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EXPLORING THE IMPACT OF ARTIFICIAL INTELLIGENCE (AI) ON ESL LEARNERS' READING SKILLS AT THE UNDERGRADUATE LEVEL

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Artificial Intelligence, ESL, reading proficiency, sub-skills, Sociocultural Theory, Zone of Proximal Development, experimental design, learner attitudes, AI tools, Pakistan.

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Abstract
This article investigates the impact of AI-based instruction on ESL learners' reading proficiency at the undergraduate level in Pakistan, focusing on five sub-skills: skimming, scanning, vocabulary, comprehension, and inferring. Adopting a true experimental design, 80 participants were divided into control and experimental groups. The experimental group received instruction via AI tools while the control group was taught through traditional methods. Pre- and post-test results revealed a statistically significant improvement in the experimental group's performance, affirming AI's effectiveness in enhancing reading skills. Grounded in Vygotsky's Sociocultural Theory, the study positions AI as a cultural tool within the Zone of Proximal Development (ZPD), reinforcing the role of guided interaction and scaffolded support. The findings offer theoretical, pedagogical, and technological implications for integrating AI in ESL classrooms, particularly in developing contexts.

1. Introduction

The English language is regarded as one of the main foreign languages among the many different languages spoken around the globe. English has become a key that unlocks opportunities for individuals across various industries and sectors, leading to progress in professional fields, enhancing confidence, skills, and communication. Furthermore, it allows individuals to express themselves creatively at a worldwide standard level. (Oluwafemi Ayotunde et al., 2023).Learning a foreign language can pose challenges at times for both students and instructors. There are multiple factors to consider when it comes to language acquisition skills in reading, writing, speaking, and listening (Gayed et al., 2022a). This growing reliance on technology necessitates a deeper understanding of its role in language learning. According to Permendiknas No. 16 of 2007, a fundamental competency of teachers is that teachers must incorporate technology and communication into the learning process. Technology can simplify the task of educators in explaining abstract concepts to make it simple for

students to grasp the concept of learning. Indicated in Permendikbud (2016), employing information, communication, and technology is the fundamental principle of teaching strategies that need to be implemented by the teacher in the classroom to enhance the effectiveness and efficacy of education(Karunia, 2016). As technological tools continue to evolve, educators must reassess their teaching approaches to maximize student engagement and comprehension, particularly in language learning. Limited Research on AI's impact on ESL learners' reading skills. The growing importance of reading proficiency for academic success. Need for effective AI-based reading instruction. The study addresses various needs, including practical needs for improved ESL learning outcomes, enhanced learner engagement, increased instructional efficiency, and better support for language teachers. Theoretical needs include understanding AI's potential in language learning, exploring AI's role in ESL instruction, investigating AI's impact on language acquisition, and developing AI-driven language learning theories. Educational needs encompass improving language learning outcomes for diverse learners, enhancing teacher professional development, integrating technology, and addressing online language learning challenges etc. Inform educators and policymakers on effective AI integration. Enhance ESL learners' reading comprehension skills.

The present study employs a beginning survey, an AI-driven classroom program, and instruction, along with a subsequent interview, to explore English teachers' views on the advantages and obstacles linked with integrating Artificial intelligence for tailored learning in the classroom. Furthermore, the study seeks to pinpoint the elements that impact instructors' readiness to integrate AI-driven digital resources in the English language learning environment. The study aims to help understand how AI tools can improve personalized language learning and guide the integration of these tools in language teaching and learning strategies. The main objectives of study are, to investigate AI's impact on ESL learners' reading proficiency skills, to explore ESL learners' attitudes toward AI-based reading tools.

Koraishi (2023) and Adolph (2016) have acknowledged AI's transformative potential for ESL instruction and have recommended deeper research into its integration. I will evaluate how AI tools (like ChatGPT or LMS-integrated AI features) impact ESL undergraduate students' reading skills, using pre- and post-testing to measure progress in comprehension, vocabulary, and inferencing etc. (Longcope, 2009). Although past research encourages AI integration in ESL, it often lacks measurable, skill-specific results, especially concerning reading comprehension in undergraduates. My study fills this empirical gap through focusing on practical classroom implementation and assessment.

2. Literature Review

2.1 The Role of AI and Deep Learning in Transforming Education

As contended through Guo et al. (2021), the application of AI and deep learning technology in the education field is slowly being regarded as one of the most revolutionary trends and has the potential to introduce reforms in conventional pedagogy. According to Guo et al. (2021), employing AI with particular devices such as feedback control systems, statistical models, and integrated learning techniques improves the precision of metrics evaluation due to an instructional evaluation shift toward a pedagogical paradigm. Their research highlights the opportunity to utilize AI in personalized instruction through immediate corrections and changes made in-person throughout the educational process, which is most beneficial within massive educational systems. Seren and Ozcan (2021) underscore the adaptation of learning materials along with the role of AI as the catalyst for change, arguing that such implementation is likely to boost and heighten learners' interest and motivation.

