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THE IMPACT OF GENERATIVE AI ON LINGUISTIC ACCURACY AND LEXICAL DIVERSITY IN ESL ACADEMIC WRITING

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Abstract
This study examines the impact of Artificial Intelligence (AI) tools on the grammatical accuracy and vocabulary range of undergraduate ESL learners. Using an experimental design, 100 undergraduate ESL students from Bahauddin Zakrya University Multan and Ghazi University D.G. Khan were randomly assigned to an experimental group and a control group. The experimental group used AI tools to support learning during the treatment phase, while the control group received instruction through traditional classroom methods without AI. Data were collected through pre-tests and post-tests administered before and after the intervention.
Results were analysed using SPSS and Microsoft Excel, employing both descriptive and inferential statistics. Findings indicate that the experimental group demonstrated statistically significant improvements in both grammatical accuracy and lexical range compared to the control group. The results suggest that AI tools can effectively support language development in ESL learners at the undergraduate level. This study contributes to the fields of applied linguistics and educational technology by providing empirical evidence on the effectiveness of AI-assisted learning in higher education contexts.

1. Introduction

1.1. Introduction to AI and Language Education

The world today is the world of digital technologies, in which most of the society has been transformed, including the education system. One such innovation of which Artificial Intelligence (AI) is a key player is changing the ways in which teachers teach, the environments in which learning takes place, and the learning–teacher interactions.

1.1.1. Artificial Intelligence and ESL Language Learning

The name AI is given to computers that learn, reason, solve problems, perceive and understand language (Russell & Norvig, 2021). The functioning of AI systems relies on algorithms that analyse data, find patterns in it, and generate a response based on the knowledge they've gained. In the field of education, AI can be used for the automation of feedback, personalization of learning experiences (Ma et al., 2024, 2025) and interactive communication simulations (Akram et al., 2022, 2021).

With the capacity to deliver immediate feedback and customize instruction to meet student demands and needs, AI is increasingly impacting the language learning space. English is the language of instruction, science and business in the world and so the need to improve students' command of English, particularly grammar and vocabulary is more urgent than ever before, particularly with those who are learning English as a Second Language (ESL).

1.1.2. AI Tools in Language Education

Language education AI tools are programs utilizing AI technologies, such as large language models, machine learning and natural language processing (NLP), in language education, including but not limited to, automated feedback (Abdelrady et al., 2026, 2025), generation of text, grammar and usage correction, and vocabulary enhancement. (Liu, 2023). These may include grammar checkers, chatbots, intelligent tutoring systems, and generative Artificial Intelligence systems.

1.1.3. Grammatical Accuracy and Vocabulary Range

The term grammatical accuracy, as pointed out by Ellis (2008), means using the right linguistic forms and structures as required by the syntactic, morphological and semantic rules of a language. The grammar in ESL writing is reflected in errors in agreement, tense, syntactic coherence and in the formation of sentences (Li & Akram, 2023, 2024).

Vocabulary range is the extent, variety and suitability of learners' vocabulary in their oral or written communicative use (Nation, 2013). The wider the vocabulary range, the more audible students are in their expression, they can participate in an academic discussion, and they can also comprehend complex texts (Nawaz et al., 2021, 2020).

1.1.4. Historical Evolution of AI in Language Learning

The use of technology in language learning is not a new development since it can be traced back to the 1960s and 1970s and the advent of Computer-Assisted Language Learning (CALL). The early CALL programs were mostly behaviourist in nature and were centred on drill and practice activities that aimed to reinforce grammar rules and vocabulary memorization (Warschauer, 1996).

1.1.5. Pedagogical Potential of using AI Tools in ESL Learning

There is a wide range of applications that include AI and Natural Language Processing (NLP) to enhance students' understanding and fluent learning of English. Common examples of apps that can be used are Grammarly, Google Translate, Elsa, or Alexa. Furthermore, Pettela (2020) noted that the utilization of AI tools, which are based on learning within an ELL environment, is essential, as they make learners' communication more like what would take place in real-life conversations. The use of audio-based activities and visual learning material also helps learners to practice pronunciation using AI-supported communication technologies (Sattar et al., 2025). AI has a significant effect on education by offering personalized learning methods that cater to the needs of each student and their learning environment (Dishon, 2017) (Huang et al., 2021).

1.1.6. The Evidence from the Field and Landscape of Pakistan Studies

English is not only the official language of Pakistan but also has a position as a second language in the country as it is mostly used in educational and professional contexts (Ali, Bashir, Anjum & Mahmood, 2020). This research explores the role of artificial intelligence in the learning process of English language in universities of Pakistan as the demand for English is high in the country in which ESL students are pursuing their education, and the use of artificial intelligence in the study of English language in Pakistan is still underexplored. The importance of this study is three-fold. Undergraduates are the first to be assisted in developing and improving their English language skills in education by AI tools. Second, technology enhanced activities can be used in the classroom to improve learning for teachers and curriculum designers. Thirdly, it can be used as a reference for future research into the functions, advantages and uses of artificial intelligence in the teaching of English.

