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AN EVALUATION OF THE GEMINI APP'S ROLE IN LEARNING ENGLISH PARTS OF SPEECH AT THE INTERMEDIATE LEVEL IN RAHIM YAR KHAN

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Abstract
This study investigates the effectiveness of the Gemini App in enhancing grammar proficiency specifically the understanding and application of parts of speech (nouns, verbs, adjectives, and adverbs) among intermediate-level students in Rahim Yar Khan. With the growing importance of digital learning tools in modern pedagogy, the study aimed to determine whether mobile-assisted learning applications can significantly outperform traditional instruction methods in grammar acquisition. A quantitative, quasi-experimental pre-test–post-test control group design was employed. 40 students were selected using random sampling and divided equally into control and experimental groups. Both groups undertook a pre-test to establish baseline equivalence in grammatical knowledge. The experimental group was taught using the Gemini App over a two-month period, while the control group continued with traditional classroom instruction. Post-test scores were then compared using descriptive and inferential statistical analyses, including independent sample t-tests. Results revealed no significant difference between groups in pre-test scores, indicating baseline equivalence. However, post-test scores showed a substantial improvement in the experimental group across all four grammatical categories, with the most notable gains observed in adjectives and adverbs. Mean scores for nouns improved from 3.00 to 4.15 in the experimental group, while the control group's scores remained nearly unchanged. Similarly, the experimental group outperformed the control group in verbs, adjectives, and adverbs, validating the app's efficacy. These findings highlight the pedagogical potential of mobile-based grammar instruction. The study supports the integration of educational technology to enhance learner engagement and retention. Limitations include the small sample size and restricted geographic focus. Future research should consider longitudinal studies with diverse populations to generalize the impact of grammar-based mobile applications across border sample size and region.

Keywords: Gemini App, English grammar, parts of speech.

1. Introduction

The acquisition of English grammar is a central pillar in the process of mastering the language, particularly for non-native speakers. Grammar proficiency is vital not only for effective communication but also for academic success and professional advancement. However, many learners struggle with grammar acquisition due to its abstract and rule-based nature, leading to difficulties in mastering parts of speech such as nouns, verbs, adjectives, and adverbs. The teaching of grammar in conventional educational institutions can be quite rote, based on textbook drills and explanation by the teacher, and may not be very effective in developing deeper learning or in the permanent retention of grammatical knowledge. This problem is especially sharp in the non-urban area where access to trained teachers, up-to-date teaching materials, and interactive teaching facilities is usually low.

To address these issues, there has been an introduction of the Mobile-Assisted Language Learning (MALL) which has offered a viable solution to the conventional pedagogical practices. MALL offers the opportunity to learn a language with the help of mobile devices and the freedom and accessibility that they provide. Mobile applications, such as the Gemini App, have grown in popularity in language learning, providing a personal, interactive, and

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engaging language learning experience using grammar. The apps give learners quick feedback, interactive activities, and adaptive learning tracks that accommodate personal needs. This enables the students to exercise and learn grammatical concepts in a self-paced and contextualized way, which increases engagement and retention.

This research seeks to understand how the Gemini App helps to enhance grammar skills of intermediate students at Rahim Yar Khan, Pakistan. Namely, the study is aimed at answering the question of how the app contributes to teaching four basic parts of speech, namely nouns, verbs, adjectives, and adverbs. The study aims at comparing the outcomes of students that used the Gemini App and those that were taught grammar traditionally so that it could be determined whether the MALL tools, like the Gemini App, can be used as an effective supplement (or even alternative) to the traditional teaching methods of grammar. Also, the research will explore the possibility of using mobile applications in the classroom to increase student engagement and motivation, which is usually deficient in traditional teaching environments.

The importance of the study is that it can fill the gap in the literature with respect to the influence of MALL on grammar acquisition, particularly in the non-urban environment. It will add to the existing knowledge base of the efficacy of mobile technology in learning and how it can be used to address educational inequities in resource-limited settings. With the increasing access to mobile gadgets across the world, the results of this research can help to determine how mobile learning can be incorporated in the mainstream educational system to enhance grammar teaching and the language skills of the students in underserved communities.

1.1.Research Background

Language acquisition field has always stressed on the fact that grammar is a fundamental aspect of language acquisition. Grammar defines the rules and organization of the language, and it is essential to be mastered so that the learners can learn how to communicate and do it without errors (Yadav et al., 2025). Of all the different aspects of grammar, it is essential to know the parts of speech namely nouns, verbs, adjectives and adverb since they are the fundamental components of creating sentences (Colaco & Antao, 2025). Grammar acquisition on the other hand is not an easy task to many people learning the language at least in a non-native situation as it is abstract and the rules governing it are complex. The conventional teaching of grammar has also utilized modes that emphasize on memorizing, reading and writing practice, and passive learning (Baskara, 2025). Though these practices are useful in terms of introducing several elements of grammar, they tend to be deficient either in developing a more independent knowledge of grammar itself or in preparing the students to exercise the knowledge of grammatical rules in more practical situations (Kohnke & Zou, 2025).

Due to a range of other issues, including the shortage of qualified teachers, insufficient availability of quality educational materials, and absence of facilities to apply the advanced instruction delivery methods, these crises are exacerbated in most non-urban regions, including Rahim Yar Khan (Marpaung, 2024). To expound further, in the countryside areas English learning materials are scarce and in most cases students lack access to textbooks, or trained teachers to help them master the English grammar. This is an ultimate obstacle to good grammar learning because these students will find it difficult to determine abstract knowledge such as the use of noun-verb (agreement) or positioning of adjectives to make grammatically formed sentences (Ananda & Salmiah, 2024). The conventional approaches to the teaching of grammar are usually inadequate in dealing with these hurdles as the other teaching pedagogy must also be adopted to enhance the learning process in such settings (Jadhav et al., 2024).

The Mobile-Assisted Language Learning (MALL) has been proposed as such solution to such problems. MALL will take advantage of the fact that mobile devices (smartphones and tablets) are becoming common and enable students to study English wherever they are and whenever they want it, without the constraints imposed by classroom activities (Obeidat et al., 2024).

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This will be especially significant to learners in more rural parts where a traditional classroom based training might not be readily available, and/or cannot be adapted to cover a whole student population (Phuong & Anh, 2024). Mobile applications such as the Gemini App gives learners flexibility to complete grammar exercises, get instant feedback and record progress over time. This is what makes MALL such a good choice in enhancing learning grammar particularly among the students in resource-limited settings (Alghozali & Mukminatun, 2024).

Gemini, an AI-based app goes an extra mile by making learning personalized to every student (da Silva & Ulbricht, 2024). Adaptive learning algorithms are used in the application so that it prepares exercises which best fit the needs of a particular learner and thus students can concentrate on points where they require the most effort. Such a personalized nature is one of the main benefits of MALL, because it provides learners with an opportunity to progress through lessons at their own rate and to review the materials they struggle with which is usually unavailable in traditional classrooms (Rane, 2024). Moreover, Gemini gives instant feedbacks, so that the students are able to correct their mistakes in real-time and learn more about the grammatical structures due to the contextualised examples (Zaimah et al., 2024). Due to interactive and gamification of grammar practice in the app, motivation is also facilitated, which reduces the learning process to a more enjoyable and productive enterprise (Enkatesh & A, 2024).

There has been successful research done on the effectiveness of MALL in the learning of grammar. Researches have shown that mobile apps are able to enhance the vocabulary retention, precision in pronunciation and the extent of grammatical mastery, as it can provide a learner with more motivating and individualized learning content (Alshraah et al., 2024). Moreover, mobile applications such as Gemini have also demonstrated the ability to promote self-directed learning which is an essential skill associated with lifelong language learners. The instant feedback and progress-tracking capabilities of the app allow the students to be in charge of their learning and acquire more independence and willingness to enhance their grammar skills (Utami et al., 2024).