2.1.1 Bridging the Gap: AI's Role in Enhancing ESL Reading Skills

The use of AI algorithms and systems in education is attracting more attention each year. Fig. illustrates the increasing quantity of papers released on the subjects "AI" and "Education"

from Web of Science and Google Scholar since the year 2010. It is important to note that the papers published between 2015 and 2019 represented a significant share, specifically 70%, of all indexed papers. As education progresses, researchers are attempting to implement sophisticated AI methods, such as deep learning and data mining, to address intricate problems and tailor teaching approaches to each student.

- Guo et al. (2021) discuss integrated learning methods and AI-based evaluations in teaching, emphasizing accuracy and effectiveness.
- Seren and Ozcan (2021) highlight the adaptive capabilities of AI in education.
- Timms (2017) suggests that AI enhances student engagement and instructional quality.
- Kulikov et al. (2020) focus on the development of intelligent education systems that provide cognitive support and adapt to student needs.
- Chassignol et al. emphasize AI's integration in administration, teaching, and learning.

These studies collectively establish that AI contributes to enhancing educational processes through personalization, adaptive support, and increased interactivity.

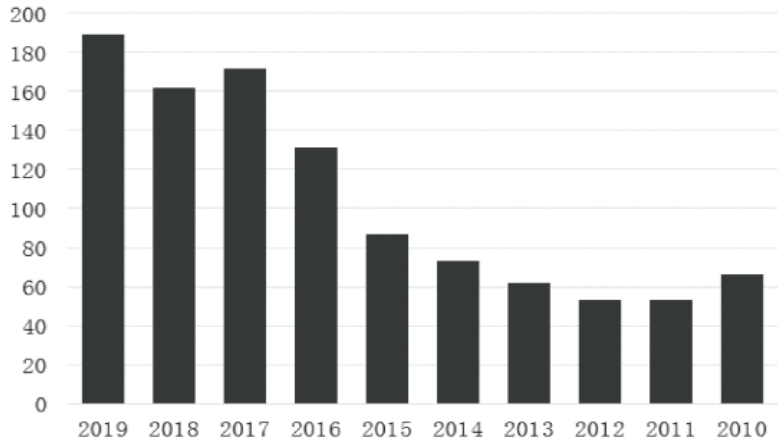

Figure 1: Bridging the Gap

2.2 Advancements and Challenges of AI

Chinese education studies have illustrated that Zhang et al. (2021) notes that the adoption of artificial intelligence (AI) has attracted numerous academic inquiries with the majority of research intended to examine its theoretical and practical implications. Zhang et al. (2021), which explored the principles, evolution, and trends of AI applied to education, offering a comprehensive summary of its conceptual development. Apart from this, Li et al. (2020) also introduced a comprehensive taxonomy, identifying four main application areas, five shared features of AI-based systems, and comprehensive development frameworks to promote learning environments. Such research contributes substantially to the theoretical base of AI in education through defining its structural and functional features. As Chong et al. (2020) pointed out, the strategic adoption of deep learning methods in classrooms implies models for enhancing learning through AI-based platforms. Lei et al. (2020) stretched this debate further through discussing the adoption of open-source AI tools in educational institutions and its associated implementation challenges, scalability, and innovation opportunities.

2.3 AI Tools for Enhancing ESL Reading Skills

Some AI applications are;

Table 1: AI Applications

No	AI Apps	Roles	References
1	ChatGPT	Text Comprehension, Vocabulary Building, Brainstorming, generating ideas, writing assistance, etc.	https://openai.com/chatgpt
2	Chatpdf	Summarization, Question-answering, Vocabulary development, etc.	https://www.chatpdf.com
3	QuillBot	Paraphrasing, Summarization, Translation, etc.	https://www.quillbot.com
4	Monica	Explanation, Summarization, Question-answering, etc.	https://www.monica.com
5	Perplexity	Question-answering, Integrating research results, etc.	https://www.perplexity.ai
6	Grammarly	Grammar checking, Editing, and writing improvement, etc.	https://www.grammarly.com
7	Google Gemini	Conducting research, finding information	https://gemini.google.com.
8	Pdf AI	Extracting information from PDF documents.	https://www.pdfai.com
9	Otter AI	Transcribing and Summarizing Lectures.	https://otter.ai
10	Replika	Scheduling and personal assistant tasks	https://www.replika.ai
11	Notedly.ai	Summarizes lengthy texts	https://www.notedly.ai
12	Eleven labs	Created AI-generated voices for presentations.	https://www.elevenlabs.com
13	Natural readers	Converts text to audio.	https://www.naturalreaders.com
14	Myreader.ai	Answers/Questions, Summaries, convert text to audiobooks.	https://www.myreader.ai
15	Sowtale	Creates interactive reading experiences using AI.	https://www.sowtale.com
16	Read theory	Adapt reading passages and quiz Questions to each student's reading level to improve comprehension skills.	https://www.readtheory.org
17	Lexia Core5 reading	Offer personalized learning paths focusing on Phonics, vocabulary, and comprehension through interactive activities.	https://www.lexialearning.com