1.2. Statement of the Problem

Usually, in the classroom, language is taught in the general way in which teacher feedback, peer review and standard exercises. These can be useful, but can be time limited, class-size limited or curriculum limited. Consequently, grammar and vocabulary feedback may be delayed, generalised and/or too general and students may not know what they are doing wrong or about words that they may be leaving out of their vocabulary. This is a problem situation

particularly when teaching pupils in the undergraduate level where they must develop their communicative competence beyond the basic level to improve their language accuracy and expressiveness. AI tools can address these challenges by providing instant feedback, language customization, and personalized learning experiences. Using AI, natural language processing, and machine learning, the tools can analyse learner input, correct its grammar, give feedback on errors, and offer suggestions for vocabulary adjustments in context. These features are especially appealing to undergraduate ESL students who are seeking immediate assistance when writing their essay, report or research paper. This has resulted in students utilizing the AI tools more as a resource to learning, rather than in class.

1.3. Significance of Study

The importance of this research lies in its potential to assist the emerging science of language teaching by systematically examining how artificial intelligence (AI) tools can enhance the grammar skills and enrich their vocabulary for undergraduate ESL students. With the advent of digital technologies in Higher Education, there has never been a more pressing and important need to examine their effect on students' higher level language development and their true value. The goal of this study is to offer empirical insights into the didactic opportunities of using AI in language learning, particularly within formal learning contexts where language precision and sophistication are of key importance.

1.4. Objectives of the Research

1) The study will assess the effectiveness of AI powered tools in improving grammatical accuracy, vocabulary range and writing skills among ESL learners.
2) Compare and contrast the effectiveness of AI tools vs traditional teaching strategies on improving the grammatical accuracy of ESL learners and their vocabulary expansion.
3) Differentiate teaching and learning to match learner's style, pace and level to ensure effective and engaging teaching and learning.
4) Practice at writing sentences, emphasizing clarity, coherence and variety.

1.5. Research Questions

1) What is the effectiveness of the AI tools with ESL students on enhancing their grammatical competency with writing, e.g., verb tenses, subject-verb agreement, sentence structure?
2) How useful are AI tools for ESL learners to enhance the use of vocabulary, such as word choice, collocations, and idiomatic expressions?

2. Literature Review

2.1. Theoretical Framework

In the present study, the theories of second language acquisition concerning the vocabulary acquisition and the grammar acquisition by the process of constructing them actively and input and interaction from the perspective of interrelated and work-tested theories are used.

2.1.1. Sociological Principle (Vigotsky, 1978)

Vygotsky introduced the phrase "zone of proximal development" (ZPD) as a distance between the children's own learning level and the level of learning achievable through support and assistance from others. Instruction and support best take place in this zone. This support has usually been provided by teachers, the peers or the teaching resources. Digital technologies, particularly AI-powered technologies, however, have also emerged as new mediations in the current educational environment, wherein the context of learning has become technologically mediated.

In this study, the AI tools are considered as mediating artifacts that work within the learners' ZPD and provide instant feedback, grammatical correction, words suggestions and contextualized input of language. The study will concentrate on the grammar accuracy and vocabulary acquisition of ESL learners in Vygotskian terms and introduce AI tools that can scaffold the grammar accuracy and vocabulary acquisition of ESL learners, through interactions, feedback and guided practice.

2.1.2. Input Hypothesis (crushen, 1982)

According to the theory of Krashen, comprehensible input is the key to the language acquisition process and language is acquired more easily when the learner's exposure to

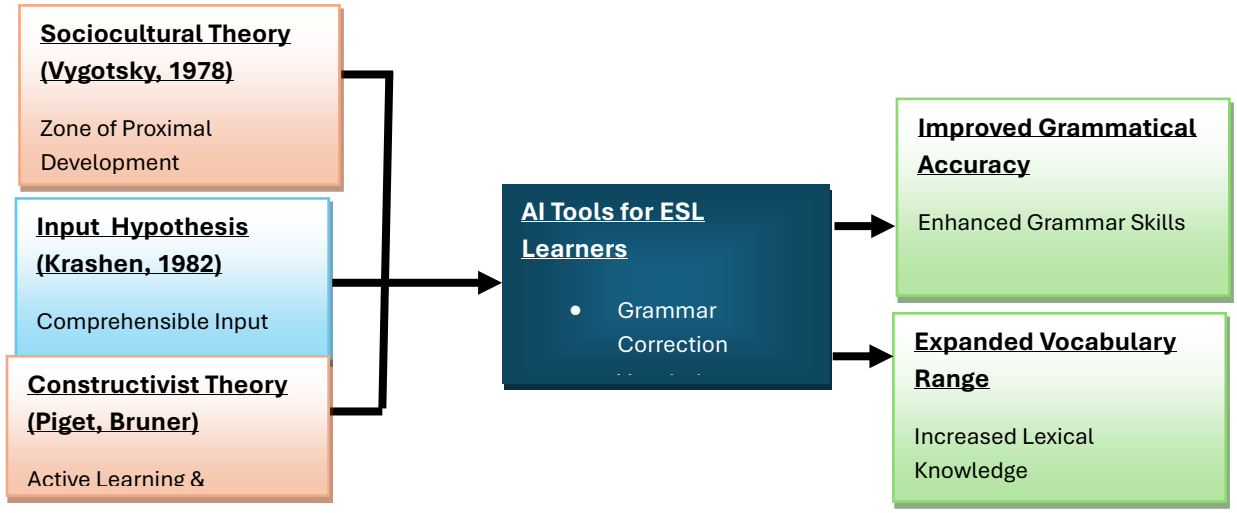
language input (i+1) is at a level slightly above their current competence.

