. These results reveal the possibility of the AI-driven tools to promote self-regulated and powerful language acquisition. Along with these benefits, there are some challenges related to the use of CAL and AI-based applications in language education. Other researchers believe that AI-based responses can be semantically inappropriate and culturally insensitive, which may influence the language acquisition process of learners (Lee and Kim, 2020). Moreover, the problem of being too dependent on technology and having less human interaction in language learning settings has been brought up (Rovai, Baker, and Ponton, 2020). To overcome these obstacles, it is necessary to take a middle ground between AI-based learning tools and human-based instructions that will maximize the learning process. With the growing use of technology in the educational process, it is necessary to discuss the efficacy of CAL and ChatGPT in improving the learning of English language.

This paper will set out to investigate how these technological tools can influence the language proficiency, engagement and motivations among learners.

STATEMENT OF THE PROBLEM

Although the literature on AI in education is increasing, a few concepts regarding the specific impacts of AI technologies on language proficiency, engagement, and motivation among English language learners have been understood. This paper will attempt to address this gap by analyzing the influence of AI-enabled tools such as ChatGPT on these aspects. The extensive adoption of technology in the classroom and especially with the use of Computer-Assisted Learning (CAL) and artificial intelligence (AI) has brought about some critical questions on its usefulness in improving English language learning. Although the possible advantages of these tools have been emphasized in many studies, no detailed knowledge has been made on the implications of these tools on the language proficiency of the learners, their



engagement and motivation. According to Lee and Kim (2020), the usefulness of AI solutions such as ChatGPT have been identified due to the fact that they have a promising potential to support language learning in the real-life learning processes, yet the practical implications of their application remain unexplored. Irrespective of the encouraging results about the application of AI tools such as ChatGPT, there are still issues in their application. According to Rovai, Baker, and Ponton (2020), technology can both improve learning experiences and problem. The latter are diminished human communication and dependency on digital devices. Besides, the cultural sensitivity and contextual appropriateness of AI-generated responses have been challenged. According to Lee (2021), the applications of AI might lack the ability to offer feedback that is contextually appropriate and this might be a barrier to learning the use of subtle language. This problem shows the necessity of the critical analysis of the content and answers produced by AI technologies with reference to their conformity to a wide range of cultural backgrounds of learners. These issues are important in order to maximize the learning process and make sure that technology is used as a facilitator and not a hindrance to the effective language learning process. Whereas AI technologies integration in language learning has had its potential, scanty studies have been conducted to examine the precise impact of AI-based applications, including ChatGPT, on language competence, student interaction, and motivation. This is where this gap lies; the practical implications of these technologies in real life education situations are yet to be evaluated. Nevertheless, even with the mentioned challenges, the introduction of AI-driven tools into language classes presents immense possibilities of improving the learning process. This paper will attempt to examine how well these technologies, especially ChatGPT, have solved these issues. Although the current literature demonstrates the potential of AI tools, such as the ChatGPT, there is still a gap in the comprehension of how these tools affect the specific area of learning English as a second language, specifically, the language proficiency, engagement, and motivation. The proposed research will address the gap by examining the benefits and shortcomings of AI in contemporary language teaching.

SIGNIFICANCE OF STUDY

This paper has proved that a combination of Computer-Assisted Learning (CAL) and ChatGPT can result in more successful and interactive language learning. The students will be able to obtain more successful outcomes of learning as they will be able to provide empirical evidence of the significant improvements in grammar and vocabulary. Moreover, the reported positive perceptions of the students, such as the enhanced motivation, self-confidence, and self-paced learning are indicative of the fact that such tools can help to turn the learning process into a proactive, individualized, and empowering process, as opposed to the passive and one-size-fits-all learning process.

Additionally, the research will also touch upon the problems of the AI usage in language instruction, including situational suitability and cultural considerations of AI-generated answers. Critically analyzing these questions, the study will help develop the best practices in the use of AI tools in a way that will respect and recognize the unique backgrounds of learners. This is especially significant in a globalized world where the learning of languages can easily be accompanied by the context of different cultures, as explained by Lee (2021).

RESEARCH QUESTION

1. What is the effect of using computer-assisted and ChatGPT-based learning on students' grammar achievement compared to traditional learning methods?
2. What is the effect of using computer-assisted and ChatGPT-based learning on students' vocabulary acquisition compared to traditional learning methods?

Literature Review *

1. Technological Tools in Language Learning

The language learning technology in the past decades usually corresponded to the weaknesses of the computing system in which it was run (Healey, 2016). Nevertheless, it was a great stepping stone to subsequent adaptive and interactive systems, including AI-driven platforms. Originally, the learners were presented with fixed training



and practicing programs. These programs had set databases of vocabulary and grammar practice, which was not responsive to context or dynamically feedback (Kaur,2023). Repetition and pattern recognition were prominent in their methodology, and they were moderately useful in preserving the communicative competence as rote learning but of lesser value in improving it(Al Fraidan & Almarri,2024). A simple early CALL tool can be a multiple-choice grammar question that merely states whether he or she has a correct answer or not, without revealing the underlying rules and can recommend how to improve the answer(Golonka,2014). With the enhancement of the computing power, some of the tools even included the primitive form of branching logic so that it could offer slightly different paths, depending on the response of learners. This methodology seems to be a forerunner to subsequent adaptive strategies as it can be easily customized to fit the performance patterns to the content difficulty (Pawlak& Kruk,2025). Nevertheless, all these changes usually were rather insignificant and were not accompanied by the profound examination of the strong and weak aspects of learners.