18	Microsoft reading progress	Records and analyzes reading sessions, providing feedback on pronunciation, pace, and accuracy.	https://www.microsoft.com
19	Kurzweil 3000	A comprehensive text-to-speech tool that helps with reading, writing, and studying.	https://www.kurzweiledu.com
20	Read and write	Provide support for reading, writing, and research with tools like text-to-speech, word prediction, and vocabulary support.	https://www.texthelp.com
21	FlentU	Uses real-world videos to teach language and improve reading skills through interactive subtitles.	https://www.fluentu.com
22	Scribe	Transcribes spoken words into written text, helping with note-taking and comprehension.	https://www.scribe.ai
23	Copilot	Provide information and support, brainstorming, etc.	https://copilot.github.com
24	Meta AI	Work on natural language processing, etc.	https://ai.facebook.com
25	Newsela	Providing reading materials at various levels, along with quizzes to test comprehension and track progress.	https://www.newsela.com
26	CoAsker	Extracts key information, summarizes content, and enhances retrieval.	https://www.coasker.com
27	Lingle read	Helps learners improve vocabulary, grammar, and reading skills through providing insights, definitions, and contextual understanding.	https://www.lingleread.com

2.4 Academic English Reading Skills and the AI Integration

2.4.1 AI Overall in Education

VanLehn (2011) argues that the program that is most often employed is known as ITS which imitates the effect of individualized tutoring by detecting student misconceptions, by varying how material is presented, and incidentally assisting the student in response to the progress being made by the student (VanLehn, 2011). The systems have recorded remarkable progresses in terms of learning efficiency particularly the STEM areas and language learning. Chen et al. (2020) note that this deficit of a purpose-driven research poses distinct issues with regards to inclusiveness and accuracy of the given AI applications.

2.4.2 AI Tools in Reading Support

The tools that were made with the help of AI, like CoAsker, ChatGPT, and other language-learning apps, help improve reading comprehension by making students develop questions and engage more with texts. As revealed by Wang et al. (2020) and Zhu et al. (2021), AI-supported Question Generation (SQG) may positively impact cognitive recall because it pushes learners into a question-making task that helps them get a better grasp of the text.

2.4.3 AI's Impact on Students' Motivation

As Alashwal (2022) claims, lately, Artificial Intelligence (AI) has taken on a more striking role in learning conditions, especially in language confusion, where the field is of extreme importance to increase the motivation of learners, their engagement and general success (Alashwal, 2022). Yang et al. (2023) state that AI-based applications, such as ChatGPT, have found their way into the English classroom where they support teachers in delivering personalized learning. The

systems allow the provision of individualized help to students, helping them learn to think critically, be independent, and self-sufficient in their educational processes (Yang et al., 2023). Also there has also been an introduction of new technologies such as virtual reality and gamification into teaching techniques to increase participation of students and to make the learning process more immersive (Deterding et al., 2011).

2.5 Virtual Reality and Interactive Learning

Chassignol et al. (2018) emphasize that AI has brought remarkable progress in the educational sector as it provided conditions to design and introduce smart systems that will improve the effectiveness of teaching. Such AI-based tools are transforming education by enhancing content generation and curriculum tailoring and assessment of students. Additionally, Rus et al. (2016) focus their attention on the importance of the Intelligent Tutoring Systems (ITS) that provide individual instruction and feedback in real-time depending on specific student requirements and improve the quality of teaching and learning.

2.6 A Systematic Review of AI Applications in ESL Education

2.6.1 Zone of Proximal Development by Vygotsky to AI-Based Education

Focusing on the adaptive aspects of AI, Ferguson et al. (2022) addressed the possibility of effectively tailoring assignments and decreasing the cognitive load to each of the individual students and approach this problem under the theoretical concept of the Zone of Proximal Development (ZPD) proposed by Vygotsky (1978). This model lays stress on individualized instructions that respond to the needs of individual students. According to Ferguson et al. (2002), the use of AI in adaptive guidance also lent itself well in learning in that the students were also within their ZPD whereas the experiential components of learning were not tampered with, when compared to a control group (Alshumaimeri and Alshemery, 2014).