Krashen (1982) argued that only when the learner receives meaningful input which he or she can comprehend can language learning take place, otherwise the only way language learning can occur is through language knowledge rather than grammar instruction. Input is "comprehensible" when it is presented in a way that facilitates comprehension, e.g. through context, background or linguistic cues. These kinds of inputs usually come from the teacher, the textbook or authentic materials in a traditional ESL classroom. These sources tend to be unflexible regarding the level of proficiency each individual learner has. AI tools overcome this challenge by providing tailored and responsive feedback. The language output of the learners is subjected to an analysis by the AI-based language tools and feedback is created according to the correct language structures and meaningful use of language. The responses are not haphazard, but rather often are restatement (reformulations) or elaboration (elaborations) of the initial learner response, and this is very similar to Krashen's idea of i+1. For example, if a learner writes a grammatically incorrect sentence, the AI system could correct it, or give a more complex sentence, showing the learner the right grammar in a context that is relevant for them. This enables AI tools to provide users with a continuous flow of understandable input, as opposed to input given as a drill in language. This assists in developing a vocabulary as well as grammatical accuracy since learners listen to the language being used correctly and appropriately.

2.1.3. Brunger, 1960; Piagate, 1950; Constructive Learning Theory

Constructivism emphasizes the learner's autonomy, problem-solving, and the process of meaning-making, learning is an active process in which the learner plays an active role in the task and the feedback (Al-Adwan et al., 2022). This theoretical perspective is particularly relevant for This research because the use of AI in education creates interactive learning environments that enable ESL learners to investigate language, experiment with concepts, assess and reflect on feedback, and correct their mistakes. In such processes, the students participate in the construction of the knowledge of grammar and vocabulary rather than simply memorizing grammar rules and lists of vocabulary. AI tools are then well-suited for constructivist approaches with their capacity to explore, investigate and engage in SRL.

In second language acquisition (SLA) studies, a focus has been placed on constructivism to emphasize meaningful language use, experimentation and reflection. The learners' competence in grammar and their vocabulary knowledge is developed through natural and semi-natural uses of the language (Ramzan et al., 2025, 2023); in the errors they make and, in the changes, they bring in their perceptions of meaning in response to feedback. This is a view that is opposite from the traditional language teaching approach which focuses on explicit explanation and memorization by learners.



❖ **Conceptual Framework: Effectiveness of AI Tools in Enhancing Grammatical Accuracy and Range of Vocabulary among ESL Learners**

2.2. Related Researches

Artificial Intelligence (AI) has made huge strides in recent years and has already had a tremendous impact on the education sector, and more specifically, on Second Language Acquisition (SLA). The use of AI in ELL is becoming more common in the use of tools to assist in grammatical correctness, vocabulary, and overall communicative competence. They provide immediate feedback and personalised learning plans, and learning environments that are interactive and not like traditional classrooms.

One of the earlier works which directly addressed the role of advanced AI techniques in grammar learning is from Winaitham (2022). The study highlighted the significance of employing natural language processing (NLP) for identifying and analysing the written language of learners and offering valuable and effective grammatical feedback. The NLP based grammar systems strive for discovering the grammar patterns, word relationships and sentence structures in texts in which the learner is studying. This feature enables AI tools to detect errors beyond simple typographical and grammatical issues, such as tense or subject–verb agreement, to deeper problems, such as clause organization or sentence construction.

According to Winaitham (2022), NLP can be used to analyse the learner input, just as humans analyse language. The system analyses grammatical structure of sentences and compares the structure with the normal linguistic structure. Thus, learners get feedback which clarifies the type of mistakes they made and correct grammatical structures. This process will help learners to learn the syntax and sentence structure and not merely to learn if they are correct or incorrect.

Liao (2023) cited the answers to various vocabulary tasks as the elements that will be examined by the AI-powered vocabulary assessment tool to determine the strengths and weaknesses of the learners' vocabulary knowledge. The automated assessment tools give immediate feedback to the learner as to word meaning, word use, collocations, and context appropriateness. This live assessment enables students to identify areas where they are falling short in their vocabulary knowledge and practice them accordingly. Chiefly, Vadivel (2023) noted that the role of AI in monitoring the development of learners' vocabulary over time is significant.

In addition to this, Hsu (2023) introduces another relevant item when it comes to the vocabulary learning process with the help of AI – the use of image recognising technologies. The study showed that the effectiveness of the visual-based AI tools, which can connect pictures with words or vocabulary items, was not just in enhancing vocabulary learning, but it also had a positive effect in reducing the anxiety of the learners.