They were more of simple classification exercises as opposed to accurate design of instructions. Multimedia increased the amount of possibilities regarding second language acquisition materials. The audio quality brought the ability to train the pronunciation with a recording of the native speech, and simple visual tools such as the animation served to explain the meaning or the cultural context that the text alerts would not allow (Gierl,2017). Although these benefits existed, interactivity was not high; students were usually consumers of content as opposed to dialogue participants within the system. In higher education settings, the initial applications of computer-assisted learning used to be complemented by language lab sessions during which teachers instructed students through the use of software. The tools were mostly supportive as opposed to the key method of delivering content. The digital exercises were applied between the lessons with students receiving immediate feedback (but very restricted one) structured in correct and incorrect binaries (Akturk,2022). The interpretive insufficiency of such outputs is explained by the fact that the progress depended on teacher interfering to describe the mistakes and outline the improvements. Nonetheless, despite such shortcomings, these primitive systems were a bit successful in encouraging self-study behaviours. The



learners would also have the opportunity to interact with the language during non-planned lessons which enhances the rate of exposure which is a crucial aspect of skill learning since in language learning there is sparsity in memory consolidation (Chen,2025). The accessibility of computers categorized computer based exercises as an alternative to paper homework as a quick and repeated drill. Similar progress happened in the abilities of formative assessment. Even though it cannot be compared in terms of the scope of the modern AI analysis, the initial signs of the diagnostic aspect surfaced, which measured the accuracy rates of the learners over the course of time. Such cumulative data may mark the point at which a student was persistently experiencing some problem with a particular category of grammar or vocabulary (Martin-Monje,2018). The commentary was simple but this follow-up showed the possibilities to individual program paths, which were eventually achieved in full in applications that were supported by machine learning. The other interesting detail is the way these tools overlapped with the efforts to make the cultural immersion(Shadiev,2025). Certain programs consisted of contextual dialogues/short stories delivered in form of audio clips with simple pictures or translations. This was to replicate real-world use situations though it was within very strict written conditions. students were advantaged by being introduced to original sentence patterns and intonation patterns, to form expectations regarding the rhythm of conversation, although the pattern of interaction may have been preprogrammed. Teachers were aware of the merits and the demerits of using such technology pedagogically. Its repetitive precision was superb to correct morphologically related terminations or typical verb conjugations yet less efficient in developing useful aptitudes, including discourse management or expression variation (Rassaei,2022). Consequently, the initial implementations of computer-assisted learning were more inclined towards hybrid systems such that human instructions were used to describe the descriptive gaps created by software applications. Comparing these roots with modern artificial intelligence systems helps to note how program responses have been replaced by generative responses, which involve statistical modeling of large datasets (Larson,2017). Recent applications such as ChatGPT can now do what previous computer-assisted instruction systems hoped to through giving correct answers, and dynamically generated corrective feedback providing corrective suggestions depending on the quality of the input



provided by the user (Abdulla,2024). Nonetheless, it is evident that the theoretical space that is currently utilized in the development of generative techniques could not have developed as it has without decades of gradual developments. The other factor is the disparity of access. Intensive use of technology prior to its early development encountered a high cost in hardware and network strains; to operate a computer-assisted learning system that is based on multimedia, special facilities and qualified technical personnel are needed to maintain the system. This restricted access even with enthusiasm on the part of major institutions (Ghafar,2023). Since comparable functionalities can be provided over the personal devices that are broadly available and linked by the broadband networks, the basic bottleneck of those years has been eliminated. The route between text-based drills that are not interactive and the interactive AI within a conversational context reflects the steps of language learning setting. Although the modern systems are superior to the ones of the past through the ability to incorporate natural language processing engines that have the potential to be contextually aware in providing assistance (Yang et al., 2025), understanding the history behind the invention provides a valuable understanding of how the initial innovations, despite being unsophisticated by modern standards, were essential experiments in testing the viability of education as well as the technological feasibility of human-led education.

2. ChatGPT and Its Role in English Language Learning

The design of a conversational input of ChatGPT to target the English language learning has to strike a just balance between practical contingency and pedagogical efficiency. The interface must support coherent and context-sensitive interactions that are based on real human dialogue. This involves coming up with answers that not only respond to the direct questions of the learner but also keep the flow of the conversation thematic across several interactions, with linguistic patterns being strengthened (Bin-Hady,2023). The contextual relevance is very important; when the system has a steady tendency of providing on-topic, semantically relevant responses, learners tend to remain actively involved and have trust in the tool as a means of effective learning. The successful approaches included placing the model in a

regulated online space, which can be accessed through common gadgets, including tablets(Agustini,2023).

The element of personalization is crucial, with the prompts in the session session being aligned with the learning topic of the week so that the interface could place the new vocabulary or grammatical structures into an existing narrative that aligns with the curricular development (Kostka and Toncelli,2023). This level of personalization does not only increase the relevance but also the motivation because learners can realize that there are direct relations between the dialogue mediated by AI and their immediate educational goals.

Conversational design has interactive components that go beyond text in cases where voice and multimodal inputs are used. Integrating chatbot conversation and speech recognition technology allows to smoothly integrate oral practice into text corrective workflows (Monika, M., and Suganthan,2024). As an example, a learner may use the sentence, where he/she will get instant feedback on the pronunciation, and this is followed by the encouragement of the learner to repeat the sentence with specific vocabulary, all in a single conversation thread. Such instant feedback sustains cognitive attention on the communicative act as opposed to the communicative act being divided into discrete evaluative processes. The interface must also be designed in such a manner that it promotes active inquiry. The act of encouraging the learners to ask questions rather than passively responding to them changes the dynamics of the dialogue into student-centered conversation. These patterns are imitative of the interaction in the real world where the speakers bargain instead of adhering to the channel dialogue. Since students become more independent, they are better able to develop spontaneous questions, which can be used to achieve grammatical progress and pragmatic proficiency. Reality simulation chat flows are used to make language use more experiential, by putting it in context of a real-life situation, like placing an order in a restaurant or having a job interview, right in the chat flow (Balci,2024). When learners get to participate in these simulated situations, they get to experience vocabulary and syntactic patterns which are inherently related to real objectives of functional communication. The levels of adaptive challenge in such tasks guarantee progress: the initial tasks with easy prompts may evolve into the open-ended challenges where



the sentence formation must be more complex. The main factor that interface designers should take into consideration is that they should strive as much as possible to prevent cognitive interjections and offer corrective input. To stop split-attention effects, it is possible to embed corrections in-line instead of redirecting them to error log files (Monika& Suganthan,2024). In case a learner uses a wrong tense in a conversation, an instant replacement of a different phrasing, with a short explanation, will enable using the word again without interfering with the storyline. Therefore, the conversational format in itself is the feedback medium, which is a significant difference that distinguishes AI-driven interfaces as opposed to the exercise sheets that are not interactive.

