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

BACKGROUND

The integration of Artificial Intelligence (AI) in education has significantly transformed traditional learning paradigms, especially in language acquisition. Specifically, Computer Assisted Learning (CAL) has emerged as a valuable tool for enhancing language acquisition by providing interactive and personalized learning experiences. (Chakravarthy ,2019).

The integration of technology in education has significantly transformed traditional learning methods, particularly in language acquisition. Computer-Assisted Learning (CAL) has emerged as an innovative tool that enhances the learning experience by providing interactive and personalized instruction. According to Davis (2016), CAL facilitates language learning by offering immediate feedback, customized exercises, and engaging multimedia resources that cater to different learning styles. With the advancement of artificial intelligence (AI), applications such as ChatGPT have further expanded the possibilities of digital learning by enabling interactive and dynamic language practice. While CAL offers significant benefits, AI-powered tools such as ChatGPT are taking language learning to new heights by offering real-time, interactive learning experiences.

Artificial intelligence-powered tools, such as ChatGPT, have gained considerable attention in the field of education due to their ability to simulate human-like conversations and provide instant language support. Studies suggest that AI-driven chatbots can enhance learners' engagement, motivation, and fluency in English by offering real-time feedback and adaptive learning experiences (Johnson & Lee, 2020). ChatGPT, developed by OpenAI, has been recognized for its capability to assist learners in improving their writing, reading, and conversational skills through interactive dialogue-based learning (Brown & Green, 2017). These features make it a valuable supplement to traditional classroom instruction and self-directed learning.

Moreover, the effectiveness of CAL and AI technologies like ChatGPT have been recognized for their ability to assist learners in in English language learning has been supported by various empirical studies. Research by Roberts & Jones (2019) found that students using AI-based

language learning applications demonstrated higher levels of engagement and language proficiency compared to those relying solely on traditional methods. Similarly, a study by Wang & Chen (2018) revealed that integrating AI chatbots in English learning environments significantly improved learners' comprehension and communication skills. These findings highlight the potential of AI-driven tools in fostering autonomous and effective language learning.

Despite these promising benefits, there are also challenges associated with the use of CAL and AI-based applications in language education. Some researchers argue that AI-generated responses may lack contextual appropriateness and cultural sensitivity, potentially affecting learners' language acquisition process (Lee & Kim, 2020). Additionally, concerns about dependency on technology and reduced human interaction in language learning environments have been raised (Rovai, Baker, & Ponton, 2020). Addressing these challenges requires a balanced approach that combines AI-based learning tools with human instruction to optimize learning outcomes.

Given the increasing reliance on technology in education, it is essential to examine the effectiveness of CAL and ChatGPT in enhancing English language learning. This study aims to explore the impact of these technological tools on learners' language proficiency, engagement, and motivation.

STATEMENT OF THE PROBLEM

Despite the growing body of literature on AI in education, there is still limited understanding of how AI technologies specifically affect language proficiency, engagement, and motivation in English language learners. This study seeks to fill this gap by examining the impact of AI-powered tools like ChatGPT on these factors.

The rapid integration of technology in education, particularly through Computer-Assisted Learning (CAL) and artificial intelligence (AI) applications, has raised important questions regarding their effectiveness in enhancing English language learning. While numerous studies have highlighted the potential benefits of these tools, there remains a lack of comprehensive understanding of their impact on learners' language proficiency, engagement, and motivation. As noted by Lee and Kim (2020), the effectiveness of AI technologies like ChatGPT have been recognized for their ability to assist learners in in language education is still under-researched,

necessitating further investigation into their practical implications in real-world learning environments.

Despite the promising findings regarding the use of AI tools like ChatGPT, challenges persist in their implementation. Rovai, Baker, and Ponton (2020) emphasize that while technology can enhance learning experiences, it may also lead to issues. These include reduced human interaction and increased dependency on digital tools..

Moreover, the contextual appropriateness and cultural sensitivity of AI-generated responses have been questioned. Lee (2021) argues that AI applications may not always provide contextually relevant feedback, which could hinder learners' understanding of nuanced language use. This issue highlights the need for a critical examination of the content and responses generated by AI tools, ensuring they align with the diverse cultural backgrounds of learners. Addressing these concerns is vital for optimizing the learning experience and ensuring that technology serves as a facilitator rather than a barrier to effective language learning.

Although the integration of AI technologies in language learning has shown promise, there is insufficient research exploring the specific effects of AI-driven tools, such as ChatGPT, on language proficiency, learner engagement, and motivation. This gap highlights the need for this study to assess the practical implications of these technologies in real-world educational contexts.

Despite these challenges, the integration of AI-driven tools into language curricula offers significant opportunities to enhance learning outcomes. This study aims to explore the effectiveness of these technologies, particularly ChatGPT, in addressing these concerns.

While existing studies show the promise of AI tools like ChatGPT, a gap remains in understanding how these tools impact English language acquisition specifically, particularly regarding language proficiency, engagement, and motivation. This research aims to fill that gap by assessing both the advantages and limitations of AI in modern language education.

SIGNIFICANCE OF STUDY

This study demonstrates that the integration of Computer-Assisted Learning (CAL) and ChatGPT can lead to more effective and engaging language acquisition. By providing empirical evidence of significant improvements in grammar and vocabulary, the students can achieve better learning outcomes. Furthermore, the positive perceptions reported by students—including increased motivation, confidence, and the ability to learn at a self-directed pace—suggest that such tools can transform the learning experience from a passive, one-size-fits-all model into an active, personalized, and empowering journey.

Furthermore, this study will address the challenges associated with the use of AI in language education, such as contextual appropriateness and cultural sensitivity of AI-generated responses. By critically examining these issues, the research will contribute to the development of best practices for utilizing AI tools in a manner that respects and acknowledges the diverse backgrounds of learners. This is particularly important in a globalized world where language learning often involves navigating various cultural contexts, as discussed 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