Athanasopolos et al. (2023) researched migrant and refugee students in a junior high school in Greece. The results showed significant gains in word proficiency, grammatical correctness, sentence complexity, and range of vocabulary for students who used AI-backed tools for learning. Theoretically, this study is important because of its focus on L2 learning difficulties which are experienced by linguistically and culturally diverse learners. Students with a migrant and refugee background are often missing education, having limited access to language resources, and are not getting the individualized instruction they need. This research has demonstrated that AI-based tools can provide consistent and available language support, can solve these problems and are available.

My et al (2024) expanded upon the research conducted by Safaei et al. (2021) in the field of EFL learning and concentrated on the effect of AI tools on the EFL students' grammar and vocabulary knowledge, as well as on their writing skills. The research revealed that learning with the help of AI tools produced a more profound understanding of the grammar rules and the use of vocabulary, with a resulting higher quality of writing. This awareness helps to increase the accuracy of language production and the use of a larger vocabulary.

3. Research Methodology

3.1. Nature of Study

This study employed the quantitative research approach, which has been suitable for analysing

the effectiveness of employing the AI tools for enhancing the grammatical accuracy and the scope of vocabulary among the ESL learners. When the researchers want to collect quantitative data and want to obtain a measurement of variables as objective as possible and want to see if an intervention has a statistically significant impact, then quantitative research is appropriate.

3.2. Data Collection

This research follows an experimental research approach to explore the impact of the use of AI tools on grammatical accuracy and vocabulary range of undergraduate ESL students. The subjects of this study are 100 students who have been selected from the undergraduate English as an additional language course and have been divided into control group and experimental group with 50 students in each group.

Data collection process starts with giving pre-test to control group and experimental group. Secondly, the treatment phase lasts for 14 days after pre-test. The experimental group receives sixteen instructional lectures and practice sessions on using the AI-assisted instructional methods in this period. At the end of the treatment phase, both groups have a post-test. The post-test has a similar structure and level of difficulty as the pre-test and contains the same types of language assessment activities. The post-test has been used to assess the effectiveness of the instructional intervention for the learners' grammatical accuracy and vocabulary range, and to see the impact of the use of AI during instruction.

The outcome of the test is systematically collected, organized, and recorded before and after for statistical analysis. The researchers can evaluate the students' growth and effectiveness of AI utilized in ESL education by comparing pre and post-tests.

3.3. Delimitations of the Study

The present study has a further scope of the effectiveness of the use of AI tools in improving the grammatical accuracy and range of vocabulary of higher education institutions' undergraduate ESL learners. The study only covers undergraduate students and post-graduates; school level and the formal education system are not considered in the study. The research also focuses on English language learning and does not consider the implications of other languages of use or learning, such as French, Arabic, Chinese or other foreign languages, in the context of the use of AI tools. Furthermore, this investigation has been limited to a short-term intervention (one academic semester). No attention is given to longitudinal outcomes (long-term grammatical and/or vocabulary gains or retention across multiple semesters). Furthermore, the study focuses on the chosen AI tools being deployed in the educational sector for learning purposes and attempts to avoid comparison of the entire plethora of AI tools or platforms that exist.

3.4. Population and Sampling

The subject group are the students, studying ESL in higher education institutions who are under-graduate. This research has been conducted in two higher education institutions, one is the Bahauddin Zakrya university, Multan, where English is a mandatory subject and another is Ghazi University, Dera Ghazi Khan, where English is an elective academic subject.

The sampling technique applied in selecting participants is the random sampling technique which is representative and no selection bias. Random sampling is appropriate because it provides an equal opportunity to be selected to all members of the population and increase the representativeness of the sample. Two Universities have been selected, and 100 participants have been selected from the two selected Universities. The sample size is appropriate for an experimental investigation, but not so large that it is impractical for quantitative analysis.

Selected participants have been divided into two groups; experimental and control group. Randomisation of subjects to groups is also used to minimise bias and maximise the internal validity of the study because any differences in results would more likely be the result of the treatment rather than any pre-existing differences among the learners.

3.5. Research Procedure

In this research work, the research design is Experimental research design, and the purpose is to determine the effect of the use of AI

powered tools on the grammatical accuracy and vocabulary range of undergraduate ESL learners. In the study, two sets of subjects are involved – control group and experimental group. There are 100 undergraduates enrolled in the study and 50 are in each group. The experimental group uses traditional classroom learning, and the experimental group uses AI teaching tools for language learning and gets the AI assistance for language learning.

Participants have been provided with informed consent forms which explain the purpose of the study, that information will be kept confidential, that participation is voluntary and that they have the right to withdraw from the study at any time. Each of the two groups takes a pre-test prior to starting the instruction, to determine their current grammatical fluency, vocabulary knowledge and writing proficiency. The pre-test has been used as a baseline assessment and to see if both groups start at the same language proficiency level before treatment is started.