Nonetheless, with the increase of studies of MALL, there is still a gap with regards to the complete research studies on the effects of MALL on the acquisition of grammar, especially on the non-urban education environment. Although a lot of current literature is dedicated to exploring how mobile applications can be utilized in teaching and learning vocabulary or speaking skills (Othman et al., 2024), little research is available regarding the effectiveness of mobile applications in teaching grammar in locations where more traditional learning methods are scarce. This paper attempts to address this gap by exploring the impact made by the Gemini App on enhancing grammatical capabilities of intermediate learners in Rahim Yar Khan particularly concentrating on the four main parts of speech of noun, verb, adjective, and adverbs (Nieminen, 2024). This study will assist in gaining insight on how MALL can be used to improve the acquisition of grammar in non-urban environments and help to determine the possible role of mobile applications and the elimination of educational disparities in resource-limited areas based on a comparison of the achievements of the student who has used the application with those receiving traditional instruction in grammar (Al-kadi et al., 2024).

1.2.Problem Statement

In Rahim Yar Khan where not many students are in an urban area, they are not able to achieve English grammar proficiency as they lack quality resources, old methods of teaching and low interest in learning tools. Traditional methods (Kohnke & Zou, 2025), (Obeidat et al., 2024), (Utami et al., 2024) tend not to be effective to maintain their students' interest and consequently, poor retention and application of grammatical concepts. However, there has been little research into MALL tools like the Gemini App's effectiveness in teaching particular grammar skills such as parts of speech, especially in non-urban contexts. Most research has

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focused on language acquisition in general while the impact of application of mobile apps has been ignored. This study fills this gap by using the results from using the Gemin App to teach nouns, verbs, adjectives and adverbs at the intermediate level compared to the traditional methods, and assess the engagement and motivation of the students. This research aims to supply empirical proof in aid of integrating mobile learning into English education, and provides a scalable solution to boost the grammar proficiencies and digital literacy of underserved zones.

1.3.Research Objectives

This research aims following objectives:

- To investigate the effect of Gemini App in learning parts of speech in English language at intermediate level.
- To gauge the impact of Gemini app in learning noun, verb, adverb, adjectives at intermediate level.
- To identify the difference between learning grammar through Gemini app and learning grammar through traditional methods.

1.4.Scope

This research focuses on evaluating the impact of the Gemini App on enhancing the learning of four key parts of speech—nouns, verbs, adjectives, and adverbs—among intermediate-level students (ages 16–18) in Rahim Yar Khan, Pakistan. The study is confined to this demographic to address the challenges faced by students in non-urban settings, where access to advanced educational resources and qualified instructors is limited. The findings are expected to contribute to the broader discourse on Mobile-Assisted Language Learning (MALL) and its potential to improve grammar proficiency in resource-constrained environments.

1.5.Limitations

The study has several limitations:

- Sample Size: With only 40 participants (20 in the experimental group and 20 in the control group), the findings may not be generalizable to a larger or more diverse population.
- Short Duration: The study's two-month intervention period is insufficient to assess long-term retention or real-world application of grammar skills.
- Narrow Focus: The research focuses solely on nouns, verbs, adjectives, and adverbs, excluding other important grammar elements such as tenses and prepositions.
- Technological Constraints: Inconsistent access to mobile devices and internet connectivity may have affected students' engagement with the app, potentially influencing the study's outcomes.

These limitations suggest that future studies should consider larger sample sizes, longer study durations, and the inclusion of a broader range of grammatical concepts to improve the external validity and applicability of the results.

1.6.Research Contributions

This study contributes to the field of Mobile-Assisted Language Learning (MALL) in several key ways:

- Evaluation of Mobile Learning Tools: It assesses the effectiveness of the Gemini App in teaching English grammar, specifically parts of speech, in an intermediate-level setting.
- Contextual Insights for Non-Urban Areas: The study highlights how mobile apps can serve as an effective solution to bridge educational gaps in resource-constrained, non-urban regions.

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- Comparison with Traditional Methods: It provides a comparative analysis of mobile-assisted learning versus traditional classroom instruction, offering valuable insights into the advantages and challenges of each approach.
- Enhancement of Grammar Learning: The research explores how real-time feedback, interactive exercises, and adaptive learning paths in mobile apps can improve students' engagement, motivation, and grammatical proficiency.
- Policy Implications: The findings could inform policymakers on the integration of mobile apps into formal education systems, particularly in underserved regions, helping to improve digital literacy and educational equity.

The paper is organized into five sections. Section I, introduction provided the background, objectives, scope, and limitations of the study. Section II literature review, reviewed existing research on Mobile-Assisted Language Learning (MALL) and its application in grammar acquisition. Section III Methodology described the research design, data collection methods, and analysis techniques used in the study. Section IV Results and Discussions presented the study's findings, discusses their implications, and compares the effectiveness of mobile-assisted learning and traditional methods. Section V Conclusions summarized the key findings, provides recommendations for future research, and discusses the potential for integrating MALL into mainstream education.

2. Literature Review

Mobile-Assisted Language Learning (MALL) has fundamentally transformed the landscape of language education, especially for English grammar acquisition. Artificial intelligence (AI) and the emergence of mobile apps have created the flexibility of studying, interactivity, and accessibility of students all over the world. The tools that are most likely to stand out in this transition include such apps as Gemini, a state-of-the-art platform that helps people enhance their English proficiency through the integration of AI with interactive language learning activities. The present literature review researches the contribution of MALL to grammar learning with the emphasis on the influence of Gemini and similar AI-based platforms on English acquisition, especially in non-urban education environments.

2.1.Historical Evolution of MALL and AI Integration

MALL has appeared as a concept in the early 2000s, when the number of mobile devices and the internet grew, and the learning process became more interactive and flexible (Miangah & Nezarat, 2015). Early MALL tools were primitive, and they were based on SMS and simple mobile applications. With the progress of mobile technology, however, applications were getting more complex, featuring multimedia content, gamification, and adaptive learning paths. Over the past 10 years, AI-based applications such as Gemini have allowed personalized learning, in which the app can adapt its contents according to the progress of the learner (Alshraah et al., 2024).

Artificial intelligence (AI) technologies especially natural language processing (NLP) has transformed the way language is learned by providing tools that interpret and react to what the students input. Chatbots based on AI, like Gemini, can correct mistakes, give contextual feedback, and assist learners to master grammar structures in a very interactive and customized fashion with the aid of NLP (Baskara, 2025; Rane, 2024). The emergence of these technologies is indicative of the change in the paradigm of education, with the traditional teacher-centered learning being supplemented, or even substituted, by the experiences of mobile-based learning (Alghozali & Mukminatun, 2024).

2.2.The Role of Gemini in English Grammar Acquisition

Gemini is among the AI-driven apps aimed to improve learning of English grammar, which targets parts of speech like nouns, verbs, adjectives, and adverbs. In contrast to the conventional classroom approach, Gemini and other such applications provide immediate feedback as well

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as interactive tasks and individualized learning scenarios that can be adjusted to the needs of the particular learner (Jadhav et al., 2024). Research indicates that students who apply Gemini have a better engagement and retention in learning grammar since the app allows them to grasp abstract concepts by using contextualized activities (Ananda & Salmiah, 2024).

The study by (Marpaung, 2024) emphasizes the importance of AI in enhancing the process of grammar acquisition, especially its features, including error-free correction and personalized learning progress. Gemini, a conversational AI tool, also contributes to this experience by means of simulating real-life conversations that enable the learners to use grammar rules in real life. This contextual learning method along with on-the-spot corrections confronts the typical problem in teaching grammar where students cannot internalize and use abstract grammar rules (Rane, 2024).

2.3.Comparison of Gemini and Traditional Grammar Instruction

The traditional way of teaching grammar is usually based on rote learning, explanations and workbook activities. Although these approaches have been the crux of teaching grammar over the centuries, they do not necessarily appeal to students, particularly in non-urban areas where resources and qualified teachers are scarce (Marpaung, 2024). Research indicates that conventional techniques lead to low retention rates and passive learning that inhibits the use of grammar skills in real life communication (Bieńkowska et al., 2021).