Technological Tools in Language Learning

The technology for language learning in previous decades often reflected the limitations of the computing systems it operated on (Healey,2016). However, it laid an important foundation for later adaptive and interactive systems, such as AI-driven platforms.Initially, learners faced static programs for training and practice. These programs were built around fixed databases of

vocabulary and grammar exercises, lacking contextual responsiveness or dynamic feedback(Kaur,2023). Their educational methodology heavily relied on repetition and pattern recognition, making them moderately effective for rote memorization but less capable of enhancing communicative competence(Al Fraidan & Almarri,2024). An early typical CALL tool might present a multiple-choice grammar question and simply indicate whether the chosen answer was correct, without explaining the underlying rules or suggesting improvements(Golonka,2014). As computing power improved, some tools incorporated primitive branching logic to provide slightly different paths based on learners' responses. This methodology appears to precede later adaptive mechanisms by allowing for simple customization of content difficulty according to performance trends (Pawlak& Kruk,2025). However, these modifications often tended to be minimal and lacked a deeper analysis of the strengths or weaknesses of learners. They functioned more as basic classification tasks rather than precise instructional design. The capabilities of multimedia expanded the possibilities for second language acquisition materials. The integration of audio allowed for pronunciation practice through recordings of native speech, while simple visual aids, such as animations, helped clarify meanings or cultural contexts that text alerts alone could not provide(Gierl,2017). Despite these gains, interactivity remained limited; learners were typically passive recipients of content rather than active participants in dialogue with the system. In higher education environments, early computer-assisted learning applications were often accompanied by language lab sessions where software was used to support teacher-led instruction. The role of the tools was primarily supportive rather than being the main delivery method for content. Students practiced with digital exercises between lessons, benefiting from immediate but limited feedback organized around correct/incorrect binaries (Akturk,2022).

The lack of interpretive depth in these outputs is attributed to the fact that progress relied on teacher intervention to explain errors and guide improvements. However, even with these limitations, these early systems achieved some success in fostering self-study habits. Learners could engage with the language outside of designated lesson hours, increasing the frequency of exposure, which is a vital factor in skill acquisition due to the distributed nature of memory consolidation in language learning (Chen,2025). The ease of access positioned computer-based exercises as an alternative to paper homework for those seeking quick, repeated practice. Parallel developments occurred in formative assessment capabilities. Although not comparable to the scope of contemporary AI analysis, early diagnostic features emerged that tracked learner accuracy rates over time. This

cumulative data could indicate when a student was consistently struggling with certain grammatical categories or vocabulary items (Martín-Monje,2018).

While the commentary remained simple, this follow-up indicated possibilities for individual program pathways, which were later fully realized in applications supported by machine learning. Another noteworthy feature is how these tools interacted with attempts at cultural immersion(Shadiev,2025). Some programs included contextual dialogues or short stories presented through audio clips accompanied by simple images or translations. The idea was to simulate real-life usage scenarios, although they were within precisely written constraints. Students benefited from exposure to original sentence structures and intonation patterns, helping to build expectations around the rhythm of conversation, even if the flow of interaction was predetermined. Pedagogically, teachers recognized both the strengths and weaknesses of using such technology. Its iterative accuracy was excellent for fixing morphological endings or standard verb conjugations, but it was less effective in enhancing practical skills such as discourse management or expressive variation (Rassaei,2022).

As a result, early computer-assisted learning deployments tended to lean towards hybrid formats where human guidance filled the explanatory gaps left by software outputs. Evaluating these roots against contemporary artificial intelligence systems highlights how shifts have occurred from programmed responses to generative outputs based on statistical modeling of large datasets (Larson,2017). Modern tools like ChatGPT now achieve what earlier computer-assisted learning systems aspired to by providing accurate explanations alongside dynamically designed corrective suggestions based on the quality of user input (Abdulla,2024). However, it is clear that without decades of incremental advancements, the conceptual space enabling current generative methods may not have matured as it has.

Another consideration involves access disparities. Early technological adoption faced significant hardware costs and logistical hurdles; running a multimedia computer-assisted learning system required dedicated facilities and trained technical staff for maintenance. This limited access despite enthusiasm among leading institutions (Ghafar,2023). Now that similar functionalities can be delivered via widely available personal devices connected through broadband networks, the fundamental bottleneck from those years has been resolved. The path from static text-based drills to conversational AI embodies the gradual layers of complexity in language learning

environments. While today's systems outperform their predecessors by integrating natural language processing engines capable of contextually aware support (Yang et al., 2025), appreciating the historical trajectory underscores how foundational innovations, even if simple by today's standards, were critical experiments testing both educational viability and technological feasibility in enhancing human-led education.

ChatGPT and Its Role in English Language Learning

The creation of a conversational interface for ChatGPT aimed at English language learning requires a careful balance between functional responsiveness and pedagogical effectiveness. The interface should facilitate coherent and contextually relevant interactions that mimic authentic human conversation. This means generating responses that not only address the learner's immediate questions but also maintain thematic continuity over multiple exchanges, reinforcing linguistic patterns (Bin-Hady,2023).

Contextual relevance is crucial; when the system consistently delivers on-topic and semantically appropriate replies, learners are more likely to stay engaged and trust the tool for effective learning. One successful strategy has been to embed the model within a controlled digital environment accessible via familiar devices, such as tablets. This setup supports structured practice sessions while avoiding overwhelming users with unnecessary complexity(Agustini,2023)

Personalization features are essential, as aligning session prompts with the week's learning theme allows the interface to contextualize new vocabulary or grammatical structures within an ongoing narrative that matches curricular progression (Kostka & Toncelli,2023). This personalization not only enhances relevance but also boosts motivation, as learners see direct connections between AI-mediated dialogue and their current learning objectives.

The interactive elements of conversational design extend beyond text when voice and multimodal inputs are integrated. Combining chatbot dialogue with speech recognition technology enables oral practice to be seamlessly blended into textual correction workflows (Monika, M., & Suganthan,2024). For example, a learner might speak a sentence, receive immediate feedback on pronunciation, and then be encouraged to rephrase using targeted vocabulary, all within a single conversation thread. This immediate feedback keeps cognitive focus on the communicative act rather than breaking it into separate evaluative steps.

The interface should also be structured to encourage active inquiry. Prompting learners to ask questions instead of merely responding passively shifts the dialogue dynamics toward student-led discourse. Such patterns mimic real-world interactions, where speakers negotiate meaning rather than follow scripted exchanges. As learners gain autonomy, their ability to formulate spontaneous questions improves, supporting both grammatical development and pragmatic competence.

Integrating real-life simulations into chat flows enhances experiential learning by situating language use within realistic scenarios, such as ordering food in a restaurant or conducting a job interview, directly within conversational threads (Balcı,2024). When learners engage in these simulated contexts, they encounter vocabulary and syntactic forms that are naturally linked to functional communication goals. Adaptive challenge levels in these tasks ensure progression: simpler prompts at the beginning can evolve into open-ended challenges that require more complex sentence formation.