2.7 Theoretical Framework

According to SCT, knowledge is built by means of social interaction, and language is a cognitive as well as a communicative device (Vygotsky, 1978). A foundational element of SCT is the Zone of Proximal Development (ZPD)—the gap between what a learners can do independently and what they can do with guidance. In language learning contexts, AI applications act as facilitators within the ZPD, providing adaptive content that meets learners where they are and helps them advance (Wood et al., 1976; Shute & Zapata-Rivera, 2012). Tools like ReadTheory and Natural Reader offer level-appropriate reading passages, real-time corrections, and comprehension checks, thus scaffolding learners' progress in reading.

One of the most explicit premises of SCT is social creation of learning during interaction with others. Google's Classroom, Padlet, Flipgrid on the differentiated AI improved platforms foster peer-to-peer interaction so that learners collaborate in reading tasks, share reading comprehensions and provide peer-to-peer feedback. The effects of the social networking tool on the development of reading in ESL have also been noted according to Gutierrez (2008) which indicated students who were given the opportunity to become involved with group readings on the internet had healthier levels of involvement and understanding. Similarly, Johnson and Johnson (1999) discovered that cooperative learning can award better understanding and critical thinking.

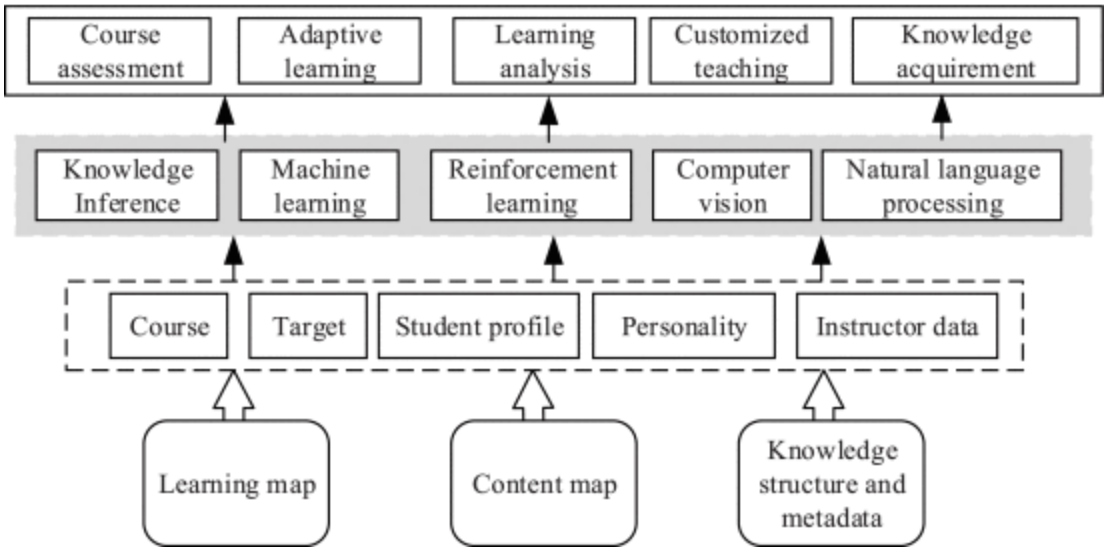

Fig 1: Frame work of the study

3. Methodology

3.1 Research Design

A true-experimental research design was selected in this research because it provides the best way to ascertain the cause-effect relationship between the use of AI tools and the reading ability of students of ESL classes. It allows high internal validity and reduces extraneous effects by random assignment, control and experimental groups, and pre and posttest with the help of them (Campbell & Stanley, 1963; Creswell, 2014).

The work included the true-experimental study. The research design involved use of standardized pre- and post-tests.

3.2 Research Instruments

3.2.1 Language Proficiency Examinations Before and After

The experimental and control groups were each given a standardized pre-test and post-test to gauge their level of ability in reading comprehension, vocabulary, scanning, and inferencing, among other critical reading skills.

3.3 The Procedure of Collecting Data

Phase 1: The Pre-Test Administration

The same pre-test was used on the control and the experimental group (n=40 ESL undergraduate students at KFUEIT) before the instructional intervention.

Phase 2: Instruction Intervention

During two weeks, both groups were taught according to their appropriate learning methodology:

1. Control group was taught in a traditional manner using text books, work books, and other typical classroom learning materials as a lecture.
2. The experimental group was given AI-facilitated training using such programs as ChatGPT, ReadTheory, Natural Reader, Grammarly, and Padlet.

Phase 3: Administration of the Post-Test

The post-test, which had the same format and level of difficulty as the pre-test, was administered to both groups at the end of the teaching time.

3.4 Reliability and Validity

To ensure the credibility and trustworthiness of the research instruments used in this study—namely, the pre-test/post-test.