However, AI-based language learning platforms, such as Gemini, offer a more dynamic experience to language acquisition. Gamification and individual feedback will help students to be active participants, and learning will be entertaining and efficient. As a study conducted by (Al-kadi et al., 2024) indicates, students who used Gemini demonstrated a marked increase in terms of grammar proficiency in comparison with those receiving conventional teaching. As the research concluded, interactive and context-based learning materials used in Gemini promoted a more in-depth knowledge of grammatical concepts, such as verb tenses and noun-adjective agreement, which are commonly difficult to learn by many learners (Jabbar, 2024).

2.4.MALL in Non-Urban Educational Contexts

The use of MALL in non-urban education poses a special combination of possibilities and problems. In areas where skilled teachers and quality educational resources are not available, mobile applications such as Gemini can be used to level the field by giving students access to advanced learning tools at very low prices. Research conducted by (Murtiningsih et al., 2024) highlights the role of MALL in closing the educational gap, especially in underserved areas. Mobile apps can bridge that gap that was caused by the traditional education system as it is a new form of learning that can be accessed at any time and any place.

According to the research conducted by (Ameri, 2020), the mobile application use has been on the rise in non-urban regions, where students are experiencing limitations in many aspects, such as access to textbooks, teachers, and other educational resources. The access to the grammar learning tools such as Gemini, which can be used with the help of smartphones, enables students to train their language skills independently and at their own pace, which positively affects both the retention and the motivation.

Nevertheless, the usefulness of MALL in such situations does not go without difficulties. According to (Fan et al., 2023), the problem of poor access to the internet, uneven access to devices, and low digital literacy in students may also impede the complete adoption of mobile learning tools. Nevertheless, due to these obstacles, the increased usage of smartphones and mobile internet infrastructure in rural and remote settings is one of the reasons why MALL could be a viable solution to improving language education in these regions (Chaitanya, 2024).

2.5.Effectiveness of MALL in Grammar Learning

The effectiveness of MALL to enhance grammar learning has been researched in several studies and in particular, interactive features and individual learning paths have been studied.

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In a study done by (Habib et al., 2022), learners who were taught with the help of MALL applications performed better in terms of both vocabulary retention and grammatical accuracy than the learners taught with the help of traditional techniques. This is especially relevant to learning grammar, in which case the apps such as Gemini, offer instant error correction and contextual learning, which is vital in learning the intricacies of grammar rules (Metruk, 2021). Further, mobile apps such as Gemini encourage self-directed learning, where students can study at their own pace and repeat the difficult topics as they wish. Such flexibility becomes crucial to the learning of grammar because students may require numerous exposures to grammatical concepts like noun-verb agreement and adjective placement before they can internalize them (Gael & Elmiana, 2021).

2.6.Pedagogical Implications of AI in Grammar Instruction

The use of AI in teaching grammar using applications such as Gemini brings with it a number of pedagogical benefits. First, AI allows personalized learning, where the app adjusts to the learner and feeds him/her with the content according to his/her progress (Enkatesh & A, 2024). This personalized learning is especially ideal in the learning of grammar as various students might have difficulty in various things. Moreover, AI-based MALL applications promote active learning, since students can trace their progress with time and they are provided with instant feedback.

Second, AI-based grammar apps can be applied as an addition to the traditional learning process in the blended learning environment, where students have a chance to refresh the knowledge gained during the classroom sessions with the help of mobile devices. Such a strategy does not only improve grammar learning but also promotes independent learning, which is essential to building a lifelong language facility (Pool, 2022).

Lastly, the use of AI in teaching grammar can be used to fill the gap between the theoretical and practical knowledge. According to (Prasodjo et al., 2024), mobile applications such as Gemini combine grammar learning with authentic situations of communication, which enables students to understand how grammar rules apply to real life. Such a method does not only contribute to the better grammatical accuracy, but also helps students to use grammar properly in speech and writing.

Mobile-Assisted Language Learning (MALL) tools, especially the AI-driven ones, such as Gemini, are an important step in grammar education. Apps such as Gemini, through interactive activities, real-time feedback, and personalized learning, have been shown to be useful in enhancing grammar proficiency, especially in non-urban settings where conventional instructional approaches are not very effective. Although there are still difficulties with technology and digital literacy, the increased use of smartphones and mobile internet networks provides a good chance of popularizing MALL in grammar teaching (Imran & Almusharraf, 2024).

The study discussed in the literature demonstrates the potential of MALL to increase student engagement, retention, and grammatical accuracy, which is a solid argument in favor of the inclusion of mobile apps in the mainstream language education (Sallam et al., 2024). With the further development of mobile technology, the role of such applications as Gemini in the future of grammar teaching is likely to grow, especially in the underserved education environments.

3. Materials and Methods

The section describes the research methodology of investigating the role of the Gemini App in teaching English parts of speech to intermediate students in Rahim Yar Khan, namely, nouns, verbs, adjectives, and adverbs. The research was conducted to evaluate the hypothesis of the mobile-assisted language learning (MALL) with the help of the Gemini App being beneficial compared with the traditional classroom learning in the field of grammar acquisition. The research was of a quantitative quasi-experimental design, a pre-test and post-test control group

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design. The sample size was forty participants randomly divided into two groups: the experimental group (20 participants) using Gemini App and the control group (20 participants) with traditional instruction. Structured grammar test and a 20-question multiple-choice questionnaire was used to collect data on grammar proficiency.

3.1.Research Design

It was a quasi-experimental study, which compared the effectiveness of the Gemini App and traditional method of teaching English grammar. Grammar proficiency was measured by means of the pre- and post-test scores of the participants. Mode of instruction was the independent variable and the post-test scores as well as the responses to the questionnaires were dependent variables. Statistical analysis was done using SPSS Version 25. The experiment was conducted in the Punjab College in Rahim Yar Khan, which is a non-urban setting, privately owned, with a low availability of digital sources and conventional learning techniques. This context represents the larger issues on English language learning in the under-resourced areas. The college offered the required infrastructure, including computer labs and mobile devices, which is why it can be considered one of the best places to test the effectiveness of the Gemini App in a real-life classroom situation.

3.2.Sampling Strategy

The sampling strategy was carefully developed to ensure representativeness, internal validity, and the feasibility of intervention-based experimentation. This study employed random sampling to assign participants into two distinct groups: the experimental group, which received instruction via the Gemini App, and the control group, which was taught using traditional classroom methods.

3.2.1. Population

The target population for this study comprised intermediate-level students (Grade 11 and 12, equivalent to ages 16–18) enrolled in Punjab College, Rahim Yar Khan. These students are typically at a developmental stage where understanding grammar forms the foundation for higher-order language skills such as writing and speaking.

3.2.2. Inclusion Criteria

To maintain internal consistency, participants were selected based on the following criteria:
Age between 16 and 18 years.
Enrollment in intermediate-level English language classes.
No prior usage of the Gemini App for grammar instruction.
Willingness to participate, evidenced by informed consent from both students and, where applicable, their parents.

3.2.3. Exclusion Criteria

Participants were excluded from the study if they met any of the following:
Diagnosed learning disabilities that might affect language processing.
Prior exposure to similar grammar-learning applications (e.g., Duolingo, Cake, or ChatGPT-based tools).
Irregular attendance or inability to complete both the pre-test and post-test assessments.

3.3.Sample Size and Selection

A total of 40 participants were selected for the study using random sampling. The sample was equally divided into:
Experimental Group (n = 20): Received grammar instruction using the Gemini App over a two-month period.
Control Group (n = 20): Received conventional grammar instruction based on lecture and textbook methods over the same period.