3. Applications for ESL and EFL Learners

The ESL/EFL skill of writing can be greatly enhanced with the help of adaptive, AI-driven support systems, particularly when these systems are incorporated into the routine of practice of the learners. Developing writing competencies depends upon the input of language information as well as repeated feedback and correction cycles in meaningful communication activities (Rajendran& Yunus,2021). The fact that ChatGPT can offer contextually rich advice promotes development that is not merely superficial accuracy, but in a deeper structural knowledge and style (Al-Bogami& Elyas,2020). The important process that can be enhanced by AI is the ability to distinguish between structural mistakes that are persistent and those that are incidental and to react differently. As an example, when a learner continuously makes the mistakes with comparing or superlatives, he/she will be provided with the detailed explanations, as well as the examples of the usage of the comparative and superlatives in different situations (Mali,2025). On the other hand, one lexical error may result in a prompt prompt to correct and move on with the activity that the learner has initiated. The methodology will avoid overload in the cognitive system; long interventions will be taken only when there are serious conceptual gaps to be filled, and the minor errors are promptly sorted out and the text production process continues. The limited nature of AI-related editing encourages slow and steady progress through in-text corrections being added to the drafts. The learners are able to observe new forms appearing in-line with their writing like changing a passive construction into an active construction



and apply these new structures to their continuing narratives. This live integration would make grammatical and syntactic corrections easier to memorize since they occur in real-life text instead of in abstract exercises that do not relate to any context (Alsaedi,2024). Such built-in feedback would over time facilitate automation of proper structures as a result of repetitive exposure at the time of need. It is also crucial that the model can allow the reformulations to be more coherent and rhetorically good rather than correct. Recommendations can be made in areas regarding logical flow of paragraphs or about the consistency of thesis statements and body as well. When the learners are instructed to relate ideas more fluidly or to provide thematic continuity between sections they learn higher order skills required in academic writing in English. All such meta-level competencies are difficult to develop by practicing in isolation but can be achieved once combined with specific AI-generated feedback, which is embedded in the writing process(Lashari,2023)

Oral skills communicative facilitation facilitated by AI-based applications, such as ChatGPT, would make interaction-focused and personalized feedback more striking in terms of development of writing. The immediacy of the conversations establishes a practice environment that is quite similar to human conversation, and learners can experiment without the social pressure or the perceived performance pressure that is associated with speaking tasks performed face-to-face (RAO,2019). This is particularly useful in the context where people are afraid of being judged or are constrained by cultural expectations; a non-judgmental, listening interface can help to overcome the effect of psychological barriers and promote oral rehearsal more often (AlSaleem,2018). Oral communication can be improved by means of constant involvement in activities that involve the process of speech production, understanding, and feedback. A two-channel solution to this is integrating ChatGPT-based text-based conversational support with a speech recognition system to have learners speak out their answers and get marks on pronunciation accuracy or a descriptive review of stress patterns and displayed on the on-going conversation threads (Rajendran& Yunus,2021).

This arrangement maximizes the relationship between production, evaluation, and application in real time. As an example, a learner with



difficulty differentiating vowel length might be asked to repeat target phrases until the acoustic product they produce resembles native-speaker models; further reinforcements will facilitate the process of progress by showing them that they are making actual change in the address of certain phonetic targets. The exposure frequency is important. Environment-based data on chatbot speech drills shows that the more time one spends in oral practice mediated by AI the more that the level of fluency and vocabulary range improves (Idrus,2016). These correlations are true even in dissimilar situations of the duration of sessions; what is significant is the repetitive succession of several interactions, and productive language use is evaluated and corrected as soon as possible. This method is similar to spaced repetition in learning vocabulary, but it is implemented in motor control and prosodic habits.

The listening-to-correct version, trying to reproduce, targeted corrections and retries are the iterative procedures that are known to enhance the automatization of correct articulatory patterns(Dewan& Sharma,2025). The system raises scenarios that mimic real-life situations, like placing an order, scheduling, or clarifying the misunderstanding, and thus, the responses will involve making the necessary tone changes or politeness strategies that apply to the target culture (Li& Zhao,2025). These demonstration prompts inculcate oral skill training in functional communication settings quite as opposed to sentence isolation. Students learn not only segmental aspects, such as the clarity of consonants, but also suprasegmental ones, such as the intonation patterns in accordance with communicative purpose. AI is also able to emphasize the fact that an increase in pitch signifies a question or that the placement of stress is a subtle feature of the meaning that may be missed in written tasks. These gains can be extended by incorporation of these tools into the collaborative classroom activities. The students might work in pairs where one of the students communicates with ChatGPT using the spoken input and the other one observes the text output to be given to him/her to make a grammatical or lexical decision.

4. Research Design

The research design of this research was a quasi experimental research design that used pre-test/ post-test control group research



design to investigate the effectiveness of Computer- Assisted Learning (CAL) and the ChatGPT application in the learning and acquisition of English language by assisting learners. The quasi-experimental design was chosen as it is suitable in testing the teaching interventions in the real educational conditions, in which assignment is not always feasible.

The study involved two groups of participants the experimental one being given instructions by using a mixture of Computer-Assisted Learning (CAL) and the use of the ChatGPT application and the control group being given instructions by using traditional teaching methods without the help of any technological aids. The instructional material was the same in grammar and vocabulary and the only difference was the mode of delivery in both groups. Pre-tests and post-tests were conducted in order to determine the effect of the intervention on both groups. These tests were aimed to assess the level of proficiency of students in two important aspects of learning the English language grammar and vocabulary.

The pre-test was used to set the base level of performance, and the post-test was used to measure the results of learning at the end of the instructional intervention.

The structure of this design allowed the researcher to:

- Compare performance across (experimental vs. control) groups and evaluate the impact of the ChatGPT-based approach,
- Compare the change of the variables between the groups (pre-test and post-test) of the same group.
- Assess the significance of the differences found through the use of proper inferential statistics.

With this research design, the study was going to identify both the overall efficacy of the introduction of ChatGPT and computer-assisted tools into the English language instruction, as well as the gains in grammar and vocabulary learning that could be attributed to the intervention, and the research design structure is demonstrated in the following Table 1.

Table 1: The research design structure

Group	Pre-Test (X1)	Treatment (Y)	Post-Test (X2)
Experimental Group	Yes	Instruction through a combination of Computer-Assisted Learning (CAL) and the ChatGPT application	Yes
Control Group	Yes	Traditional instruction only	Yes

Notes: X_1 =Pre-test; Y = Treatment (combination of Computer-Assisted Learning (CAL) and the ChatGPT application)

X_2 = Post-test

5. Population and Sample

The target population of the study was undergraduate under English language courses at the Arab American University. It was also narrowed down to students in their third and fourth academic year since they will have an intermediate to advanced level of mastering the English language and thus can be used in the traditional and technology-enhanced modes of instruction.