4. Data Analysis and Data Interpretation

This section of the research provides an in-depth presentation and interpretation of the information obtained to examine the effects of the Artificial Intelligence (AI)-based instruction on the reading proficiency of English language learners that belong to the undergraduate population. The study was guided by two research questions: (1)

What is the impact of AI-based teaching on ESL learners' reading proficiency skills at the undergraduate level? And (2) What are the attitudes of ESL learners toward AI-based instruction of reading?

4.1 Interpretation and Analysis of Data: Control Group (Pre-test and Post-test)

This section is the results section comprising an in-depth statistical and interpretation statistics of the pre and post-test performance of the control group that was taught using conservative, no AI-methods. This is meant to determine the degree to which traditional classroom instruction succeeded in enhancing reading skills of ESL students during the intervention phase. Analysis is done using descriptive analysis, accompanied by the previous SPSS output.

Table 2: Pre- and post-test comparison (Control Group)

	Pre test				Control Group		Post test				
Sr.	Name	TM	Obt	Mean	SD	Sr.	Name	TM	Obt	Mean	SD
1	Student a	25	7	16	9	1	Student a	25	20	22.5	2.5
2	Student b	25	8	16.5	8.5	2	Student b	25	17	21	4
3	Student c	25	5	15	10	3	Student c	25	18	21.5	3.5
4	Student d	25	8	16.5	8.5	4	Student d	25	18	21.5	3.5
5	Student e	25	3	14	11	5	Student e	25	21	23	2
6	Student f	25	5	15	10	6	Student f	25	21	23	2
7	Student g	25	3	14	11	7	Student g	25	17	21	4
8	Student h	25	8	16.5	8.5	8	Student h	25	20	22.5	2.5
9	Student I	25	3	14	11	9	Student I	25	23	24	1
10	Student j	25	5	15	10	10	Student j	25	23	24	1
11	Student k	25	7	16	9	11	Student k	25	24	24.5	0.5
12	Student l	25	3	14	11	12	Student l	25	24	24.5	0.5
13	Student m	25	10	17.5	7.5	13	Student m	25	19	22	3

14	Student n	25	9	17	8	14	Student n	25	20	22.5	2.5
15	Student o	25	4	14.5	10.5	15	Student o	25	16	20.5	4.5
16	Student p	25	5	15	10	16	Student p	25	18	21.5	3.5
17	Student q	25	5	15	10	17	Student q	25	19	22	3
18	Student r	25	4	14.5	10.5	18	Student r	25	24	24.5	0.5
19	Student s	25	3	14	11	19	Student s	25	18	21.5	3.5
20	Student t	25	5	15	10	20	Student t	25	15	20	5
21	Student u	25	6	15.5	9.5	21	Student u	25	20	22.5	2.5
22	Student v	25	7	16	9	22	Student v	25	19	22	3
23	Student w	25	6	15.5	9.5	23	Student w	25	19	22	3
24	Student x	25	6	15.5	9.5	24	Student x	25	19	22	3
25	Student y	25	9	17	8	25	Student y	25	18	21.5	3.5
26	Student z	25	2	13.5	11.5	26	Student z	25	14	19.5	5.5
27	Student A	25	4	14.5	10.5	27	Student A	25	14	19.5	5.5
28	Student B	25	5	15	10	28	Student B	25	19	22	3
29	Student C	25	3	14	11	29	Student C	25	18	21.5	3.5
30	Student D	25	6	15.5	9.5	30	Student D	25	17	21	4
31	Student E	25	3	14	11	31	Student E	25	18	21.5	3.5
32	Student F	25	10	17.5	7.5	32	Student F	25	17	21	4
33	Student G	25	10	17.5	7.5	33	Student G	25	19	22	3
34	Student H	25	6	15.5	9.5	34	Student H	25	19	22	3
35	Student I	25	3	14	11	35	Student I	25	18	21.5	3.5
36	Student J	25	10	17.5	7.5	36	Student J	25	19	22	3

37	Student K	25	6	15.5	9.5	37	Student K	25	19	22	3
38	Student L	25	3	14	11	38	Student L	25	19	22	3
39	Student M	25	10	17.5	7.5	39	Student M	25	19	22	3
40	Student N	25	2	13.5	11.5	40	Student N	25	19	22	3
Total 40		1000	227	613.5	386.5	Total 40		1000	758	879	121

Table 3: Group Statistics

Group	N	Mean	Std. Deviation	Std. Error Mean
CG	40	5.675	2.4847	0.39
EG	40	5.8	2.2781	0.36

A little improvement with AI-based teaching was indicated by the experimental group's slightly better score (M = 5.8) compared to the control group's (M = 5.675). The experimental group's smaller standard deviation points to more reliable performance. Although the difference is slight overall, it favors the inclusion of AI.