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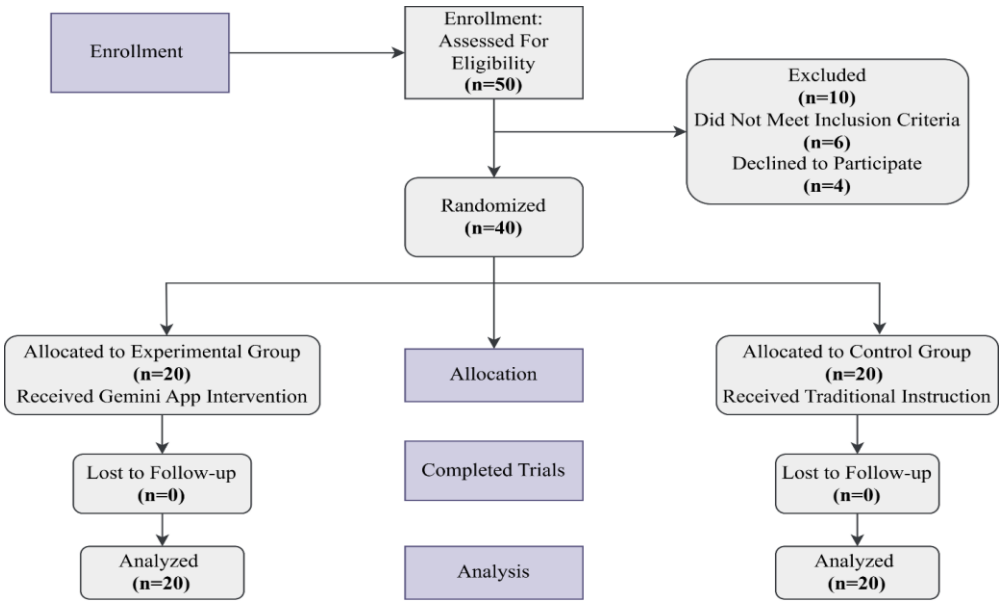

Figure 1 CONSORT Flow Diagram of Participant Progression

Random assignment was used to minimize selection bias and ensure that any observed differences in post-test performance could be attributed to the intervention rather than pre-existing group disparities.

3.4.Data Collection

In order to measure the effectiveness of the Gemini App in facilitating the learning of English parts of speech among intermediate-level students, this study employed two primary quantitative data collection instruments structured grammar proficiency tests (pre-test and post-test). These tools were designed to assess both cognitive learning outcomes and affective learner responses, thereby offering a comprehensive evaluation of the instructional intervention.

3.5.Pre-Test and Post-Test

Two parallel grammar tests—one administered before and one after the intervention—were developed by the researcher in consultation with subject matter experts in English language teaching. The pre-test was administered to both the experimental and control groups at the beginning of the instructional phase to determine their baseline understanding of the four targeted parts of speech: nouns, verbs, adjectives, and adverbs. The post-test was conducted after the two-month instructional period to assess the extent of learning improvement.

Each test comprised a total of 20 items, carefully aligned with intermediate-level curriculum standards. The item types include Multiple-choice questions (MCQs) to assess recognition of parts of speech in isolated words and within sentences.

3.6.Data Analysis Techniques

The data collected through the grammar proficiency tests and were analyzed using quantitative statistical methods to evaluate the impact of the Gemini App on students' grammar acquisition and to examine their perceptions of the learning experience. The analysis was conducted using SPSS (Version 25) to ensure accuracy and reliability in statistical processing.

3.6.1. Descriptive Statistics

Descriptive statistics were employed to summarize the basic features of the data. This included measures such as:

Frequencies, percentages of score of pre- and post-test scores.

Frequency distributions for demographic variables (e.g., age, gender, previous learning experience).

Mean scores for each item in the Grammar proficiency test.

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These descriptive measures helped identify general trends and provided an overview of learner responses.

3.6.2. Instrumentation, Validity, and Reliability

To evaluate the effectiveness of the Gemini App in teaching English parts of speech, two primary instruments were used: a grammar proficiency test (pre-test and post-test). Both instruments were developed and validated to ensure their relevance, clarity, and psychometric soundness.

3.6.3. Grammar Proficiency Test (Pre-Test and Post-Test)

The grammar test was designed to assess students' ability to correctly identify and use four fundamental parts of speech: nouns, verbs, adjectives, and adverbs. The test comprised multiple-choice and sentence-completion items and was administered to both groups before and after the intervention. The questions were carefully constructed to align with the curriculum standards of intermediate-level English language instruction in Pakistan. The content validity of the test was reviewed by subject matter experts to ensure appropriate difficulty levels and coverage of all targeted grammatical components.

3.7.Ethical Considerations

Ethical integrity was maintained at every stage of the research process to ensure the protection, dignity, and rights of all participants. The study adhered to standard ethical protocols in educational research and obtained formal approval from the administration of Punjab College, Rahim Yar Khan, before the commencement of data collection.

To maintain confidentiality, all personal identifiers were removed from the dataset. Each participant was assigned a unique Participant ID to ensure anonymity during data entry and analysis. Responses from tests and questionnaires were kept secure, and the collected data was used solely for research purposes. The findings were reported in aggregated form, ensuring that no individual could be identified in the published results.

4. Results and Discussion

This section presents the results obtained through the analysis of data collected from a quasi-experimental study designed to examine the effectiveness of the Gemini App in improving the learning of English parts of speech among intermediate-level students. The findings are organized into sections covering demographic characteristics, pre-test and post-test performance, comparative group analysis. The results are discussed in light of the research objectives and hypotheses established in earlier chapters.

4.1.Demographic Characteristics

This study included a total of 40 participants, equally divided between an experimental group (n = 20) and a control group (n = 20). The demographic profile of the participants was carefully analyzed to ensure representation across key variables such as age, gender, educational level, grammar learning experience, access to mobile technology, and language usage habits. In terms of age distribution, the majority of participants were either 17 or 16 years old, with a smaller number aged 18. The gender composition reflected a slight predominance of female participants in both groups. With respect to educational level, both 1st-year and 2nd-year intermediate students were represented relatively equally, indicating a balanced academic foundation among participants.

Table 1 Demographics Characteristics of participants

Demographic Variable	Options	Experimental Group (n=20)	Control Group (n=20)
Age	16 years	6	7
	17 years	8	10
	18 years	6	3
Gender	Male	7	10

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	Female	13	10
Educational Level	1st Year	12	10
	2nd Year	8	10
	Never	3	6

Age Distributions

The age distribution of the participants is presented to provide a clearer understanding of the demographic composition of the sample used in this study. As shown in Table 1 and illustrated in Figure 2, the majority of the participants (45%) were 17 years old, representing a significant portion of the intermediate student cohort. This was followed by 16-year-olds, accounting for 32.5% of the sample, while 18-year-olds comprised 22.5% of the participants. The data suggests that the sample predominantly falls within the mid-range of the intermediate academic level, providing a suitable age group for evaluating the effectiveness of the Gemini App in enhancing grammar skills. The distribution is relatively balanced and reflective of the target academic population for this intervention.

Table 2 Age Distributions

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16	13	32.5	32.5	32.5
	17	18	45.0	45.0	77.5
	18	9	22.5	22.5	100.0
	Total	40	100.0	100.0	

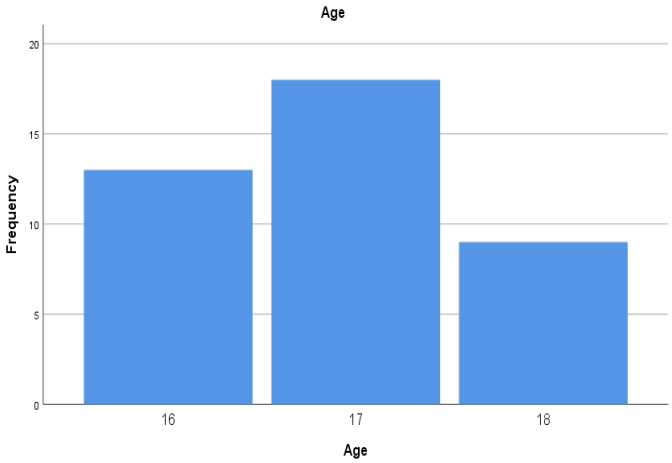

Figure 2 Bar graph of Age Distributions

Gender Distributions

The gender distribution of participants, as shown in Table 3 and illustrated in Figure 2, reveals a higher representation of female students within the sample. Out of 40 participants, 57.5% were female and 42.5% were male. This reflects a modest gender imbalance, with female students slightly more engaged or available during the sampling phase of the study. The distribution remains adequately balanced to allow for comparative analysis across genders, ensuring the findings of the study are not unduly influenced by disproportionate gender representation.