An important consideration for interface designers is to minimize cognitive interruptions while providing corrective input. Embedding corrections inline, rather than directing users to separate error logs, can help reduce split-attention effects (Monika& Suganthan,2024). If a learner misuses tense during a conversation, immediate insertion of an alternative phrasing, along with a brief explanation, allows for reapplication without disrupting the narrative flow. Thus, the conversational format itself serves as the feedback medium, a key distinction that sets AI-driven interfaces apart from static exercise sheets.

Applications for ESL and EFL Learners

Writing proficiency in ESL and EFL contexts can significantly improve with adaptive, AI-driven support systems, especially when these systems are integrated into learners' regular practice routines. Enhancing writing skills relies not only on exposure to language input but also on iterative cycles of feedback, error identification, and targeted corrections within meaningful communication tasks(Rajendran& Yunus,2021)

ChatGPT's ability to provide contextually rich guidance fosters development that goes beyond surface-level accuracy, encouraging deeper structural understanding and stylistic refinement (Al-Bogami& Elyas,2020). A key mechanism for improving writing is how AI differentiates between persistent structural errors and incidental mistakes, adjusting its responses accordingly. For

example, if a learner frequently misuses comparative or superlative forms, the system may offer detailed explanations along with examples illustrating correct usage in various contexts (Mali,2025). Conversely, a single lexical error might lead to a quick suggestion for immediate correction, allowing the learner to continue with their task without interruption.

This approach prevents cognitive overload; extensive interventions occur only when significant conceptual gaps need addressing, while minor mistakes are quickly resolved to maintain the flow of text production. The iterative nature of AI-assisted editing promotes gradual improvement by incorporating corrections directly into drafts as they are written. Learners can see alternative structures appear inline with their writing, such as transforming a passive construction into an active one, and then test these new forms within their ongoing narratives. This real-time integration makes grammatical and syntactic changes more memorable because they happen within authentic content rather than in abstract drills disconnected from context (Alsaedi,2024). Over time, such embedded feedback aids in the automation of correct structures through repeated exposure at the moment of need.

Equally important is the model's ability to provide reformulations that enhance coherence and rhetorical quality, going beyond mere correctness. Suggestions may focus on logical progression between paragraphs or ensuring alignment between thesis statements and body content. When learners are guided to connect ideas more fluidly or maintain thematic consistency across sections, they develop higher-order skills essential for academic writing in English. These meta-level competencies are challenging to cultivate through isolated exercises but become attainable when paired with targeted AI feedback integrated into the drafting process(Lashari,2023)

Evidence from comparative studies shows measurable improvements in writing proficiency when students use AI-assisted drafting over extended periods. Pre-test/post-test analyses indicate a reduction in error frequency alongside qualitative enhancements in argumentation and paragraph unity among those receiving continuous feedback from ChatGPT (Kostka& Toncelli,2023).

Facilitating oral communication skills through AI-driven platforms like ChatGPT enhances the focus on interaction and personalized feedback discussed earlier in writing development. The immediacy of conversations creates a practice environment that closely mimics human dialogue, allowing learners to experiment without the social pressures or performance anxiety often linked to in-person speaking tasks (RAO,2019). This is especially beneficial for individuals in settings

where fear of judgment or cultural norms restrict open verbal participation; a private, responsive interface can reduce psychological barriers and encourage more frequent oral practice (AlSaleem,2018).

Improvement in oral communication relies on continuous engagement with tasks that incorporate speech production, comprehension, and feedback cycles. Combining ChatGPT's text-based conversational support with integrated speech recognition technology offers a dual-channel approach: learners articulate responses aloud, receive scores for pronunciation accuracy or descriptive feedback on stress patterns, and see corrected forms within ongoing conversation threads (Rajendran& Yunus,2021). This setup enhances the connection between production, assessment, and reapplication in real time. For instance, a learner who struggles with vowel length distinctions could be prompted to repeat target phrases until their acoustic output matches native-speaker models; subsequent confirmations encourage progression by demonstrating tangible improvements on specific phonetic targets.

The frequency of exposure is crucial. Data from environments utilizing chatbot speech drills indicate that increased time engaged in AI-mediated oral practice correlates strongly with improvements in fluency and vocabulary range (Idrus,2016). These correlations hold true even when session lengths vary; what matters most is the cumulative repetition across multiple interactions, where productive language use is promptly assessed and adjusted. This approach reflects principles similar to spaced repetition for vocabulary learning, applied to motor control and prosodic habits. The iterative process of listening to correct versions, attempting reproduction, receiving targeted adjustments, and retrying fosters the automation of accurate articulatory patterns(Dewan& Sharma,2025).

Beyond mechanical accuracy, conversational AI tools facilitate the development of pragmatic skills. By simulating real-world scenarios—such as ordering food, negotiating schedules, or resolving misunderstandings—the system prompts responses that require appropriate tone adjustments or politeness strategies relevant to the target culture (Li& Zhao,2025). These situational prompts embed oral skill training within functional communication contexts rather than isolated sentence practice. Learners absorb not just segmental features like consonant clarity but also suprasegmental elements, such as intonation patterns aligned with communicative intent. AI can highlight when a rising pitch indicates a question or how stress placement subtly alters

meaning, aspects often overlooked in written exercises. Incorporating these tools into collaborative classroom activities can further enhance these gains. Students could pair up, with one interacting live with ChatGPT through spoken input while the other monitors the text output for grammatical or lexical choices.

Research Design

This study employed a quasi-experimental research design utilizing a pre-test/post-test control group approach to examine the effectiveness of Computer-Assisted Learning (CAL) and the ChatGPT application in enhancing English language acquisition among learners. The quasi-experimental design was selected due to its suitability for evaluating instructional interventions in real educational settings, where random assignment is often impractical.

Two groups of participants were involved in the study: an experimental group that received instruction through a combination of Computer-Assisted Learning (CAL) and the ChatGPT application, and a control group that received instruction through traditional teaching methods without the use of technological tools. Both groups were exposed to the same instructional content in grammar and vocabulary, with the primary difference being the mode of delivery.

To assess the impact of the intervention, pre-tests and post-tests were administered to both groups. The tests were designed to measure students' proficiency in two critical components of English language learning: grammar and vocabulary. The pre-test served to establish a baseline level of performance, while the post-test measured the learning outcomes following the instructional intervention.

This design enabled the researcher to:

- Compare performance between groups (experimental vs. control) to assess the effect of the ChatGPT-based approach,
- Analyze within-group changes over time (pre-test vs. post-test),
- Evaluate whether the observed differences were statistically significant using appropriate inferential statistical methods.