The treatment period follows the pre-test period and is for 2 weeks. During this phase, an average of sixteen teaching sessions of AI-assisted teaching methods are provided to the experimental group. The control group learns using traditional teaching methods, without the assistance of AI tools.

After the treatment phase, both groups take the same post-test as the pre-test, but of the same difficulty and content. The reason for the post-test is to measure the learning gains of the learners after the instruction and to examine the effectiveness of AI assisted instruction and traditional instruction. Both tests are recorded, recorded on a table and prepared for statistics. Pre and post tests are used to see how much improvement there is in grammatical accuracy, vocabulary range and writing skills for the learners in both groups.

3.6. Tools Used in the Study

The study has been adopted in various instructional materials, technologies, and assessments to investigate the effectiveness of the AI application in improving students' grammatical accuracy and vocabulary size in undergraduate ESL students.

3.6.1. Language Learning Tools Powered by Artificial Intelligence

AI-based language learning apps are the key tools with which the instruction is conducted in this study. The tools are incorporated into teaching process of the experimental group in the treatment stage.

- Grammarly
- QuillBot
- ChatGPT
- Wordtune
- Google Translate

3.6.2. Testing Instruments

AI tools for instruction and pre and post-tests were among the main assessment techniques employed in the study. The following tests have been developed to assess the learners' grammatical accuracy, vocabulary knowledge, sentence structure and writing ability before and after the instructional treatment.

The tests include activities such as:

- Essay writing
- Paragraph writing
- Grammar correction exercises
- Vocabulary tasks
- Sentence transformation
- Error identification

3.6.3. Classroom Activities

There are also a number of activities used as tools in the treatment process to actively involve learners in language learning. These activities include:

- AI-assisted essay writing
- Vocabulary-building exercises
- Sentence restructuring tasks
- Grammar correction activities
- Interactive quizzes
- Writing revision tasks

3.6.4. Role of the Tools in Evaluation of the Results

The materials utilized in the study have made a great contribution in assessing learner's grammatical accuracy and vocabulary learning. Before and after assessments (pre-tests and post-tests) allows the researchers to make comparisons of learning before and after the instructional intervention.

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In general, it has helped develop a comprehensive evaluation of the research objectives and the reliable evidence of the improvement of grammatical accuracy and vocabulary size of ESL students after using AI tools, assessment tools, classroom activities, and statistical tools.

3.7. Data Analysis

The data collected have been analysed quantitatively and interpretatively by using the statistical package for social sciences (SPSS) and Microsoft excel. The purpose of the analysis has been to find out whether the AI tools can improve the accuracy of grammar, word choice, and writing skills in ESL students.

All pre and post and scores after coding are entered into SPSS and statistical analysis conducted. Descriptive statistical techniques are used to summarize and organise data (frequencies, percentages, mean scores, and standard deviations). They are all the steps taken to identify trends and patterns in learners' performance and reactions in general.

The analysis is made under four major categories that are constructed based on the research goals and research questions:

1. The Ways with Which AI Tools can Improve Grammatical Accuracy and Vocabulary Range
2. Treatment Phase
3. Comparison of AI Tools with Traditional Teaching Methods
4. Learner Engagement, Adaptability, and Writing Skill Development

3.7.1. Significance Level

The level of significance for all inferential statistical tests was:

A p-value < 0.05 means that the improvement or difference that was seen in the results was not caused by chance and was therefore statistically significant.

4. Data Analysis

Category 01

Effectiveness of AI Tools in Improving Grammatical Accuracy and Vocabulary Usage

Test Activity	Total Marks
Essay Writing	20
Paragraph Writing	10
Grammar Correction	15
Fill-in-the-Blanks	10
Sentence Transformation	10
Vocabulary Exercises	10
Synonym and Antonym Tasks	5
Sentence Completion	5
Error Identification	10
Short Composition	5
Total	100

Structure of Pre-Test and Post-Test

Table 4.1: Test Structure and Marks Distribution

Interpretation:

The test structure is built to evaluate learners in a comprehensive way, both in grammatical skills and vocabulary skills. Grammar corrections and error identification tasks assess learners' knowledge of grammatical principles like verb tenses, subject-verb agreement, punctuation, and sentence construction. Vocabulary-related tasks involve looking at word choice, context, synonyms, antonyms, and collocation use.

Pre-Test Analysis

Table 4.2: Pre-Test Mean Scores by Activity

Test Activity	Control Group Mean	Experimental Group Mean
Essay Writing	9.4	9.1
Paragraph Writing	4.7	4.8
Grammar Correction	6.8	6.5
Fill-in-the-Blanks	5.1	5.3
Sentence Transformation	4.9	4.8
Vocabulary Exercises	4.8	5.0
Synonym and Antonym Tasks	2.6	2.7
Sentence Completion	2.4	2.5
Error Identification	5.3	5.1
Short Composition	2.2	2.3
Total Mean Score	48.26	47.89

Interpretation of Pre-Test Results:

The pre-test analysis shows that both groups have the same level of grammatical and vocabulary skills prior to the instruction. The average scores obtained in the writing of essays suggest that both groups have difficulties at the beginning in sentence structure, coherence, and grammar. Likewise, all grammar corrections and vocabulary related tasks are of moderate level of proficiency among participants.