Table 3 Gender Distributions

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	23	57.5	57.5	57.5
	Male	17	42.5	42.5	100.0

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	Total	40	100.0	100.0	

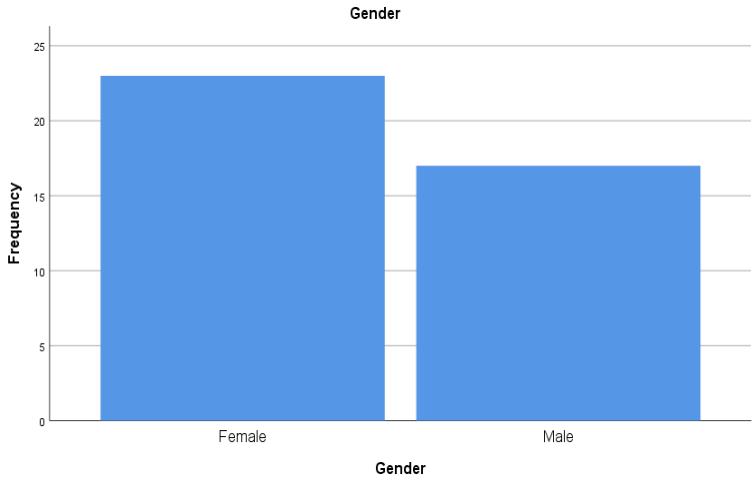

Figure 3 Bar Graph of Gender Distributions

Group Distributions

As presented in Table 4 and visually represented in Figure 4, the study sample was evenly divided between the control group and the experimental group, with each group comprising 50% of the total participants (n = 20 per group). This balanced allocation ensures methodological rigor by maintaining equal representation for comparative analysis. Such an even split strengthens the validity of pre-test and post-test comparisons, facilitating reliable inferences about the effectiveness of the Gemini App intervention on grammar learning outcomes.

Table 4 Group Distributions (Control or Experimental)

Group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Control	20	50.0	50.0	50.0
	Experimental	20	50.0	50.0	100.0
	Total	40	100.0	100.0	

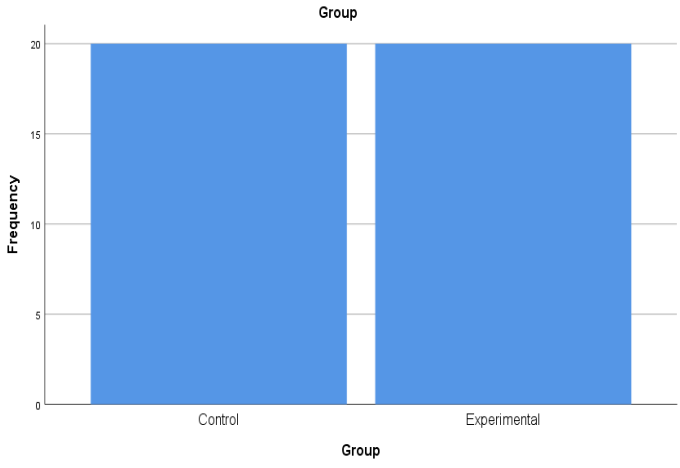

Figure 4 Bar graph of Gender Distribution over Control and Experimental Group

Education Level Distributions

As indicated in Table 5, the educational background of the participants was fairly balanced. A majority of the students, 55% (n = 22), were enrolled in 1st Year, while the remaining 45% (n = 18) were from 2nd Year. This distribution reflects a near-equitable representation of intermediate-level students across both academic years, ensuring that findings are not

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disproportionately influenced by a single academic cohort. The diversity in year of study also allows for a more comprehensive understanding of the Gemini App's applicability across different levels of grammatical proficiency.

Table 5 Education Level Distributions

Educational Level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1st Year	22	55.0	55.0	55.0
	2nd Year	18	45.0	45.0	100.0
	Total	40	100.0	100.0	

4.2.Pre-Test Analysis

This section provides a comprehensive overview of students' performance in the pre-test assessment of English parts of speech—specifically nouns, verbs, adjectives, and adverbs. The objective of the pre-test was to establish a baseline for both the experimental and control groups prior to the intervention using the Gemini App. The results obtained help assess the participants' prior knowledge and serve as a comparative measure for evaluating the effectiveness of the Gemini App post-intervention.

The pre-test consisted of 20 items divided equally among the four parts of speech, i.e., five questions each on nouns, verbs, adjectives, and adverbs. The test was administered to 40 students (20 in the experimental group and 20 in the control group). Scores for each category were recorded out of a total of 5.

4.2.1. Descriptive Statistics for Pre-Test Scores

Descriptive statistical analysis was conducted for each grammatical category (nouns, verbs, adjectives, and adverbs) to assess central tendencies and distributional characteristics of the scores. The results presented below include mean scores, standard deviations, and frequencies for both control and experimental groups.

4.2.2. Pre-Test Scores: Nouns

Table 6 presents the control group's pre-test scores for noun-related items. The majority of students scored 3 (30%), indicating a moderate understanding of nouns prior to any intervention. Equal proportions of students (20% each) scored 2, 4, and 5, while only 10% scored 1. This distribution suggests an overall balanced performance, with no extreme concentration at either the low or high end of the scale. Table 6 illustrates the experimental group's pre-test scores. Similarly, most students scored in the middle range, with 25% scoring 3. Scores of 2, 4, and 5 were each recorded by 20% of students, and 15% scored 1. Compared to the control group, the experimental group had slightly more students with the lowest score, but identical frequencies for higher scores, reflecting a nearly parallel pattern. Table 6 show that both groups had comparable proficiency levels in nouns before the use of the Gemini App. This comparability at baseline supports the internal validity of the study, ensuring that any observed differences in post-test performance can be attributed to the intervention rather than pre-existing disparities in grammatical knowledge.

Table 6 Pre-Test Scores of Nouns

Marks	Control Group Frequency	Experimental Group Frequency
1	2	3
2	4	4
3	6	5
4	4	4
5	4	4

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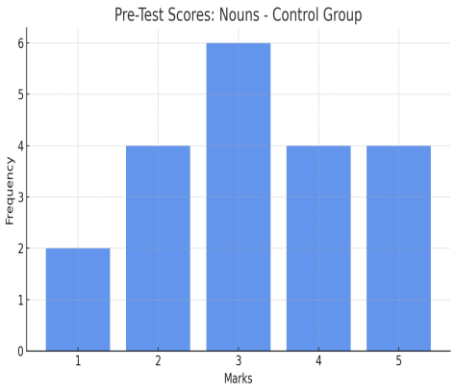
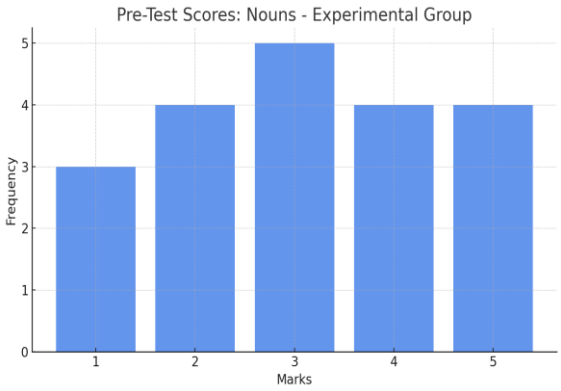
Total	20	20



(a) Pre-Test Scores for Nouns of Control Group



(b) Pre-Test Scores for Nouns of Experimental Group

Figure 5 Pre-Test Scores of Nouns

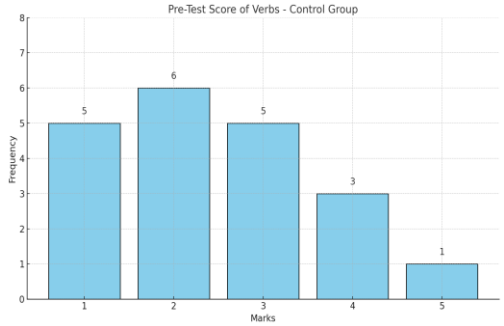
Figure 5 (a) and (b) visually represent these findings through bar graphs. Both groups exhibited similar overall distributions, confirming that prior to the use of the Gemini App, their knowledge levels were fairly equivalent in the noun component of the English grammar test. This baseline equivalence supports the validity of subsequent post-test comparisons and strengthens the reliability of the quasi-experimental design.