The purposive sampling method was used in selecting the participants based on the condition that they fit the requirements of sharing similarity in the levels of their command of the English language and that they were in active enrollment in courses that dealt with grammar and vocabulary. Out of this number, 30 students were been selected and each group was taken to consist of 15: Experimental Group: 15 students that were trained by means of Computer-Assisted Learning (CAL) and the usage of the ChatGPT application.

Control Group: 15 students who were taught using conventional methods of teaching and they did not use computer or AI-based tools. Caution was made so that the two groups are balanced in terms of the level of study (i.e., year of study), previous exposure to English learning tools and general demographics to reduce the chances of external factors affecting the outcome.



The purpose and procedures of the research were explained to all the participants who voluntarily consented to take part in the study. This sample was small but adequate regarding giving initial clues on the effectiveness of ChatGPT-based learning and it was capable of enabling the usage of simple inferential statistics to ascertain the importance of the observed differences across and within the groups.

6. Research Variables

This study investigated the effect of technology-enhanced instruction on English language learning by examining the relationship between one independent variable and one dependent variable.

- Independent Variable:

The independent variable in this paper is the Computer-Assisted Learning (CAL), as well as the ChatGPT Application. This involves instruction models that combine interactive digital tools and AI-powered ChatGPT tool to assist in teaching and learning English grammar and vocabulary. This was a variable that was used only on the experimental group.

- Dependent Variable:

The dependent variable is the improvement in the English language learning and this is directly measured by the performance of the students in grammar and vocabulary. The improvement was evaluated based on comparing the pre-test and post-test scores in and out of the experimental and control groups.

This research sought to establish the effectiveness of the combination of ChatGPT and computer-assisted instruction in enhancing the acquisition of English language in students through the analysis of the effect of the independent variable.

7. Research Instrument

Two tests were used as the main research tools to gauge the effectiveness of the intervention and they were an English Grammar Test and Vocabulary Test. These assessment tests were quantitative in



determining how competent the learners were in the specific language skills prior to the period of instruction and at the end of the instruction period.

A. English Grammar Test:

The English grammar test is an exam in the form of 50 questions that aimed to assess the knowledge of the English grammar comprehensively and its application. The questions were diverse in grammatical areas pertaining both to the intermediate and advanced learners such as tenses, sentence structure, parts of speech, and correction of errors. Questions in the format were of multiple choices, sentence correction, and grammatical error. This was to be done in order to assess the accuracy and profundity of the grammatical knowledge of the learners in relation to the teaching material.

B. Vocabulary Test:

The Vocabulary Test included five well-formulated questions that were aimed to determine various dimensions of knowledge and use of vocabulary: True or False: The students had to answer questions on whether some provided statements were true or false in reference to the use of vocabulary. Multiple Choice: The students had to circle the letter with the correct answers out of a number of choices.

Translation: The students were asked to translate English idioms into the corresponding Arabic idioms and see how well they comprehended the figurative language and cultural synonyms. Conceptual Explanation: The students have been able to explain the concepts of denotation and connotation and present contrasting points between them as well as give examples to explain their responses.

Definition and examples: Students described particular definitions where vocabulary is involved and then they also explained their definitions by providing pertinent examples. These two tests were conducted twice; during pre-test in the case of the instructional intervention to achieve the proficiency level before the intervention, and during post-test at the end of the intervention in order to determine the learning outcomes.

The pre-test and post-test versions were to be content and difficulty comparable to meet reliable results comparison.

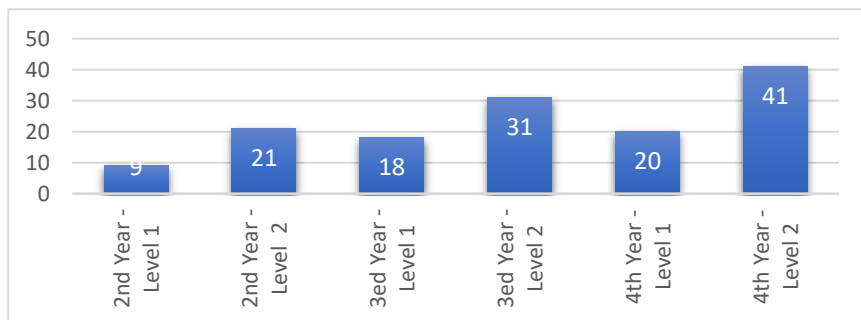
7.1 Purpose and Scope of the Questionnaire

The questionnaire was an attempt to supplement the quantitative data of the pre-tests and post-tests with a wider perspective of the attitude and experiences of the students. Although the tests were used to assess the grammar and vocabulary performance improvements, the questionnaire delved into the subjective assessment of the students as to: Their perceived usefulness and user-friendliness of ChatGPT and CAL tools in learning. The simulative and interaction scope of adopting AI-based programs in teaching English. What precise advantages do students point out having with the use of these tools (e.g. more practice, instantaneous feedback, or greater confidence).

7.2 Sample Description

A sample of 140 students who were selected to answer the questionnaire was used, based on courses in the English language in the Arab American University. The larger sample was selected to get a more representative and general perception of the learners in various levels of academics with diverse backgrounds. The study sample was both males and females, starting with second year and up to fourth year undergraduate students with different levels of familiarity with AI tools and digital learning platform, and Figure1 presents the distribution of the sample.

Fig. 1: Sample of 140 students drawn from various English language courses at the Arab American University





A stratified sampling approach was used to ensure that students from different academic years and English proficiency levels were adequately represented. This approach enhanced the reliability and diversity of responses, capturing the perceptions of students who had both direct and indirect exposure to AI-supported English instruction.

All participants voluntarily took part in the study and were informed about the research objectives and confidentiality of their responses. The data were collected anonymously to encourage honest and reflective feedback.

7.3 Structure of the Questionnaire

The questionnaire consisted of two main parts:

- **Part A:** A set of 15 Likert-scale items rated on a five-point scale (1 = Strongly Disagree to 5 = Strongly Agree).
 - Items 1–6: Measured *perceived usefulness* and *ease of use* of CAL and ChatGPT in language learning.
 - Items 7–10: Focused on the *benefits and improvements* students noticed, such as enhanced understanding of grammar, vocabulary expansion, or improved communication skills.
 - Items 11–15: Assessed the *challenges and limitations* faced by students, including technological constraints, difficulty interpreting AI outputs, or lack of instructor support.