Category 02

Treatment Phase

After the pre-test, students undergo treatment for 14 days. About 16 lectures and instructions sessions are given in the experimental group during this period with the help of AI-assisted instructional strategies.

The experimental group is engaged in various activities aimed at enhancing grammar and vocabulary that involve the use of artificial intelligence. These activities include:

- AI-assisted essay writing
- Corrects grammar with the assistance of AI tools.
- Vocabulary enhancement exercises
- AI-generated writing prompts
- Sentence restructuring activities
- Paragraph revision tasks
- Interactive grammar quizzes

The following AI tools are used during the instructional treatment:

- Grammarly
- QuillBot
- ChatGPT
- Wordtune
- Google Translate

Category 03

Comparison of AI Tools with Traditional Teaching Methods

Post-Test Analysis

Once the treatment phase is over, both groups are given a post-test consisting of a similar structure and a similar difficulty level as the pre-test.

Table 4.3: Post-Test Mean Scores by Activity

Test Activity	Control Group Mean	Experimental Group Mean
Essay Writing	11.8	16.7
Paragraph Writing	5.8	8.3
Grammar Correction	8.1	12.9
Fill-in-the-Blanks	6.2	8.5

Test Activity	Control Group Mean	Experimental Group Mean
Sentence Transformation	5.9	8.1
Vocabulary Exercises	6.1	8.3
Synonym and Antonym Tasks	3.1	4.4
Sentence Completion	3.0	4.2
Error Identification	6.4	8.9
Short Composition	2.9	4.6
Total Mean Score	56.34	74.92

Interpretation of Post-Test Results:
The results of the post-test show that the experimental group have significant improvement in achieving the expected performance after receiving AI-assisted instruction. The experimental group learners make a noticeable improvement in their essay writing skills, grammar correction, vocabulary exercise and sentence transformation exercise.

Category 04
Learner Engagement, Adaptability, and Writing Skills
Quantitative Comparison of Pre-Test and Post-Test
Table 4.4: Overall Improvement in Scores

Group	Pre-Test Mean	Post-Test Mean	Mean Gain
Control Group	48.26	56.34	8.08
Experimental Group	47.89	74.92	27.03

Interpretation:
The quantitative comparison is quite clear that the experimental group is significantly improving as compared to the control group. The results of this study indicate that the application of AI-assisted teaching is highly beneficial for students in the aspects of accuracy, vocabulary and writing ability.

Paired Sample t-Test Results
Table 4.5: Paired Sample t-Test Analysis

Group	Pre-Test Mean	Post-Test Mean	t-value	p-value
Control Group	48.26	56.34	4.21	0.032
Experimental Group	47.89	74.92	10.86	0.001

Interpretation:
Results of paired sample t-test indicate that there is statistically significant improvement for both groups. However, there is a significant improvement in the experimental group compared to the control group.
Overall, the conclusions presented in this part indicate that the application of AI in teaching has a positive impact on the grammatical accuracy, word selection and writing ability of students. Students are involved in grammar activities, sentence manipulation, vocabulary drills, written tasks, and receive corrective feedback about these activities.

5. Findings and Conclusion

5.1. Findings

The main purpose of this study has been to explore the impact of using AI tools to enhance grammatical accuracy and vocabulary usage in ESL learning. The findings in response to the research questions are reported.

3) Q1: What is the effectiveness of the AI tools with ESL students on enhancing their grammatical competency with writing, e.g.,

verb tenses, subject-verb agreement, sentence structure?

The results for the first research question "How effective is the use of AI for improving grammatical accuracy?" indicate a positive trend. Analysis of data showed that many of the learners showed improvements in the grammatical aspect of their language after using AI-based tools. This improvement was noticed in such things as verb tenses, subject–verb agreement and sentence construction. Also, the pre-test and post-test scores were compared, and it was observed that the performance had improved, especially in the experimental group which was given AI-assisted teaching. The accuracy of the learners of the experimental group was more accurate than the control group in detecting and correcting the grammatical errors. In addition, the participants indicated that AI tools offered timely and clear feedback, allowing them to grasp their errors and correct them for future performance. This suggests that the use of AI tools in continuous training and real-time corrections is effective in reinforcing the grammar rules.

4) Q2: How useful are AI tools for ESL learners to enhance the use of vocabulary, such as word choice, collocations, and idiomatic expressions?

However, the results are not as good as they are in the case of the second research question on the use of vocabulary. While there were some positive outcomes, students were aware of how AI helps them learn new words and how it helps them understand the meaning of the words, improvements in the use of advanced vocabulary were less than impressive. The information indicated that AI tools proved to be most helpful for basic vocabulary development, such as finding synonyms or definitions. The achievement with vocabulary knowledge in context, however, was not as consistent, particularly with respect to collocations and idiomatic expressions. The learners found that their use of the suggestions generated by the AI tools in their writing was not optimal and it is not necessarily addressed in the uses of language in context, so it is necessary to support them.