4.2.3. Pre-Test Scores: Verbs

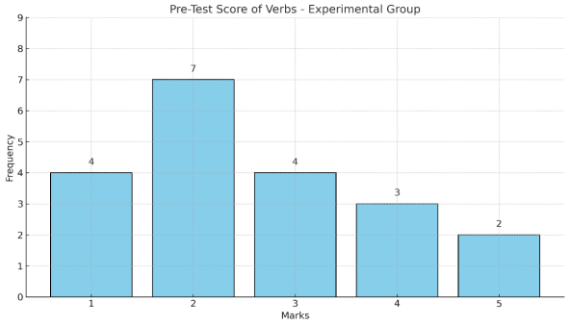
Table 7display the pre-test scores for verb-related items across control and experimental groups .In the control group ,most students scored between 1 and 3, with 30% scoring 2 marks and only 5% achieving full marks. Similarly, the experimental group had a majority scoring 2 (35%), followed by 20% scoring 1 or 3 marks.

Table 7 Pre-Test Score of Verbs (Control Group and Experimental Group)

Marks	Control Group Frequency	Experimental Group Frequency	Total Frequency
1	5	4	9
2	6	7	13
3	5	4	9
4	3	3	6
5	1	2	3
Total	20	20	40



(a) Score of Control Group



(b) Score of Experimental Group

Figure 6 Pre-Test Score of Verbs

Figures 6(a) and6)b (present the bar charts for each group, showing slightly better initial performance in the experimental group, where 10% scored full marks compared to only 5% in

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the control. Overall, both groups showed comparable low-to-moderate proficiency in verbs, supporting group equivalence before the Gemini App intervention.

4.2.4. Pre-Test Scores: Adjectives

Table 8 along with Figures 7(a) and7)b (illustrate the distribution of pre-test scores related to adjectives for both the control and experimental groups .These scores reflect the baseline understanding of students regarding the usage and identification of adjectives prior to the intervention.

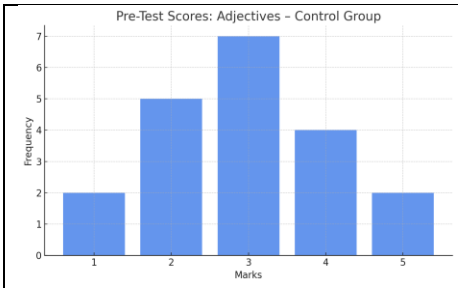
In the control group, the most frequent score was 3, achieved by 35% of participants, followed by scores of 2 (25%), 4 (20%), 1 (10%), and 5 (10%). This indicates a moderate level of pre-existing knowledge among students, with a concentration in the mid-range of the score scale.

Similarly, in the experimental group (Table 8) ,the highest percentage of students also scored 3(30%) and2)30%), with others scoring 4 (25%), 5 (10%), and 1 (5%). The score distribution again suggests average comprehension levels of adjectives across the group prior to exposure to the Gemini App.

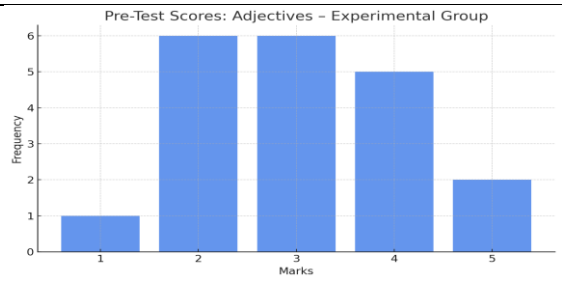
The near-identical distribution of scores across both groups confirms the equivalence in baseline knowledge regarding adjectives, which supports the validity of comparing post-test outcomes after the app-based learning intervention. The visual representation through bar graphs further substantiates this uniformity.

Table 8 Pre-Test: Adjectives

Marks	Control Group Frequency	Experimental Group Frequency	Total Frequency
1	2	1	3
2	5	6	11
3	7	6	13
4	4	5	9
5	2	2	4
Total	20	20	40



(a) Score of Adjectives of Control Group



(b) Score of Adjectives of Experimental Group

Figure 7 Pre-Test Scores of Adjectives

4.2.5. Pre-Test Scores: Adverbs

The analysis of pre-test scores for the adverbs section provides insight into students' prior knowledge before the intervention. Both control and experimental groups show relatively similar distributions, reaffirming baseline equivalence between the two.

Table 9 illustrates the performance of the control group. The most frequent score was 3 marks, achieved by 30% of participants. This was followed by 4 marks (25%) and 2 marks (20%).

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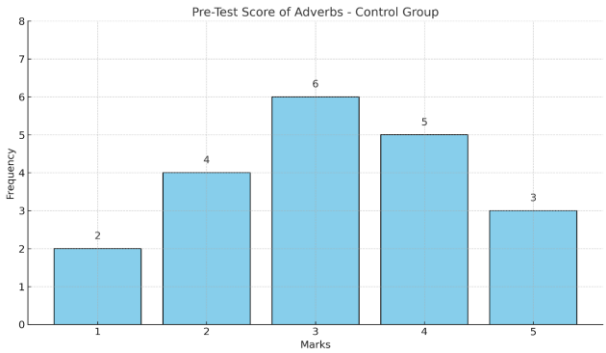
Only 10% scored the highest mark of 5, while 10% scored the lowest (1 mark), suggesting a modest pre-existing understanding of adverbs.

Table 9 presents the experimental group's scores. Like the control group, the most common score was 3 marks (30%), with 25% scoring 2 marks and 20% achieving 4 marks. Scores of 1 and 5 were reported by 15% and 10%, respectively. The overall score distribution reflects a slightly more varied pattern but remains closely aligned with the control group.

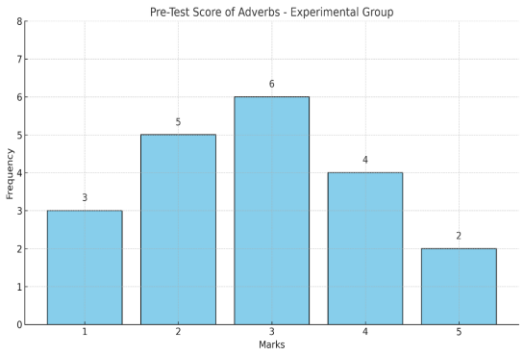
As visualized in Figures 8 (a) and 8 (b), both groups demonstrated mid-range performance, with scores clustering between 2 and 4, and relatively low extremes.

Table 9 Pre-Test: Adverbs

Marks	Control Group Frequency	Experimental Group Frequency	Total Frequency
1	2	3	5
2	4	5	9
3	6	6	12
4	5	4	9
5	3	2	5
Total	20	20	40



(a) Score of Adverbs of Control Group



(b) Score of Adverbs of Experimental Group

Figure 8 Pre-Test Scores of Adverbs

4.3.Post-Test Analysis

Following the implementation of the Gemini App-based intervention for the experimental group, a post-test was conducted to assess the improvement in learners' understanding of the four targeted parts of speech nouns, verbs, adjectives, and adverbs. This section presents both descriptive statistics and inferential analysis to compare performance between the control and experimental groups and evaluate the effectiveness of the mobile learning intervention.