Table 4: Independent Sample Test

		Levene's test for equality of variances		t-test for equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Score	Equal variances assumed	0.27	0.605	-0.235	78	0.815	-0.125	0.533	-1.1861	0.9361
	Equal variances not assumed			-0.235	77.42	0.815	-0.125	0.533	-1.1862	0.9362

Equal variances are assumed for the t-test since the results of Levene's test (Sig. = 0.605) show that the assumption of equal variances is satisfied. The Sig. (2-tailed) result of 0.815, which is significantly greater than the 0.05 criterion, as displayed by the independent samples t-test. This indicates that the experimental group and the control group do not differ significantly.

4.2 Experimental Group (Pre-test and Post-test) Data Analysis and Interpretation

In this section, the researcher would analyze the experimental group in great detail as it is the one that is being taught with the help of AI tools to improve their skills in reading ESL. Descriptive statistics has been used to analyze the intervention so as to establish its effectiveness.

Table 5: Pre and Post -test Comparison (Experimental Group)

	Pre test				Experimental Group		Post test				
Sr.	Name	TM	Obt	Mean	SD	Sr.	Name	TM	Obt	Mean	SD
1	Student a	25	10	17.5	7.5	1	Student a	25	24	24.5	0.5
2	Student b	25	10	17.5	7.5	2	Student b	25	24	24.5	0.5
3	Student c	25	10	17.5	7.5	3	Student c	25	25	25	0
4	Student d	25	5	15	10	4	Student d	25	25	25	0
5	Student e	25	4	14.5	10.5	5	Student e	25	24	24.5	0.5
6	Student f	25	5	15	10	6	Student f	25	24	24.5	0.5
7	Student g	25	9	17	8	7	Student g	25	23	24	1
8	Student h	25	5	15	10	8	Student h	25	24	24.5	0.5
9	Student I	25	5	15	10	9	Student I	25	24	24.5	0.5
10	Student j	25	5	15	10	10	Student j	25	25	25	0
11	Student k	25	6	15.5	9.5	11	Student k	25	24	24.5	0.5
12	Student l	25	9	17	8	12	Student l	25	23	24	1
13	Student m	25	5	15	10	13	Student m	25	25	25	0
14	Student n	25	4	14.5	10.5	14	Student n	25	24	24.5	0.5
15	Student o	25	3	14	11	15	Student o	25	24	24.5	0.5
16	Student p	25	8	16.5	8.5	16	Student p	25	25	25	0
17	Student q	25	4	14.5	10.5	17	Student q	25	24	24.5	0.5
18	Student r	25	3	14	11	18	Student r	25	24	24.5	0.5
19	Student s	25	6	15.5	9.5	19	Student s	25	23	24	1
20	Student t	25	4	14.5	10.5	20	Student t	25	23	24	1

21	Student u	25	5	15	10	21	Student u	25	25	25	0
22	Student v	25	9	17	8	22	Student v	25	23	24	1
23	Student w	25	8	16.5	8.5	23	Student w	25	25	25	0
24	Student x	25	6	15.5	9.5	24	Student x	25	24	24.5	0.5
25	Student y	25	5	15	10	25	Student y	25	24	24.5	0.5
26	Student z	25	4	14.5	10.5	26	Student z	25	24	24.5	0.5
27	Student A	25	5	15	10	27	Student A	25	25	25	0
28	Student B	25	3	14	11	28	Student B	25	24	24.5	0.5
29	Student C	25	4	14.5	10.5	29	Student C	25	22	23.5	1.5
30	Student D	25	4	14.5	10.5	30	Student D	25	23	24	1
31	Student E	25	6	15.5	9.5	31	Student E	25	24	24.5	0.5
32	Student F	25	4	14.5	10.5	32	Student F	25	25	25	0
33	Student G	25	10	17.5	7.5	33	Student G	25	25	25	0
34	Student H	25	3	14	11	34	Student H	25	25	25	0
35	Student I	25	7	16	9	35	Student I	25	25	25	0
36	Student J	25	3	14	11	36	Student J	25	25	25	0
37	Student K	25	9	17	8	37	Student K	25	25	25	0
38	Student L	25	8	16.5	8.5	38	Student L	25	25	25	0
39	Student M	25	5	15	10	39	Student M	25	25	25	0
40	Student N	25	4	14.5	10.5	40	Student N	25	25	25	0
Total=40		1000	232	616	384	Total 40		1000	969	984.5	15.5

Table 6 : Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Score	CG	40	18.95	2.36372	0.37374
	EG	40	24.225	80024	0.12653

This suggests that AI-based training enhanced students' performance. As opposed to EG's data, which probably has a standard deviation of (80024), CG's standard deviation (2.36) shows a lot of variation. The experimental group appears to be performing more steadily, as seen by the reduced standard error of the mean in EG (0.13) compared to CG (0.37). Taken together, these results show how effectively AI tools may improve reading skills.