5.2. Conclusion

Based on the findings of this study, several conclusions have been drawn for the various research objectives.

The first objective is to determine how well the AI tools can improve grammatical correctness, vocabulary usage and writing skills. The results are promising and demonstrate the potential of AI tools in enhancing grammatical accuracy and sentence composition. The use of AI tools is evident to improve the grammatically correct sentence construction and the correct identification of errors by the learners. The second goal is to carry out a comparative study of the efficacy of AI instruments and traditional teaching approaches. The results indicate that use of AI tools has several benefits but does not entirely replace the need for traditional teaching. The third aim is to explore how AI tools can be adapted to people's learning styles and requirements. The results suggest that AI tools have the potential to be highly flexible and can be applied to support individualized learning, which is appropriate for learners of varying skill levels. The fourth one is to teach sentence-level writing. The results indicate that AI tools play a crucial role in enhancing the clarity, coherence, and accuracy of writing.

Overall, the study concludes that AI-powered tools are valuable resources for ESL learning, particularly in improving grammar and writing skills. Nevertheless, they are not effective in enriching vocabulary skills and need to be applied along with conventional approaches to reach the comprehensive achievement of language.

5.3. Future Implications

The results of this study have lot of implications for the future of ESL education, mainly in the application of AI in language learning. One of the major implications of AI tools is that they could revolutionize traditional teaching practices, making them more efficient, flexible, and personalized. AI's capacity for real-time feedback and customized learning experiences implies that the future of classrooms might be more likely characterized by a blend of AI and in-person learning. This shift may lead to more dynamic and interactive learning experiences and facilitate students' learning control.

The other major takeaway is the capability of AI to support tailored learning. Students have varying abilities, learning rates and learn in different ways; AI can be used in a way that adapts learning to the student's individual needs. This is particularly helpful when dealing with ESL students who may have several problems with the language. AI systems' ability to adapt to their content, pacing, and difficulty can help address learning gaps and enhance learning outcomes. As AI technology advances, this can be further enhanced in the future, giving more context feedback and linguistic analysis.

As for research implications, this study suggests some ways to go forward in further research. Future studies could investigate the long-term impacts of AI tools on language learning, including retention and transfer of skills. Moreover, one should consider the potential and possibilities of augmenting AI tools with the ability to support higher order language skills like critical thinking, creativity, and discourse level writing.

5.4. Recommendations

This study has led to several recommendations that are made for the educators, institutions, and future studies on ESL learning and AI integration.

When it comes to language instruction, AI tools have been suggested to be used in conjunction with, rather than in place of, traditional language instruction. Secondly, teachers need to be adequately trained in the effective application of AI tools in the classroom (Jalalzai et al., 2025). Professional development opportunities can assist teachers in grasping both the potential and limitations of AI tools, so they can help students use them appropriately. Thirdly, it is recommended that students be made aware of the responsible use of AI tools. These should not be used to complete assignments, but for learning.

In conclusion, future studies should address potential challenges and ethical issues related to using AI in education, including privacy concerns, academic integrity, and the reliance on AI in learning. To tackle these challenges, it is crucial to ensure that AI technology is being used in a responsible and effective way.

The study concludes by emphasizing the need for the responsible and effective integration of AI in ESL to ensure a balanced and informed application. The study calls for continuous research, teacher training, and institutional support. With AI, these challenges can be mitigated, and strengths can be utilized to enhance the language learning process in the future.

REFERENCES

Abdelrady, A. H., Akram, H., Mohamed, A. T. A., Abaalkhail, G. F., Osman, E. H. E., Mohamed, G. T. A. H., & Suliman, W. M. M. (2026). *World Journal of English Language, 16*(4), 311-321.

Abdelrady, A. H., Ibrahim, D. O. O., & Akram, H. (2025). Unveiling the Role of Copilot in Enhancing EFL Learners' Writing Skills: A Content Analysis. *World Journal of English Language, 15*(8), 174-185.

Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in psychology*, *13*, 920317.

Akram, H., Yingxiu, Y., Al-Adwan, A. S., & Alkhalsifah, A. (2021). Technology Integration in Higher Education During COVID-19: An Assessment of Online Teaching Competencies Through Technological Pedagogical Content Knowledge Model. *Frontiers in Psychology*, 12, 736522-736522.

Al-Adwan, A. S., Nofal, M., Akram, H., Albelbisi, N. A., & Al-Okaily, M. (2022). Towards a sustainable adoption of e-learning systems: The role of self-directed learning. *Journal of Information Technology Education: Re-search, 21*, 245-267.