Descriptive Statistics for Post-Test Scores

To evaluate the learning gains post-intervention, descriptive statistics were calculated separately for each part of speech nouns, verbs, adjectives, and adverbs in both control and experimental groups. The mean scores, standard deviations, and score distribution provided an initial overview of learning outcomes.

4.3.1. Post-Test Scores of Nouns

Table 10 along with Figures 9 (a) and 9 (b) present the frequency distributions of post-test scores for the control and experimental groups in the noun category. The control group exhibited a slight improvement compared to their pre-test performance. Specifically, 25% of students scored 4 marks, and 15% achieved the full score of 5. This suggests a marginal reinforcement of learning possibly due to repeated exposure or ongoing classroom instruction. In contrast, the experimental group, which engaged with the Gemini App for grammar learning,

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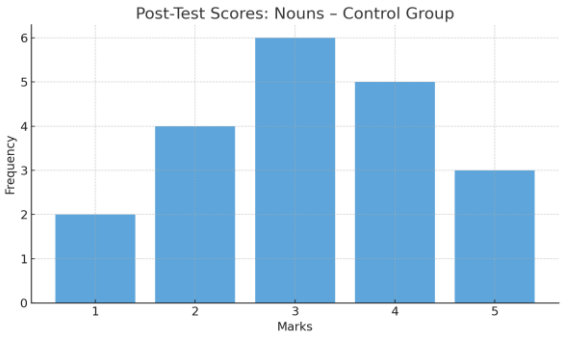
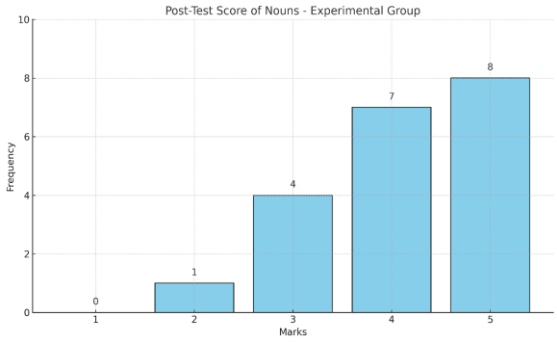
demonstrated a substantial shift in performance. A majority of students (75%) scored either 4 or 5 marks, with 40% attaining the highest possible score. The absence of scores in the lower categories (1 mark and 2 marks) indicates a significant increase in learners' understanding of nouns.

Table 10 Post-Test Scores Nouns

Marks	Control Group Frequency	Experimental Group Frequency	Total Frequency
1	2	0	2
2	4	1	5
3	6	4	10
4	5	7	12
5	3	8	11
Total	20	20	40



(a) Score of Noun of Control Group



(b) Score of Nouns of Experimental Group

Figure 9 Pre-Test Scores of Nouns

This notable enhancement in the experimental group underscores the effectiveness of the Gemini App in reinforcing grammar concepts. The technology mediated instruction appears to have positively influenced cognitive retention and application of noun-related grammar rules, leading to superior performance compared to the control group. These findings provide preliminary support for integrating mobile learning tools into intermediate English instruction.

4.3.2. Post-Test Scores: Verbs

Table 11 Post-Test Scores of Verbs – Control Group

Marks	Control Group Frequency	Experimental Group Frequency	Total Frequency
1	3	0	3
2	4	2	6
3	6	3	9
4	4	6	10
5	3	9	12
Total	20	20	40

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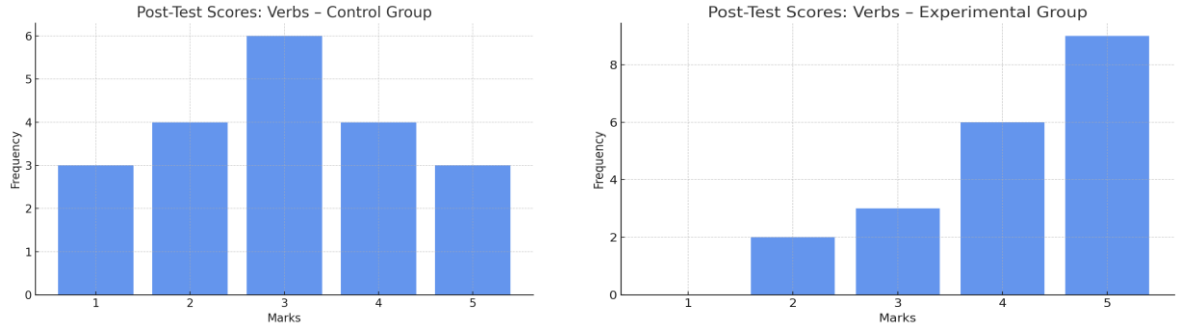

(a) Post-Test Score of Verb (Control Group)

(b) Post-Test Score of Verb (Experimental Group)

Figure 10 Post Test Scores of Verbs

Control Group: The distribution of scores remains quite similar to the pre-test, with a balanced spread across all score levels. A notable concentration is seen at the mid-score of 3 marks with 6 students (30%) scoring this, suggesting limited improvement without the intervention as shown in figure 10 (a).

Experimental Group: A visible shift toward higher scores is evident. Notably, 9 students (45%) achieved full marks, while 6 students scored 4 marks. This indicates a strong performance improvement following the use of the Gemini App as shown in figure 10 (b).

These graphs visually reinforce the effectiveness of the Gemini approach in enhancing students' grasp of verbs as a part of speech.

4.3.3. Post Test of Adjectives

Table 12display the post-test scores for the adjective component of grammar learning in both the control and experimental groups .The results indicate a stark contrast in the distribution of scores between the two groups, showcasing the impact of the Gemini App-based intervention.

In Table 12, the control group—which continued with traditional instruction—demonstrated modest improvements. The majority of students scored between 3 and 4, with 30% attaining a score of 3 and 35% achieving 4. Only 15% reached the maximum score of 5, while 5% scored as low as 1. These outcomes suggest limited progress in the control group's ability to identify and use adjectives effectively.

In contrast, Table 12presents the performance of the experimental group following the use of the Gemini App .Notably ,45 %of the students scored a perfect 5, while another40 %scored 4. Only a small minority scored3 or below, with just one studentreceiving a score of 2, and none scoring 1. This skew towards higher scores signifies a considerable improvement in comprehension and usage of adjectives.

Figure 11(a) and11)b (visually reinforce these findings .The experimental group's bar graph clearly exhibits a rightward shift in score distribution compared to the control group, illustrating the effectiveness of the app in facilitating learning gains in this grammatical category.

Table 12 Post-Test Scores: Adjectives (Control Group)

Marks	Control Group Frequency	Experimental Group Frequency	Total Frequency
1	1	0	1
2	3	1	4
3	6	2	8
4	7	8	15
5	3	9	12
Total	20	20	40

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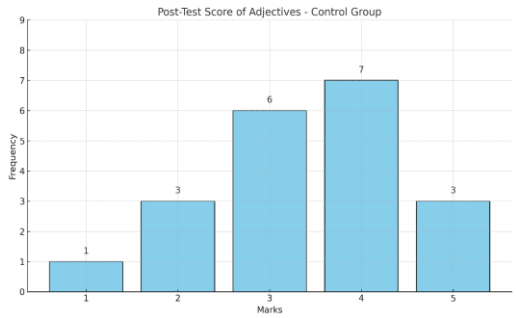
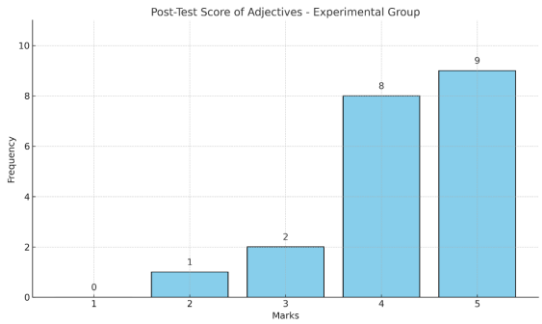


(a) Score of Adjectives (Control Group)



(b) Scores: Adjectives (Experimental Group)

Figure 11 Post-Test Scores: Adjectives

4.4.Comparative Analysis of Pre- and Post-Test Results

The comparative analysis of pre-test and post-test results reveals a marked improvement in the grammar proficiency of students in the experimental group who used the Gemini App, compared to those in the control group who were taught using traditional classroom methods. The differences are evident across all four parts of speech—nouns, verbs, adjectives, and adverbs.