Data Collection and Analysis

The questionnaire was developed as an online form on the Learning Management System (LMS) of the university, and it was easily accessible to all the participants. The data was collected when students had already got involved into AI-supported learning activities throughout the semester.

The Likert-scale items provided quantitative data, which was analyzed with the help of descriptive statistics (mean, standard deviation, frequency, and percentage) to describe some general tendencies in the perception of students. Besides that, the inferential

statistical tests, i.e., t-tests, ANOVA, were also used to find out whether there were any significant differences in the perceptions depending on the variables, i.e., the level of academic study, gender, or previous experience using the AI tools.

The thematic analysis was used to analyze the qualitative results of the open ended questions. The responses of the students were coded and classified into themes, including, but not limited to, improved engagement, autonomous learning, technical issues, and AI limitations. This two-fold method of analysis gave depth and breadth of the knowledge of the student perspective.

7. 4 Significance of the Questionnaire

Including such a mass survey, the research goes beyond the immediate experimental results and encompasses more educational and psychological aspects of it. The results will enable the educators and policymakers to realise how the students perceive the incorporation of AI in English teaching, the real issues encountered, as well as the pedagogical approaches that should be adopted to maximise AI utilisation in the classroom in the future. Experimental outcomes are supplemented with perception-based data to increase the validity, the extent of understanding, and applicability of the conclusions made in the study.

D. Validity and Reliability:

In order to make the tests valid, experts in the field of English language teaching reviewed the two instruments, and piloted them on a sample group of students equivalent to those who participated in the study. The results of this pilot were obtained to make improvements in questions clarity and alignment to learning objectives.

The reliability was evaluated by the use of Cronbach alpha and the results showed that both grammar and vocabulary tests had good internal consistency. The perception questionnaire was also reviewed by the experts to determine the content validity and the alpha of Cronbach was determined on the Likert-scale items and the coefficient obtained was within the acceptable range, meaning that the scale can reliably measure the student perceptions.



These tools allowed obtaining strong quantitative measures of grammar and vocabulary proficiency of learners as well as useful qualitative data about their perceptions, which allowed conducting a comprehensive assessment of the effectiveness of Computer-Assisted Learning (CAL) and the ChatGPT application in improving the acquisition of English language.

7.5 The Data Collection

The process of collecting data in this study was well planned in order to measure the effects of Computer-Assisted Learning (CAL) and the use of ChatGPT application on the English language proficiency of students accurately. The procedure used in the collection was systematic in order to adhere to the quasi-experimental design, whereby the experimental and control groups underwent pre-test and post-test tests.

Step 1: Pre-Test Administration

Before the instructional intervention, participants of both experimental and control groups had to undergo two standardized pre-tests, i.e., the English Grammar Test (including 50 questions) and the Vocabulary Test (including 5 multi-format questions). The intention of the pre-tests was to create a level of proficiency of each participant in grammar and vocabulary. The tests occurred in a controlled classroom to ensure consistency and the participants received clear instructions and were allowed the same amount of time to answer the tests.

Step 2: Implementation of the Instructional Intervention

After the pre-tests, the intervention was put in place within a specified instructing time. Experimental group was instructed with the combination of Computer-Assisted Learning (CAL) resources and the ChatGPT application, and the control group was instructed with the use of traditional face to face teaching methods (without involving any digital or AI-based tools). The content of the instruction was the same in both groups and it was based on grammar and vocabulary topics. The only point of differentiation was the one of delivery method.

Step 3: Post-Test Administration

Post-tests after the end of the teaching session were done on the same grammar and vocabulary tests with identical conditions as the pre-tests. The post-tests were aimed at gauging the learning results and whether any significant changes occurred in the performance of the students and especially the experimental group.

Step 4: Data Recording and Organization

The entire pre-test and post-test data were gathered, documented and coded in a tabular database to be subjected to statistical analysis. The data was coded based on the group of the participants (experimental or control) and the type of test (grammar or vocabulary), so it could be easily distinguished and compared both between and within the groups. Caution was observed during the collection of data to ensure objectivity, negligence, and integrity of results of the data collection process.

The reliability and validity of the data collected was made possible by the standardized administration of tests and uniformity of the material taught.

7.6 Data Analysis Technique

The data analysis techniques in this research were developed to comply with the quasi experimental research design and to give valid response to the mentioned research questions. The Statistical Package of the Social Sciences (SPSS) was used to analyze the quantitative data obtained during the tests of grammar and vocabulary both in pre-tests and post-tests. Both descriptive and inferential statistics were considered in analysis to consist of differences between the experimental and control groups and the effectiveness of the intervention.

The Independent Samples t-test was used to address the first research question that included the impact of employing computer-assisted and ChatGPT-based learning on the grammar performance of students versus the traditional learning methods. This test was designed to compare grammar scores after the post-test by students in the



experimental group (those who were instructed with the help of ChatGPT and computer-assisted tools) and the control group (those who were taught using traditional methods). This analysis involved the computation of the mean and standard deviation of each group and then a t-value, degrees of freedom and p-value were reported.

A substantial p-value ($p < 0.05$) would imply the statistical significance of the difference between the two groups, which would tell whether the intervention was effective or not. In the same way, the second research question was on vocabulary acquisition. The post-test results were once more compared with the Independent Samples t-test between both groups regarding vocabulary.

The outcomes were useful in establishing whether there was a significant difference in the use of ChatGPT and computer-assisted tools on vocabulary learning. In case the means of experimental group were significantly higher, it would be in favor of the hypothesis that ChatGPT-based approach is more effective in acquiring vocabulary than traditional ones.

Description of the Sample (Experimental vs. Control Group)

The respondents of this research were 30 undergraduate students undertaking English language classes at Arab American University.

The study populations were split into two equal groups: Experimental Group ($n = 15$): These students had to be taught in a Computer-Assisted Language Learning (CALL) environment that was based on the use of the ChatGPT application. During the learning sessions, they interacted with the interactive digital content, exercises, and live assistance of AI-based tools.

Control Group ($n = 15$): The students of the Control Group were taught through the traditional face-to-face means, i.e., through printed textbooks, grammar lessons in a lecture format, and vocabulary memorization exercises without using AI tools.