By adopting this research design, the study aimed to determine not only the overall effectiveness of integrating ChatGPT and computer-assisted tools into English language instruction, but also the specific gains in grammar and vocabulary learning attributable to the intervention, and the structure of the research design is shown as the following Table 3.1.

Table 3.1: 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:

$\mathbf{X_1}$ = Pre-test

Y = Treatment (combination of Computer-Assisted Learning (CAL) and the ChatGPT application)

$\mathbf{X_2}$ = Post-test

Population and Sample

The population of this study consisted of undergraduate students enrolled in English language courses at Arab American University. The focus was specifically on students in their third and fourth academic years, as they possess an intermediate to advanced level of English proficiency, making them suitable for engaging with both traditional and technology-enhanced instructional methods.

A purposive sampling technique was employed to select participants who met the criteria of having comparable levels of English language competence and were actively enrolled in grammar and vocabulary-related courses. From this population, a total of 30 students were selected and divided equally into two groups:

- Experimental Group: 15 students who received instruction through Computer-Assisted Learning (CAL) combined with the use of the ChatGPT application.

- Control Group: 15 students who received instruction through traditional teaching methods without the use of computer or AI-based tools.

Care was taken to ensure that both groups were balanced in terms of academic level (i.e., year of study), prior exposure to English learning tools, and general demographic characteristics, in order to minimize external variables that might influence the results. All participants voluntarily agreed to participate in the study and were informed about the purpose and procedures of the research.

This sample size, while limited, was sufficient to provide preliminary insights into the effectiveness of ChatGPT-based learning and to allow for the application of basic inferential statistical analyses to determine the significance of observed differences between and within groups.

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 study is the use of Computer-Assisted Learning (CAL) and the ChatGPT Application. This includes instructional strategies that integrate interactive digital tools and the AI-powered ChatGPT platform to support the teaching and learning of English grammar and vocabulary. This variable was applied exclusively to the experimental group.

- **Dependent Variable:**

The dependent variable is the enhancement of English language learning, specifically measured through students' performance in grammar and vocabulary. Improvement was assessed by comparing pre-test and post-test scores within and between the experimental and control groups.

By examining how changes in the independent variable influence the dependent variable, this study aimed to determine the effectiveness of integrating ChatGPT and computer-assisted instruction in improving students' English language acquisition.

Research Instrument

To measure the effectiveness of the intervention, two tests were employed as the primary research instruments: an English Grammar Test and a Vocabulary Test. These tests quantitatively assessed learners' proficiency in the targeted language skills before and after the instructional period.

A. English Grammar Test:

The English Grammar Test consisted of 50 questions designed to comprehensively evaluate students' understanding and application of English grammar. The questions covered a range of grammatical topics relevant to intermediate and advanced learners, including tenses, sentence structure, parts of speech, and error correction. The format included multiple-choice questions, sentence completion, and identification of grammatical errors. This test aimed to measure the accuracy and depth of learners' grammatical knowledge as related to the instructional content.

B. Vocabulary Test:

The Vocabulary Test comprised five carefully constructed questions designed to assess different aspects of vocabulary knowledge and usage:

- True or False: Students were asked to state whether several given statements related to vocabulary usage were true or false.
- Multiple Choice: Students circled the letter corresponding to the correct answer among several options.
- Translation: Students translated English idioms into their corresponding Arabic idioms, testing their understanding of figurative language and cultural equivalences.
- Conceptual Explanation: Students explained the concepts of denotation and connotation, highlighted the differences between them, and provided examples to illustrate their answers.

- Definition and Examples: Students defined specific vocabulary-related concepts and supported their definitions with relevant examples.

Both tests were administered twice: as a pre-test before the instructional intervention to establish baseline proficiency, and as a post-test after the intervention to measure learning progress. The pre-test and post-test versions were designed to be equivalent in content and difficulty to ensure reliable comparison of results.

1. Purpose and Scope of the Questionnaire

The questionnaire aimed to complement the quantitative data from the pre-tests and post-tests by providing a broader understanding of students' attitudes and experiences. While the tests measured improvements in grammar and vocabulary performance, the questionnaire explored students' subjective evaluations regarding:

- The perceived usefulness and ease of using ChatGPT and CAL tools in their learning process.
- The motivational and engagement aspects of integrating AI-based applications in English instruction.
- The specific benefits students identified when using these tools (e.g., increased practice opportunities, immediate feedback, or improved confidence).
- The challenges or limitations encountered, such as difficulties in understanding AI-generated responses, language complexity, or technical barriers.

2. Sample Description

The questionnaire was administered to a sample of 140 students drawn from various English language courses at the Arab American University. This larger sample was chosen to ensure a more representative and generalizable understanding of learners' perceptions across different academic levels and backgrounds.

The participants included both male and female students, ranging from second year to fourth year undergraduates, with varying degrees of familiarity with AI tools and digital learning platform, and Figure 3.1 show the distribution of sample.