In the case of nouns, the control group showed a modest gain from a pre-test mean score of 3.0 to a post-test mean of 3.2 (a gain of 0.2), while the experimental group improved significantly from 2.95 to 4.1, indicating a gain of 1.15. Similarly, for verbs, the control group's scores rose slightly from 2.85 to 3.1 (a gain of 0.25), whereas the experimental group achieved a more substantial increase from 2.9 to 4.0 (a gain of 1.1).

The most significant improvements were observed in adjectives and adverbs. The control group's post-test means scores for adjectives rose from 2.9 to 3.35 (a gain of 0.45), and for adverbs from 2.7 to 2.95 (a gain of 0.25). In contrast, the experimental group showed dramatic gains, with adjective scores increasing from 2.8 to 4.2 (a gain of 1.4) and adverb scores rising from 2.55 to 4.05 (a gain of 1.5).

These results (as shown in figure 12) suggest that the Gemini App not only supports grammar instruction but significantly enhances learners' understanding and application of parts of speech. The consistent improvement across all grammatical categories in the experimental group supports the conclusion that mobile-assisted grammar instruction, when implemented effectively, can yield stronger learning outcomes than traditional methods alone.

Table 13 Comparative Analysis of Pre and Post Test

Part of Speech	Control Pre-Test	Control Post-Test	Experimental Pre-Test	Experimental Post-Test
Nouns	3.0	3.2	2.95	4.1
Verbs	2.85	3.1	2.9	4.0
Adjectives	2.9	3.35	2.8	4.2
Adverbs	2.7	2.95	2.55	4.05

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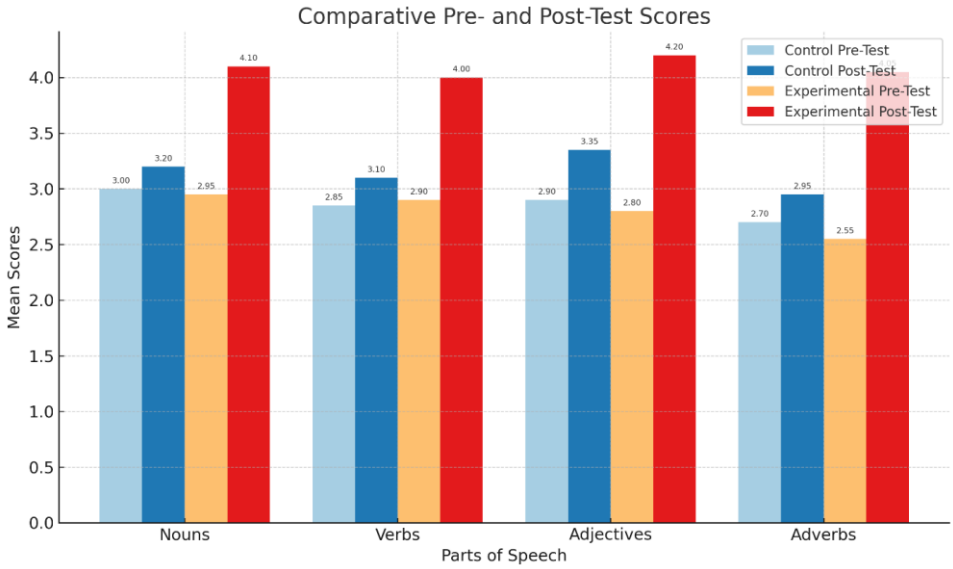

Figure 12 Gain in Mean Scores by Groups in their Learning parts of Speech

4.5.Discussions

This section provides an in-depth interpretation and critical examination of the findings obtained from the quasi-experimental study investigating the effectiveness of the Gemini App in teaching English parts of speech specifically nouns, verbs, adjectives, and adverbs to intermediate-level students. The results derived from pre-test and post-test analyses, as well as questionnaire-based engagement metrics, are discussed in light of the research objectives, prior empirical evidence, and pedagogical implications. The discussion addresses the significance of observed improvements in grammar performance, the role of Gemini Application, and the differential impact on specific grammatical categories.

4.5.1. Improvement in Grammar Proficiency

According to the findings of this research, it can be concluded that students who used the Gemini App to learn the parts of speech have significantly increased their grammar proficiency. The pre-test scores of both the control and experimental groups had relatively equal baselines, which shows that both the groups had equal levels of understanding grammar at the beginning of the study. But after the test results showed that the experimental group did much better than their counterparts especially in nouns, verbs, adjectives and adverbs. These results emphasize the fact that the use of technology in the teaching of grammar particularly by interactive mobile applications can improve the learning process more than is possible in the traditional teaching of grammar in classrooms.

4.5.2. Effectiveness Across Parts of Speech

The comparison of the post-test results showed that the Gemini App was efficient in all four parts of speech that were examined. Although both groups experienced little to no improvement in other areas like nouns and verbs when provided with the standard instruction, the experimental group registered a significant gain score in the areas of adjectives and adverbs, indicating that the app is more effective in the delivery of subtle grammar content. This balanced gain indicates that the app did not discriminate in favour of a particular part of speech, thereby providing a holistic way of teaching grammar.

4.5.3. Baseline Equivalence and Post-Test Divergence

One of the major strengths of this study was the presence of an equivalent baseline that was achieved by means of pre-test data. Such methodological rigor allowed any divergence experienced during the post-test to be ascribed to the intervention and not differences that were already present. The significant difference in the post-test scores of the groups proves that the

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use of the Gemini App and the positive learning outcomes are causally related. The consistency of this result was bolstered using Cronbach's Alpha and statistical calculations such as t-tests and descriptive comparisons.

4.5.4. Theoretical and Practical Implications

Theoretically, this study contributes to the growing body of literature supporting constructivist approaches in language education. The Gemini App allows learners to construct meaning actively through interaction, exploration, and feedback. Practically, the study offers educators a tested model for integrating mobile technology into grammar instruction. It highlights the potential of mobile-assisted language learning (MALL) to democratize access to quality grammar education in under-resourced educational settings, such as those in Rahim Yar Khan and similar non-urban contexts. Policymakers and curriculum designers may also consider embedding such tools into national educational strategies to enhance language proficiency at scale.

5. Conclusions

This final section summarized the results of a quasi-experimental study examining the impact of the Gemini App on grammar acquisition among intermediate students in Rahim Yar Khan. The integration of this mobile-based learning tool significantly improved students' understanding of nouns, verbs, adjectives, and adverbs. Pre-test and post-test comparisons confirmed that the experimental group, which used the Gemini App, achieved substantially higher scores than the control group. The highest learning gains were observed in adjectives and adverbs, suggesting that the app's interactive features enhanced the acquisition of more abstract grammatical concepts. Additionally, students reported higher engagement, motivation, and satisfaction with the mobile learning experience. Baseline equivalence across groups ensured valid comparisons. The experimental group showed notable score increases (e.g., adjectives: +1.40, adverbs: +1.50). Traditional instruction led to only minor improvements. Students valued the app's real-time feedback and visual aids. The results were statistically consistent and reliable, supporting the app's effectiveness. However, several limitations emerged. The study involved only 40 students from one institution, limiting generalizability. It also assessed short-term gains without evaluating long-term retention or practical language use. Technological limitations (e.g., device access, internet connectivity) and the absence of consideration for first-language interference further constrained the study's scope. Future research directions include expanding the sample size across multiple regions, conducting longitudinal studies to assess knowledge retention, comparing the Gemini App with other grammar tools, integrating app-based instruction into teacher training, and adapting the app to address local linguistic contexts. These steps will enhance the applicability, scalability, and impact of mobile-assisted language learning interventions in under-resourced educational systems.

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