All the participants were in their 3rd or 4th year of study and their English proficiency was of a similar level, which was determined by

the institutional placement tests. Random assignment was done to provide equivalence and remove the possible selection bias.

Data Collection Process

The data collection was conducted over a six-week instructional period. The study utilized two primary assessment tools:

- English Grammar Test: A standardized test comprising 50 multiple-choice and fill-in-the-blank questions designed to evaluate students' mastery of grammatical structures.
- Vocabulary Test: A five-question analytical test that measured different aspects of vocabulary knowledge, including:
 1. Identification of True/False statements.
 2. Multiple-choice question on word meaning.
 3. Idiom translation from English to Arabic.
 4. Explanation of denotation and connotation with examples.
 5. Definition of key vocabulary concepts with examples.

Each participant completed a pre-test before the intervention and a post-test after completing the instructional period. Both grammar and vocabulary tests were administered to measure learning gains. In addition, observational notes and feedback were collected during the instructional sessions to support the interpretation of quantitative data.

Descriptive Statistics Analyses

The data obtained were compared to determine the performance of the students in grammar and vocabulary prior to and after the intervention. The variables of both groups are provided as Table 2 and Table 3 below in means, standard deviations and sample sizes respectively. Table 2 and Table 3 are respectively represented in Fig 2 and Fig 3 as a graphical representation of pre-test and post-test performance in grammar and vocabulary respectively in both groups.

Table 2: Descriptive Statistics for Grammar Scores

Group	Test-type	Mean Score	Standard deviation	Sample size
Experimental	Pre-test	11.60	1.88	15
Experimental	Post-test	16.13	1.77	15
Control	Pre-test	11.53	1.64	15
Control	Post-test	13.47	1.73	15

Fig. 2: Graphically illustrates Descriptive Statistics for Grammar Scores

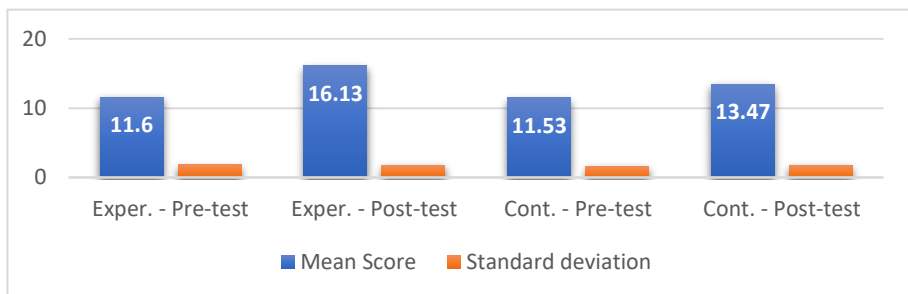
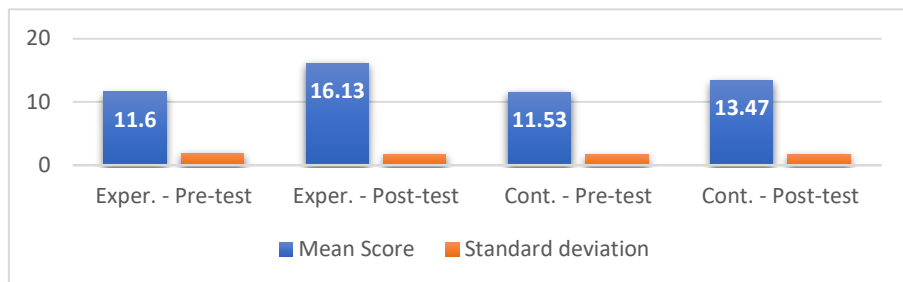


Table 3: Descriptive Statistics for Vocabulary Scores

Group	Test-type	Mean Score	Standard deviation	Sample size
Experimental	Pre-test	11.20	2.83	15
Experimental	Post-test	16.47	1.73	15
Control	Pre-test	11.27	2.09	15
Control	Post-test	13.40	2.53	15

Fig. 3: Graphically illustrates Descriptive Statistics for Vocabulary Scores



As depicted in the above Figures, Figure 2 and 3 provide the descriptive statistics of grammar and vocabulary scores of both experimental and control groups in the pre and post intervention period. These tables can reveal the performance patterns in each of the groups and can be regarded as an initial sign of the adequacy of the Computer-Assisted and ChatGPT-based learning strategy used in the experimental group.

As it is shown in Figure 2, the pre-test mean grammar score in the experimental group was 11.60 (SD = 1.88), and the post-test mean was significantly higher, 16.13 (SD = 1.77), which shows that grammar proficiency has improved significantly after the intervention. This enhancement is an indication that the teaching method that was applied on the experimental group could have contributed positively to the learning of grammar among students. Equally, grammar marks of the control group also indicated a more modest improvement with a pre-test mean of 11.53 (SD = 1.64) and a post-test mean of 13.47 (SD = 1.73).

Although the improvement is seen, the scale of the change is a lot lesser than the experimental group. This difference in the improvement of the score of the two groups proves the hypothesis according to which the introduction of computer-assisted learning tools and especially ChatGPT can be more efficient in improving grammatical skills of students than the usual strategies. In addition, the standard deviations, which are quite close to each other in each group and type of test, show that the difference in the performance of students was uniform in each group, which is why the effect of the intervention on the student is likely to be quite homogeneous between groups.



The experimental group, as presented in Figure 2, experienced a great vocabulary improvement, having a pre-test of 11.20 (SD = 2.83) and post-test of 16.47 (SD = 1.73). Such a significant result highlights the possible efficiency of the ChatGPT-improved learning environment in the vocabulary acquisition process. However, vocabulary scores in the control group were less improved with the mean score of 11.27 (SD = 2.09) pre-test and 13.40 (SD = 2.53) post-test.

Despite a certain improvement of the vocabulary skills, the difference between pre- and post-test scores is not as high as in the case of the experimental group. The standard deviations also give some additional information on the distribution of the scores. The larger SD of the pre-test scores indicates that the pre-test vocabulary knowledge of students was more diverse, and it became more stable (lower SD) following the intervention in the experimental group which may indicate the success of the specific learning strategy.