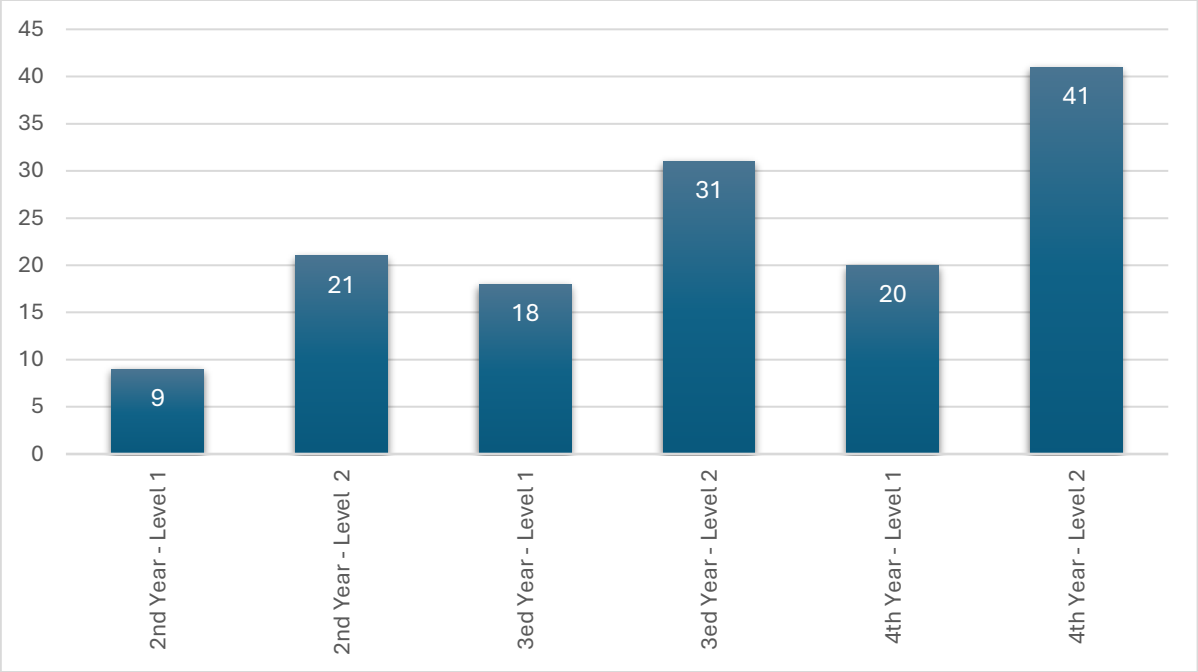

Fig. 3.1: Sample of 140 students drawn from various English language courses at the Arab American University

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.

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 administered online through the university's Learning Management System (LMS), allowing easy access for all participants. Data collection occurred after students had engaged with AI-assisted learning activities during the semester.

The quantitative data obtained from the Likert-scale items were analyzed using descriptive statistics (mean, standard deviation, frequency, and percentage) to summarize general trends in students' perceptions. In addition, inferential statistical tests, such as *t-tests* or *ANOVA*, were employed to identify any significant differences in perceptions based on variables such as academic level, gender, or prior experience with AI tools.

The qualitative responses from the open-ended questions were analyzed using thematic analysis. Students' answers were coded and grouped into themes such as "improved engagement," "autonomous learning," "technical difficulties," and "AI limitations." This dual analysis approach provided both breadth and depth to the understanding of students' perspectives.

5. Significance of the Questionnaire

By incorporating this large-scale questionnaire, the study extends beyond direct experimental outcomes to include broader educational and psychological dimensions. The findings will help educators and policymakers understand how students perceive AI integration in English education, the practical challenges faced, and the pedagogical strategies needed to optimize AI use in future classrooms. The combination of experimental results and perception-based data enhances the validity, comprehensiveness, and applicability of the study's conclusions.

D. Validity and Reliability:

To ensure the validity of the tests, both instruments were reviewed by experts in English language teaching and piloted with a sample of students similar to the study participants. Feedback from this pilot was used to refine question clarity and alignment with learning objectives. Reliability was assessed through Cronbach's alpha, with results indicating acceptable internal consistency for both the grammar and vocabulary tests. The perception questionnaire was also subjected to expert review to ensure content validity, and Cronbach's alpha was calculated for the Likert-scale items, yielding a coefficient within the acceptable range, indicating reliable measurement of student perceptions.

These instruments provided robust quantitative data on learners' grammar and vocabulary skills, as well as valuable qualitative insights into their perceptions, enabling a comprehensive evaluation of the effectiveness of Computer-Assisted Learning (CAL) and the ChatGPT application in enhancing English language acquisition.

3.6 The Data Collection

The data collection process in this study was carefully designed to ensure the accurate measurement of the impact of Computer-Assisted Learning (CAL) and the ChatGPT application on students' English language proficiency. The collection procedure followed a systematic sequence aligned with the quasi-experimental design, involving both pre-test and post-test assessments for the experimental and control groups.

Step 1: Pre-Test Administration

Prior to the instructional intervention, all participants in both the experimental and control groups were administered two standardized pre-tests: the English Grammar Test (consisting of 50 questions) and the Vocabulary Test (comprising 5 multi-format questions). The purpose of the pre-tests was to establish a baseline level of each participant's proficiency in grammar and vocabulary. The tests were administered in a controlled classroom setting to maintain consistency, and participants were given clear instructions and equal time to complete the assessments.

Step 2: Implementation of the Instructional Intervention

Following the pre-tests, the intervention was implemented over a defined instructional period. The experimental group received instruction through a combination of Computer-Assisted Learning (CAL) resources and the ChatGPT application, while the control group received instruction through traditional face-to-face teaching methods without the use of digital or AI-based tools. The instructional content was identical in both groups and focused on grammar and vocabulary topics. The delivery method was the only differentiating factor.

Step 3: Post-Test Administration

At the end of the instructional period, the same grammar and vocabulary tests were re-administered as post-tests to both groups under the same conditions as the pre-tests. The goal of the post-tests was to measure the learning outcomes and determine whether there were significant improvements in the students' performance, particularly in the experimental group.

Step 4: Data Recording and Organization

All pre-test and post-test scores were collected, recorded, and organized into a structured database for statistical analysis. The data was labeled according to participant group (experimental or control) and test type (grammar or vocabulary), ensuring clear differentiation and enabling comparative analysis between and within groups.

Throughout the data collection process, care was taken to maintain objectivity, minimize bias, and uphold the integrity of the results. The standardized administration of tests and consistency in instructional content helped ensure the reliability and validity of the data collected.

3.7 Data Analysis Technique

The data analysis procedures in this study were designed to align with the quasi-experimental research design and to provide valid answers to the stated research questions. Quantitative data obtained from the pre-tests and post-tests of both grammar and vocabulary were analyzed using the Statistical Package for the Social Sciences (SPSS). The analysis involved both descriptive and

inferential statistics to examine the differences between the experimental and control groups and to assess the effectiveness of the intervention.

To address the first research question, which examined the effect of using computer-assisted and ChatGPT-based learning on students' grammar achievement compared to traditional learning methods, an Independent Samples t-test was employed. This test was used to compare the post-test grammar scores of the experimental group (which received instruction through ChatGPT and computer-assisted tools) with those of the control group (which received traditional instruction). The analysis included calculating the mean and standard deviation for each group, followed by reporting the t-value, degrees of freedom, and p-value. A significant p-value ($p < 0.05$) would indicate a statistically meaningful difference between the two groups, suggesting the effectiveness of the intervention.

Similarly, the second research question focused on vocabulary acquisition. An Independent Samples t-test was again used to compare the vocabulary post-test scores of the two groups. The results helped determine whether the use of ChatGPT and computer-assisted tools had a significant impact on vocabulary learning. If the experimental group achieved a significantly higher mean score, it would support the hypothesis that the ChatGPT-based method enhances vocabulary acquisition more effectively than traditional methods.