Table 7: Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std error difference	95% confidence interval of the difference	
									lower	upper
Score	Equal variances assumed	11.58	0.001	-13.36	78	0	-5.275	39457	-6.060	-4.489
	Equal variances not assumed			-13.36	47.8	0	-5.275	39457	-6.06	-4.481

The significant outcome (Sig. = 0.001) of Levene's Test for Equality of Variances indicates that the control and experimental groups' variances are not equal, indicating the need to apply the equal variances assumption. A significant t-test result (p = 0.000) and a large mean difference of -5.275 show that the experimental group outperformed the control group. The fact that zero is excluded from the 95% confidence interval (-6.064 to -4.481) validates the statistical significance of this difference. The significant negative t-value (-13.369) further suggests a strong influence. Overall, AI-based learning had a positive and substantial impact on pupils' reading abilities. The pre-test standard deviation of 7.5 indicates variability in prior skills, while the post-test standard deviation of 0.5 suggests that AI tools supported all learners effectively, helping them achieve nearly perfect scores (mean = 24.5/25). This improvement aligns with Vygotsky's Sociocultural Theory, where learning is mediated by cultural tools and social interaction. In this study, AI tools like ChatGPT, ReadTheory, Grammarly, Natural Reader, and Rewordify acted as intelligent scaffolds, supporting learners in their Zone of Proximal Development (ZPD) by offering individualized feedback, repeated practice, and multimodal inputs. The significant outcomes are also supported by recent literature. For instance: Lin and Warschauer (2021) found that AI-based reading systems promote learner autonomy and comprehension. Huang and Hu (2022) reported that digital reading interventions improved reading accuracy and learner motivation.

4.3 Comparative Analysis Between Experimental and Control Groups

This part gives comparison of statistical and pedagogical results of post-test results between the control group (traditional instruction) and the experimental one (AI-based instruction). It is to identify how the instruction of reading with AI can improve the reading proficiency of ESL learners at the undergraduate level.

4.3.1 Group Statistics Overview

The summary of descriptive statistics of the groups is provided below:

Table 8: Groups Statics

Group	N	Mean	Standard Deviation
Control Group (CG)	40	18.95	2.36
Experimental Group (EG)	40	24.23	0.80

The control group had a mean post-test mark of 18.95 compared to the 24.23 by the experimental group out of the 25 total. This depicts a significant difference of 5.28 points which favors the experimental group. Moreover, the standard deviation of the experimental group (SD = 0.80) is significantly smaller than the deviation of the control group (SD = 2.36), which means that the performance of students was more consistent under the AI-based instruction.

4.3.2 Independent Samples t-Test

To determine the significance of the mean difference, an independent samples t-test was conducted:

Table 9: Independent Sample t-test

Test	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval
Equal variances assumed	-13.37	78	0.00	-5.275	[-6.060, -4.489]

The results reveal that the difference between the two groups is statistically significant (p = 0.000). The negative t-value (-13.369) and confidence interval that does not include zero further confirm that the higher performance of the experimental group is not due to chance. This finding provides robust evidence supporting the efficacy of AI-based reading instruction.

4.4. Findings of the Study

The first research question was what the effectiveness of AI in developing reading skills is. The findings revealed a substantial and statistically significant improvement in the EG's post-test scores compared to their pre-test results and to those of the CG. The experimental group showed a marked increase in mean scores from 17.5 to 24.5, with standard deviation decreasing from 7.5 to 0.5, indicating both performance improvement and score consistency. In contrast, the control group displayed only marginal gains with a pre-test mean of 18.95 and a post-test mean of 20.2, and the results were not statistically significant (p = 0.815). An independent samples t-test comparing

post-test scores of both groups indicated a significant mean difference ($M = -5.275$, $p < 0.001$), confirming the superiority of AI-based instruction. These outcomes validate that the use of AI tools in reading instruction significantly enhances learners' performance in ESL reading sub-skills.

The second research question focused on student attitudes toward AI-assisted reading instruction. The attitudinal survey findings revealed overwhelmingly positive responses. A majority of students expressed enjoyment in learning with AI ($M = 4.0$, $SD = 0.7$) and reported enhanced engagement ($M = 4.2$, $SD = 0.9$). Learners also felt more confident using AI tools to enhance their English reading skills ($M = 4.3$), and believed that AI-supported lessons contributed positively to their overall reading development ($M = 4.3$). However, motivation levels were slightly lower ($M = 4.0$), indicating that while AI tools built competence, they were less effective in stimulating intrinsic interest.