On the whole, the results suggest that the grammar and vocabulary levels were more significantly improved in the experimental group compared with the control group as reflected in Figure 4.3 and Figure 3, which, in turn, supports the purpose of the study to determine the effectiveness of the computer-assisted and ChatGPT-supported learning tools. The increased consistency of the scores and the minimization of the standard deviations, especially in the experimental group, are the first signs that the intervention might have resulted in higher learning outcomes and fairer performance of the students.

Fig. 4: Comparison of Pre-Test and Post-Test Grammar Scores by Group

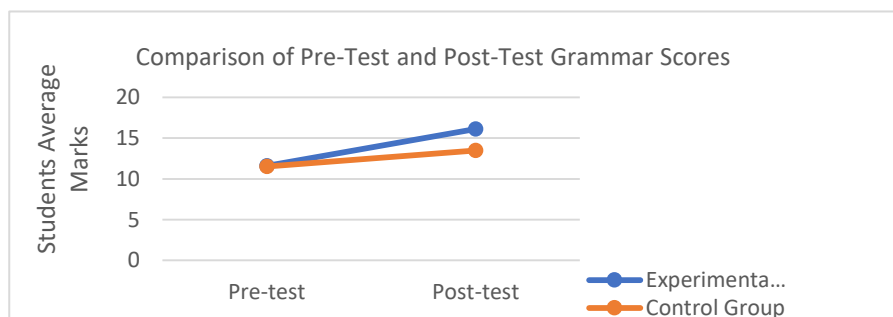
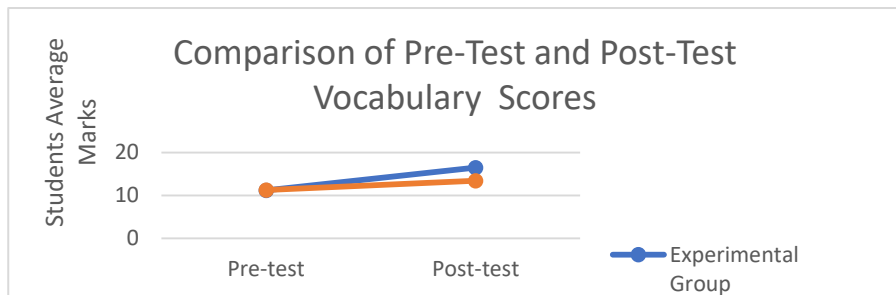


Fig. 5: Comparison of Pre-Test and Post-Test Vocabulary Scores by Group

Overall, data gathered through the pre-test and the post-test evaluation were helpful to understand whether the introduction of ChatGPT and computer-assisted instruction in English language learning is effective. The descriptive analysis showed that the experimental group performed better than the control one in grammar and vocabulary assessments, which indicated that the application of AI-based tools has a positive impact on the process of language learning. These results provide the basis of further inferential statistical examination which shall be highlighted in subsequent consecutive sections of this chapter.

Results for Research Question 1

Research Question 1: *What is the effect of using computer-assisted and ChatGPT-based learning on students' grammar achievement compared to traditional learning methods?*

In order to study the impact of applying the computer-assisted and ChatGPT-based learning on the grammar achievement of the students, a paired sample t-test was performed on each of the groups (i.e. the experimental and control groups) to determine the within-group improvements between the pre-test and the post-test. Further, an independent sample t-test was done to compare the post-test scores of both groups and establish whether the dissimilarity in grammar accomplishment was statistically significant.



Paired Sample t-Test: Within-Group Grammar Performance

Table 4 presents the paired sample t-test results for grammar pre-test and post-test scores in both the experimental and control groups.

Table 4: Paired Sample t-Test for Grammar Scores (Within-Group Comparison)

Group	Test-type	Mean	SD	t-value	df	p-value (sig)	Interpretation
Experimental	Pre-Test	11.60	1.88	16.56	14	.000	significant
	Post-Test	16.13	1.77				
Control	Pre-Test	11.54	1.64	8.47	14	.000	significant
	Post-Test	13.46	1.72				

In Table 4, where the findings of paired samples t-test have been displayed to test the within group differences in grammar success in the experimental and control groups.

In the case of the experimental group, the mean grammar mark was growing by 11.60 standard deviation of (1.88) in the pre test and 16.13 standard deviation of (1.77) in the post test. The paired t-test showed that this improvement was statistically significant, t-value was equal to (16.56) and the significant value was lower than 0.05 which shows a significant improvement in grammar performance after the introduction of computer-assisted learning and ChatGPT-based learning.

In the case of the control group, the grammar score increased in mean of 11.54 with standard deviation of (1.64) during the pre-test to 13.46 with standard deviation of (1.72) during the post-test. It was also statistically significant with the t-value being equal to (8.47) and the significant value being below 0.05 thus indicating that the conventional method of teaching resulted in quantifiable but relatively less significant gains in grammar achievement.



In general, the extent of within-group improvement in both groups was impressive, but the degree of improvement in the experimental group seems higher than in control one, indicating that the computer-assisted and ChatBots-based method of learning grammar could have been more effective to achieve higher grammar achievements.

Independent Sample t-Test: Between-Group Grammar Performance

To further assess the difference between the two groups, an independent samples t-test was conducted to compare the post-test grammar scores between the experimental and control groups.

Table 5: Independent Sample t-Test for Grammar Post-Test Scores (Between-Group Comparison)

Group	Mean	SD	t-value		df	p-value (sig)	Interpretation
Experimental	16.13	1.77	4.18		28	.000	significant
Control	13.46	1.72					

Table 5 has shown the results of independent sample t-test that was used to examine the scores of grammar at the post-test stage in both the experimental and the control group. The results have indicated that the experimental group, i.e., learned with the help of the computer-assisted and ChatGPT-based learning, received a better mean after the post-test grammar score of (16.13) and a standard deviation of (1.77).

The control group, which was taught using the conventional teaching process, on the other hand, had a mean post-test grammar score of (13.46) and standard deviation of (1.72). The independent samples t-test showed that the difference between the two groups had significant mean with the calculated t-value of (4.18), (28) degrees of freedom, and (.000) p-value. Such a large value of p-value implies that the likelihood of chance occurrence of such a difference is very low, which means that the instructional approach was very important in determining the results.



These findings give a definite indication that the experimental group had better grammar achievement as compared to the control group after the intervention. The high difference of mean scores indicates that computer-assisted learning and the ChatGPT-based learning were more effective in improving grammar skills in comparison with traditional learning.