Baskara R, Mukarto M. Exploring the Implications of AI Tools for Language Learning in Higher Education. Indonesian Journal of English Language Teaching and Applied Linguistics [Internet]. 2023;7(2):343–58. Available from: https://files.eric.ed.gov/fulltext/EJ1391490.pdf

Blanka Klimova, Pikhart M, Liqaa Habeb Al-Obaydi. Exploring the potential of AI Tools for foreign language education at the university level. Frontiers in psychology [Internet]. 2024 Apr 8;15. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11036125/

Chukwuere JE. The use of AI Tools in higher education: The advantages and disadvantages [Internet]. arXiv.org. 2024. Available from: https://arxiv.org/abs/2403.19245

Du J, Alm A. The Impact of AI Tools on English for Academic Purposes (EAP) Students' Language Learning Experience: A Self-Determination Theory Perspective. Education Sciences. 2024 Jul 3;14(7):726–6.

Filipec O, Woithe J, Mccauley B. Understanding the Adoption, Perception, and Learning Impact of AI Tools in Higher Education A qualitative exploratory case study analyzing students' perspectives and experiences with the AI-based large language model Title: Understanding the Adoption, Perception, and Learning Impact of AI Tools in Higher Education [Internet]. 2023. Available from: https://www.diva-portal.org/smash/get/diva2:1762617/FULLTEXT01.pdf

Google Scholar [Internet]. Google.com. 2025 [cited 2025 Aug 22]. Available from: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Factors+Influencing+Learner+Attitudes+Towards+ChatGPT-Assisted+Language+Learning+in+Higher+Education&btnG=

Hong WCH. The impact of AI Tools on foreign language teaching and learning: opportunities in education and research. Journal of Educational Technology and Innovation [Internet]. 2023 Mar 17;3(1). Available from: https://jeti.thewsu.org/index.php/cieti/article/view/103

https://www.researchgate.net/profile/ZanyarGhafar/publication/374949974_ChatGPT_a_New_Tool_to_Improve_Teaching_and_Evaluation_of_Second_and_Foreign_Languages_a_Review_of_ChatGPT_The_Future_of_Education/links/6538f83f73a2865c7ad30175/ChatGPT-a-New-Tool-to-Improve-Teaching-and-Evaluation-of-Second-and-Foreign-Languages-a-Review-of-ChatGPT-The-Future-of-Education.pdf

Huang W, Hew KF, Fryer LK. Chatbots for language learning—Are they really useful? A systematic review of chatbot-supported language learning. Journal of Computer Assisted Learning. 2021 Sep 24;38(1):237–57.

Jalalzai, N. N., Akram, H., Khan, M., Kakar, A. K. (2025). Technology Readiness in Education: An Analysis of ICT Facilities in High Schools of Loralai, Balochistan. *Contemporary Journal of Social Science Review*, 3(3), 2835-2842.

Li, S., & Akram, H. (2023). Do emotional regulation behaviors matter in EFL teachers' professional development?: A process model approach. *Porta Linguarum: revista internacional de didáctica de las lenguas extranjeras*, (9), 273-291.

Li, S., & Akram, H. (2024). Navigating Pronoun-Antecedent Challenges: A Study of ESL Academic Writing Errors. *SAGE Open*, *14*(4), 21582440241296607.

Ma, D., Akram, H., & Chen, I. H. (2024). Artificial Intelligence in Higher Education: A Cross-Cultural Examination of Students' Behavioral Intentions and Attitudes. *The International Review of Research in Open and Distributed Learning*, *25*(3), 134-157.

Ma, D., Akram, H., & Li, S. (2025). Assessing the role of physical activity in shaping students' academic motivation: the mediating role of mental health. *BMC Public Health*.

Nawaz, S., Aqeel, M., & Ramzan, M. (2021). Listening Comprehension Problems, Corresponding Factors and Strategies for Better or Enhanced Listening Skill. *Pakistan Languages and Humanities Review*, *5*(2), 729-737.

Nawaz, S., Ramzan, M., Khan, M. A., Rehman, W., & Tanoli, Z. A. (2020). A study on Urdu speakers' use of English stress patterns: Phonological variation from native speakers. *Elementary Education Online*, *19*(4), 6215-6235.

Ramzan, M., Akram, H., & kynat Javaid, Z. (2025). Challenges and Psychological Influences in Teaching English as a Medium of Instruction in Pakistani Institutions. *Social Science Review Archives*, *3*(1), 370-379.

Ramzan, M., Mushtaq, A., & Ashraf, Z. (2023). Evacuation of difficulties and challenges for academic writing in ESL learning. *The University of Chitral Journal of Linguistics and Literature (JLL)*, *7*(1), 42-49.

Rasul T. The role of AI Tools in higher education: Benefits, challenges, and future research directions. Journal of Applied Learning & Teaching [Internet]. 2023 May 11;6(1). Available from: https://pure.aib.edu.au/ws/portalfiles/portal/35431301/787_Article_Text_3375_1_10_20230510.pdf

Sattar, N., Rashid, F., & Ramzan, M., (2025). Translanguaing In Digital Spaces: Cognitive and Linguistic Dimensions of Language Acquisition in Pakistan. *Qualitative Research Journal for Social Studies*, *2*(4), 1424-1438.

Vildan İnci Kavak, Duygu Evis, Abdurrahim Ekinci. The Use of AI Tools in Language Education. Gaziantep Islam Science and Technology University. 2024 Jun 13.

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