Description of the Sample (Experimental vs. Control Group)

The participants in this study consisted of 30 undergraduate students enrolled in English language courses at Arab American University. The participants were divided equally into two groups:

- Experimental Group (n = 15): These students were taught using a Computer-Assisted Language Learning (CALL) environment supported by the ChatGPT application. They engaged with interactive digital content, exercises, and real-time support from AI-based tools during the learning sessions.
- Control Group (n = 15): These students were taught using conventional face-to-face methods, including printed textbooks, lecture-based grammar instructions, and vocabulary memorization drills, without the use of AI tools.

All participants were in their 3rd or 4th academic year and had comparable English proficiency levels, as assessed by institutional placement tests. Random assignment was used to ensure equivalence and eliminate potential 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 collected data were analyzed to assess students' performance in grammar and vocabulary before and after the intervention. The means, standard deviations, and sample sizes for both groups are presented as shown in Table 4.1 and Table 4.2 below. Figure 4.1 graphically illustrates the results of Table 4.1, providing a visual comparison of pre-test and post-test performance in grammar between the experimental and control groups, while Figure 4.2 illustrates the results of Table 4.2, presenting a visual comparison of pre-test and post-test performance in vocabulary for both groups.

Table 4.1: 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

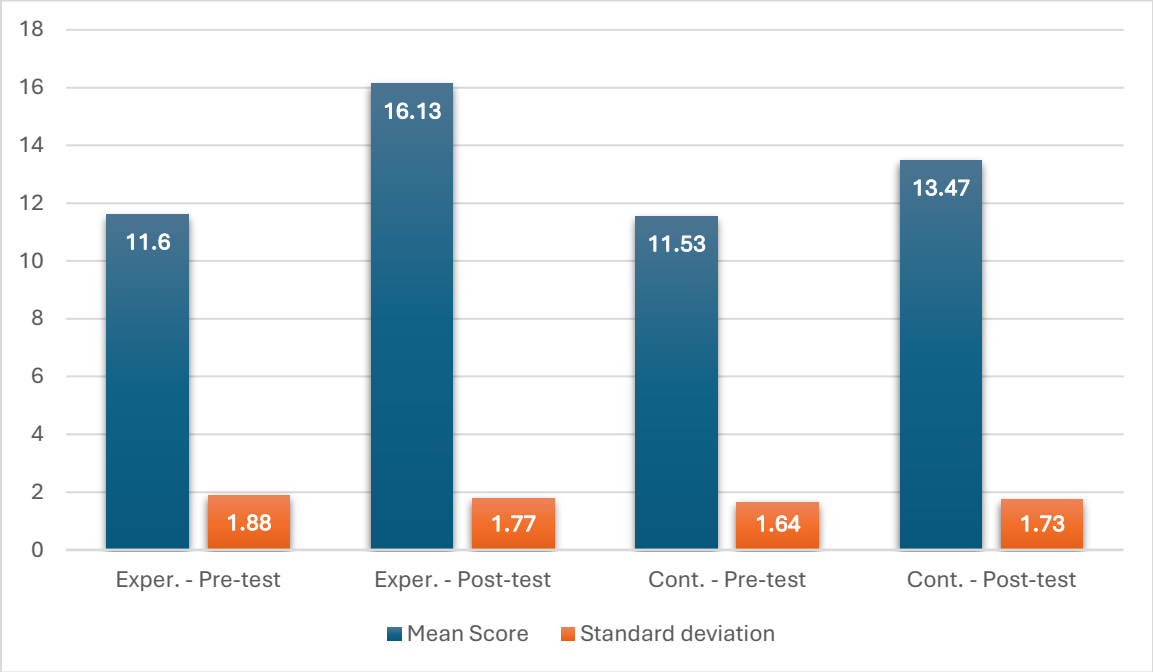

Fig. 4.1: Graphically illustrates Descriptive Statistics for Grammar Scores

Table 4.2: 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

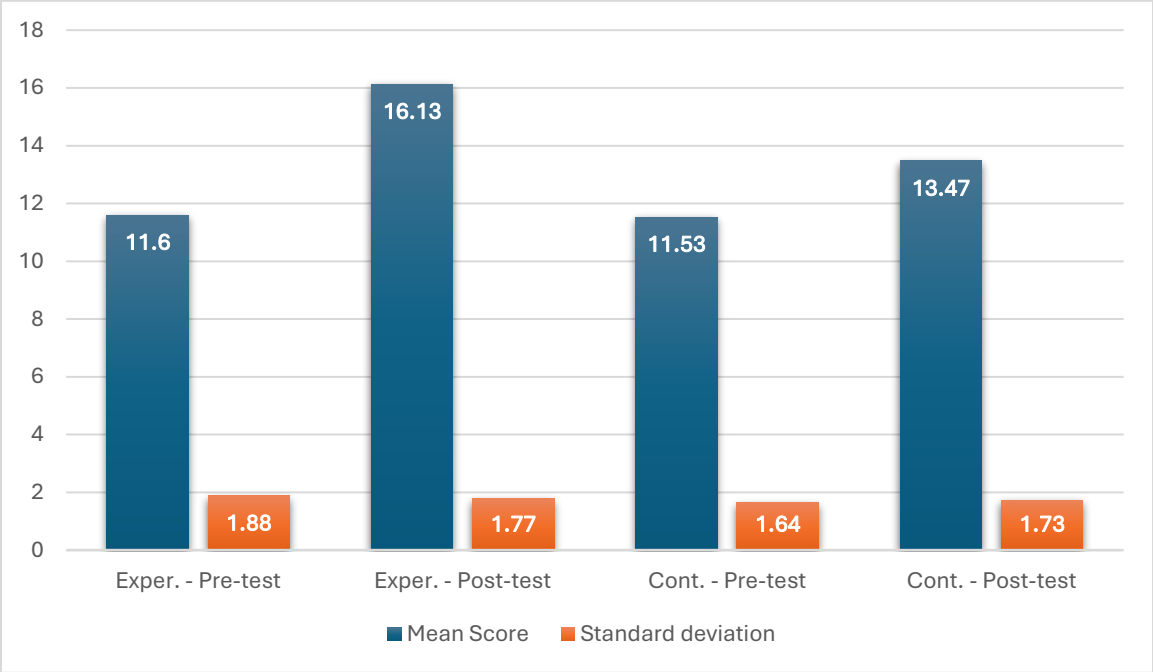

Fig. 4.2: Graphically illustrates Descriptive Statistics for Vocabulary Scores

As shown in the previous Figures, Figure 4.1 and 4.2 present the descriptive statistics for the grammar and vocabulary scores of both the experimental and control groups before and after the intervention. These tables provide insights into the performance trends within each group and serve as a preliminary indication of the effectiveness of the Computer-Assisted and ChatGPT-based learning approach employed in the experimental group.