This observation is in line with modern studies in the field of educational technology, which focus on the promise of interactive, technology-based, and the use of artificial intelligence to enhance student learning outcomes with instant feedback, pacing, and learning experience enrichment strategies.

Interpretation of Findings

The results of Research Question 1 indicate that computer-aided and ChatGPT-based learning produced a positive and significant effect on the grammar attainment of the students. Both groups have recorded improvement between pre-test and post-test but the gains of the experimental group were significantly high. This finding, along with the accumulating evidence, confirms the necessity of including AI tools, including ChatGPT, in language teaching (mainly grammar improvement). These findings support the possibility of technology-enhanced learning environment to enhance the educational performance and to offer learning experiences to the learners that are more dynamic and responsive. Not only the fact that the experimental group improved indicates that the accessibility of instant feedback that ChatGPT provides should be improved, but also the possibility of repetitive and interactive and personalized practice.

Results for Research Question 2

Research Question 2: *What is the effect of using computer-assisted and ChatGPT-based learning on students' vocabulary acquisition compared to traditional learning methods?*

In order to respond to this question, scores of both experimental and control groups were compared in terms of vocabulary test. Both the groups had a pre-test and an after-test. The experimental group was

taught using computer-assisted learning based on ChatGPT, and the control group been taught using the conventional method.

Descriptive Statistics

Table 6 presents the means and standard deviations for the vocabulary test scores of both groups.

Table 6: Descriptive Statistics for Vocabulary Test Scores

Group	Test-type	Mean Score	Standard deviation	Sample size
Experimental	Pre-test	11.20	2.83	15
Experimental	Post-test	16.47	1.73	15
Control	Pre-test	11.27	2.09	15
Control	Post-test	13.40	2.53	15

In Table 6 the results showed that in the case of the experimental group, the means of vocabulary scores were (11.20) in the pre-test, which had SD of (2.83) and sample size of (15) students, whereas in the post-test it was (16.47) with SD of (1.73) and the same sample size of (15) students. This significant increase in the mean score indicates a significant increase in vocabulary learning after the introduction of the computer-assisted and ChatGPT-based learning technique. The reduction in the standard deviation between the pre-tested and post-tested scores also suggests that the post-test scores were more homogenous among students, which can also be explained by the fact that the instructional intervention resulted in a more homogenous benefit. In the case of control group, the mean vocabulary score rose in (11.27) to (13.40) in the pre-test and in post-test respectively with a standard deviation of (2.09) and (2.53) respectively and sample size of (15) students respectively.

Despite the fact that there was a significant improvement in vocabulary performance in this group, the change in the mean score was not as great as the experimental group. Also, the standard deviation

between pre-test scores and post-test scores increased, which implies more variability in the post-test scores, and not all students equally learnt under the traditional approach of teaching.

The descriptive statistics in general show that both groups showed improvement in pre-test to post-test. Nonetheless, the higher increase in the mean score and the improved performance after the test in the experimental group indicate that the computer-assisted learning and the ChatGPT-based one might be more efficient in inducing vocabulary acquisition as compared to the traditional method of teaching. Inferential statistical analysis will also be applied to this observation in order to establish whether or not the differences observed are statistically significant.

4.4.2 Inferential Statistics

To determine whether the observed differences in post-test vocabulary scores between the experimental and control groups were statistically significant, an independent samples t-test was conducted.

Table 7: Independent Samples t-Test for Vocabulary Post-Test Scores

Group	Mean	SD	t-value	df	p-value (sig)	Interpretation
Experimental	16.47	1.73	3.88	28	.001	significant
Control	13.40	2.52				

The table below (7) shows the outcome of the independent samples t-test using the vocabulary post-test results of the experimental and the control group. The experimental group that also adopted computer-assisted learning with the use of the ChatGPT application got the mean score of (16.47) and the standard deviation (1.73). The control group, whose students used the traditional approaches to learning, got a mean of (13.40) with a standard deviation of (2.52). The mean score shows the average performance of the vocabulary test of students in each group whereas the standard deviation shows the degree of dispersion or range of the students in each group. The smaller standard deviation of the experimental group implies that the scores of the students were more

tightly clustered around the mean which means that they performed more consistently.

The independent samples t-test got a t-value that was (3.88) and (28) degrees of freedom. Value of test (p-value) was (0.001), which is less than the standard level of significance (0.05). This shows that the difference in the post-test vocabulary between the two groups is significant, which implies that there are extremely few chances that this difference was caused by chance. Thus, the findings prove that students who studied vocabulary using the ChatGPT application with the help of computers performed much better as compared to their peers that studied vocabulary using conventional approaches. This is why these findings can be used to conclude that the combination of computer-assisted and ChatGPT-based learning tools can be effectively used to improve the vocabulary learning results in students.

Results

1. Grammar Achievement:

- Grammar scores improved statistically significantly from the pre-test to the post-test for both the experimental (ChatGPT) and control (traditional) groups.
- Compared to the control group, the experimental group showed noticeably more progress. The experimental group's post-test mean (16.13) was significantly higher than the control group's (13.46), and the difference was statistically significant ($p = .000$).

2. Vocabulary Acquisition:

- The vocabulary scores of both groups increased. But compared to the control group (from 11.27 to 13.40), the experimental group's mean score increased significantly (from 11.20 to 16.47).
- The independent samples t-test verified that there was a statistically significant difference ($p = .001$) between the two groups' post-test vocabulary scores. Compared to the control group, the experimental group did better.



Recommendations

Based on the findings of this study, the following recommendations are proposed:

For Educational Institutions and Instructors:

- For grammar and vocabulary training in particular, educational institutions should think about proactively incorporating computer-assisted learning and artificial intelligence (AI) tools like ChatGPT into their English language teaching curricula.
- Teachers should be trained in the usage of these AI tools to guarantee successful implementation. This entails creating exercises with AI support, instructing students on how to use ChatGPT effectively, and deciphering the AI's input.

For Policymakers and Curriculum Developers:

- To create precise rules and frameworks for the moral and efficient application of generative AI in schools, legislators should collaborate with specialists in education. This guarantees the responsible use of these tools to improve learning outcomes.
- Assistance should be given to guarantee that educational institutions have the technology infrastructure (such as dependable internet and device connectivity) needed to successfully and fairly deploy computer-assisted and AI-based learning.

For Future Research:

- Future studies should examine whether the significant gains from ChatGPT-based learning are sustained over a longer period (long-term retention) compared to traditional methods.



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