In Figure 4.1, the pre-test mean grammar score for the experimental group was 11.60 (SD = 1.88), whereas the post-test mean increased substantially to 16.13 (SD = 1.77), indicating a notable improvement in grammar proficiency following the intervention. This improvement suggests that the instructional approach used with the experimental group may have had a positive impact on students' grammar learning outcomes.

Similarly, the control group's grammar scores showed a more modest increase, with a pre-test mean of 11.53 (SD = 1.64) and a post-test mean of 13.47 (SD = 1.73). While some improvement is observed, the magnitude of the change is considerably smaller compared to the experimental

group. This difference in score gains between the two groups supports the hypothesis that the integration of computer-assisted learning tools—particularly ChatGPT—may be more effective in enhancing students' grammar skills than traditional methods.

Moreover, the relatively close standard deviations within each group and test type indicate that the variation in student performance was consistent, suggesting a relatively homogeneous impact of the intervention within groups.

As shown in Figure 4.2, the experimental group demonstrated a significant increase in vocabulary performance, with a pre-test mean of 11.20 (SD = 2.83) and a post-test mean of 16.47 (SD = 1.73). This substantial improvement underscores the potential effectiveness of the ChatGPT-enhanced learning environment in supporting vocabulary acquisition.

In contrast, the control group's vocabulary scores showed a smaller improvement, with the pre-test mean score at 11.27 (SD = 2.09) and the post-test mean at 13.40 (SD = 2.53). Although there was some progression in vocabulary skills, the gap between pre- and post-test scores is less pronounced compared to that of the experimental group.

The standard deviations also provide further insights into score distribution. The higher SD in the pre-test scores suggests more varied prior vocabulary knowledge among students, which became more consistent (as seen by the lower SD) after the intervention in the experimental group, potentially reflecting the effectiveness of the targeted learning strategy.

Overall, the data indicate that both grammar and vocabulary skills improved more markedly in the experimental group than in the control group as shown in Figure 4.3 and Figure 4.4, aligning with the study's aim of evaluating the effectiveness of computer-assisted and ChatGPT-supported learning tools. The consistency in score increases and the narrowing of standard deviations, particularly in the experimental group, provide initial evidence that the intervention may have contributed to greater learning gains and more equitable performance among students.

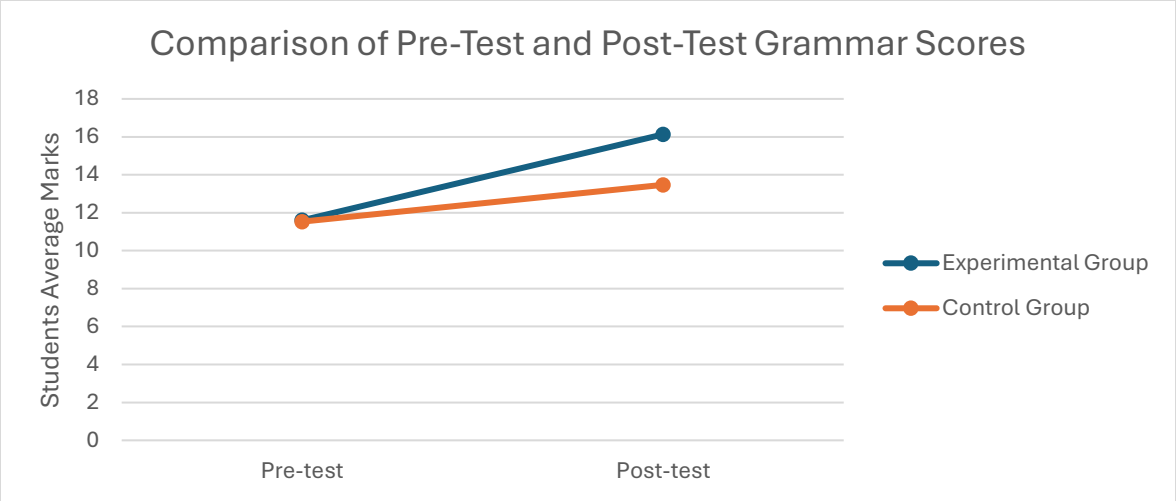

Fig. 4.3: Comparison of Pre-Test and Post-Test Grammar Scores by Group

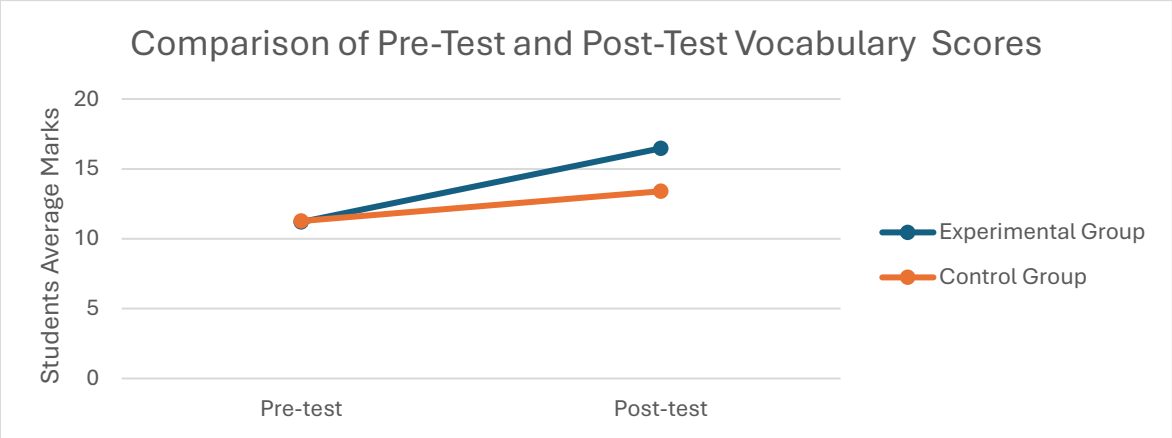

Fig. 4.4: Comparison of Pre-Test and Post-Test Vocabulary Scores by Group

In summary, the data collected from the pre-test and post-test assessments provided valuable insights into the effectiveness of integrating ChatGPT and computer-assisted instruction into English language learning. The descriptive statistics revealed that the experimental group outperformed the control group in both grammar and vocabulary tests, suggesting that the use of AI-supported tools positively influenced language acquisition. These findings set the foundation for further inferential statistical analysis, which will be detailed in the upcoming subsequent 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?***

To examine the effect of using computer-assisted and ChatGPT-based learning on students' grammar achievement, a paired sample t-test was conducted for each group (i.e. experimental and control groups) to assess the within-group improvements from pre-test to post-test. Additionally, an independent sample t-test was conducted to compare the post-test results between the two groups and determine whether the differences in grammar achievement were statistically significant.

Paired Sample t-Test: Within-Group Grammar Performance

Table 4.3 presents the paired sample t-test results for grammar pre-test and post-test scores in both the experimental and control groups.

Table 4.3: 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				

Where Table 4.3 presents the results of the paired samples t-test conducted to examine within-group changes in grammar achievement for both the experimental and control groups.

For the experimental group, the mean grammar score increased from 11.60 with standard deviation of (1.88) in the pre-test to 16.13 standard deviation of (1.77) in the post-test. The paired t-test revealed that this improvement was statistically significant, where t-value equaled to (16.56), and the significant value was less than 0.05, indicating a substantial gain in grammar performance following the implementation of computer-assisted and ChatGPT-based learning.

For the control group, the mean grammar score improved from 11.54 with standard deviation of (1.64) in the pre-test to 13.46 with standard deviation of (1.72) in the post-test. This increase was also statistically significant, where t-value equaled to (8.47), and the significant value was less than 0.05, suggesting that the traditional teaching method led to measurable, though comparatively smaller, improvements in grammar achievement.

Overall, while both groups demonstrated significant within-group gains, the magnitude of improvement in the experimental group appears greater than that of the control group, suggesting that the computer-assisted and ChatGPT-based learning approach may have been more effective in enhancing grammar achievement.

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 4.4: 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 4.4 presents the results of the independent samples t-test that was conducted to compare the post-test grammar scores between the experimental group and the control group. The findings show that the experimental group, which received instruction through computer-assisted and ChatGPT-based learning, obtained a higher mean post-test grammar score of (16.13) with a standard deviation of (1.77). In contrast, the control group, which received instruction through traditional teaching methods, achieved a mean post-test grammar score of (13.46) with a standard deviation of (1.72).

The independent samples t-test revealed that the difference between the two groups was statistically significant, with a calculated t-value of (4.18), degrees of freedom equal to (28), and

a p-value of (.000). A p-value of this magnitude indicates that the probability of observing such a difference by random chance is extremely small, suggesting that the instructional method played a critical role in influencing the outcomes.

These results provide clear evidence that the experimental group outperformed the control group in grammar achievement after the intervention. The substantial difference in mean scores suggests that computer-assisted and ChatGPT-based learning was more effective in enhancing grammar skills than traditional instruction. This finding aligns with contemporary research in educational technology, which emphasizes the potential of interactive, technology-driven, and artificial intelligence–supported approaches to improve student learning outcomes by offering immediate feedback, individualized pacing, and enriched learning experiences.

Interpretation of Findings

The findings for Research Question 1 suggest that the use of computer-assisted and ChatGPT-based learning had a positive and statistically significant impact on students' grammar achievement. While both groups showed progress from pre-test to post-test, the experimental group's gains were markedly higher. This result supports the growing body of evidence in favor of integrating AI tools such as ChatGPT into language instruction, particularly for grammar enhancement.

These results confirm the potential of technology-enhanced learning environments to enrich educational outcomes and provide learners with more dynamic and responsive instructional experiences. The improvement in the experimental group reflects not only the accessibility of instant feedback provided by ChatGPT but also the opportunity for repeated, 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?*

To answer this question, the vocabulary test scores of both the experimental and control groups were analyzed. Each group completed both a pre-test and a post-test. The experimental group

received instruction through computer-assisted learning with ChatGPT, while the control group followed traditional learning methods.

Descriptive Statistics

Table 4.4 presents the means and standard deviations for the vocabulary test scores of both groups.

Table 4.4: 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

As illustrated in Table 4.4, For the experimental group, the mean vocabulary score increased from (11.20) in the pre-test, with a standard deviation of (2.83) and a sample size of (15) students, to (16.47) in the post-test, with a standard deviation of (1.73) and the same sample size of (15) students. This considerable improvement in the mean score suggests a notable enhancement in vocabulary acquisition following the application of the computer-assisted and ChatGPT-based learning method. The decrease in the standard deviation from pre-test to post-test further indicates that the post-test scores were more consistent among students, which may reflect a more uniform benefit from the instructional intervention.

For the control group, the mean vocabulary score increased from (11.27) in the pre-test, with a standard deviation of (2.09) and a sample size of (15) students, to (13.40) in the post-test, with a standard deviation of (2.53) and the same sample size of (15) students. Although there was measurable improvement in vocabulary performance in this group, the increase in mean score was smaller compared to the experimental group. Additionally, the increase in standard deviation from pre-test to post-test suggests greater variability in post-test scores, indicating that not all students benefited equally from the traditional teaching method.

Overall, the descriptive statistics indicate that both groups demonstrated progress from pre-test to post-test. However, the larger gain in the mean score and the greater post-test performance observed in the experimental group suggest that the computer-assisted and ChatGPT-based learning approach may have been more effective in promoting vocabulary acquisition than the traditional instructional method. This observation will be further examined through inferential statistical analysis to determine whether 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 4.5: 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				

Table 4.5 presents the results of the independent samples t-test comparing the vocabulary post-test scores between the experimental group and the control group. The experimental group, which used computer-assisted learning including the ChatGPT application, obtained a mean score of (16.47) with a standard deviation of (1.73). The control group, which followed traditional learning methods, had a mean score of (13.40) with a standard deviation of (2.52).

The mean score indicates the average vocabulary test performance of the students in each group, while the standard deviation reflects the amount of variability or spread in the students' scores within each group. The smaller standard deviation in the experimental group suggests that the students' scores were more closely clustered around the mean, indicating more consistent performance.

The independent samples t-test yielded a t-value of (3.88) with (28) degrees of freedom. The p-value associated with this test was (0.001), which is less than the conventional significance level

of (0.05). This indicates that the difference in post-test vocabulary scores between the two groups is statistically significant, meaning it is highly unlikely that this difference occurred by chance.

Therefore, the results demonstrate that students who engaged in computer-assisted learning with the ChatGPT application achieved significantly better vocabulary acquisition than those who learned through traditional methods. These findings support the conclusion that integrating computer-assisted and ChatGPT-based learning tools can effectively enhance students' vocabulary learning outcomes.

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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