This study addresses key gaps in the literature and contributes to both theory and practice in AI-integrated ESL instruction. Methodologically, it advances the field through a true experimental design, ensuring more reliable, generalizable results than previous quasi-experimental or descriptive studies. Theoretically, it extends Vygotsky's Sociocultural Theory by framing AI tools as digital mediators within learners' ZPD, operationalizing core concepts such as scaffolding and internalization through tools like Grammarly, Rewordify, and ChatGPT. The study also offers a dual perspective, combining performance data with attitudinal insights to provide a holistic view of AI's educational impact. Unlike prior research focused on high-resource contexts, this study, conducted in Pakistan, demonstrates AI's potential in low-resource settings, reinforcing its global relevance. It also points out three success factors digital readiness, accessibility of tools, and teacher support essential in successful integration of AI.

5. Conclusion

Conclusively, this paper confirms that AI could be a game-changer in ESL reading instruction, insofar as it is used carefully, and promotes transformation in learning more strategic, confident, and more proficient readers. Nevertheless, the AI would be effective when AI is not considered a substitute educator but as a companion in the educational process. The effectiveness of AI in ESL classroom depends on its effective implementation including employment of strategic planning, facilitation by a teacher and adherence to effective pedagogical and theoretical principles. Due to the consideration of both cognitive and emotional aspects of learning, this research guides future, broader, and theory-based implementation of artificial intelligence in language education.

5.1 Recommendations for Future Research

Drawing from the findings and limitations of this study, several directions for future research emerge that can deepen our understanding of AI's evolving role in ESL instruction. First, longitudinal studies are needed to assess the sustained impact of AI on learner autonomy, motivation, and the internalization of reading strategies. Such research, grounded in Vygotsky's Sociocultural Theory, would capture how learners progress from assisted performance within the Zone of Proximal Development (ZPD) to independent mastery over time. Second, future work should explore cross-skill and integrated language development, examining how AI supports interconnected domains such as speaking, listening, and writing, and how it facilitates integrated tasks like reading-to-write or listening-to-speak, which mirror authentic communication. Third, studies should investigate teachers' perceptions, readiness, and pedagogical practices in using AI tools, as teacher agency and scaffolding play a crucial role in successful implementation. Fourth, comparative analyses of AI tools are needed to evaluate their relative effectiveness across sub-skills and learner types, helping educators and policymakers make informed choices. Fifth, research should address equity, accessibility, and digital readiness, particularly focusing on how factors like socio-economic status, geographic location, gender, and digital literacy affect learners' engagement with AI,

and how targeted interventions can close access gaps. Lastly, future studies should examine the development of culturally responsive and context-specific AI platforms that reflect local languages, identities, and curricular needs, ensuring that AI enhances inclusion and relevance in diverse ESL settings.

REFERENCES

Adolph, R. (2016). *済無No Title No Title No Title*. *10*, 1–23.

Ahmed, I. (2023). Evaluating Primary-Level English Textbooks of Single National Curriculum through the Lens of Bloom's Taxonomy. *PAKISTAN LANGUAGES AND HUMANITIES REVIEW*, *7*(III). https://doi.org/10.47205/plhr.2023(7-iii)31

Alhalangy, A. G. I., & Abdalgane, M. (2023). Exploring the Impact of AI on The EFL Context: A Case Study of Saudi Universities. *Journal of Intercultural Communication*, *23*(2), 41–49. https://doi.org/10.36923/jicc.v23i2.125

Alshumaimeri, Y. A., & Alshememry, A. K. (2024). The Extent of AI Applications in EFL Learning and Teaching. *IEEE Transactions on Learning Technologies*, *17*, 653–663. https://doi.org/10.1109/TLT.2023.3322128

Arbi, A. P., & Kunci, K. (2024). Optimizing The Use Of Artificial Intelligence In English Language Learning: A Literature Review. *Gudang Jurnal Multidisiplin Ilmu* , *2*(2), 25–30.

Chichekian, T., & Benteux, B. (2022). The potential of learning with (and not from) artificial intelligence in education. *Frontiers in Artificial Intelligence*, *5*. https://doi.org/10.3389/frai.2022.903051

Gayed, J. M., Carlon, M. K. J., Oriola, A. M., & Cross, J. S. (2022a). Exploring an AI-based writing Assistant's impact on English language learners. *Computers and Education: Artificial Intelligence*, *3*(January), 100055. https://doi.org/10.1016/j.caeai.2022.100055

Gayed, J. M., Carlon, M. K. J., Oriola, A. M., & Cross, J. S. (2022b). Exploring an AI-based writing Assistant's impact on English language learners. *Computers and Education: Artificial Intelligence*, *3*(February), 100055. https://doi.org/10.1016/j.caeai.2022.100055

Gomathi, R., Maheswaran, S., Mythili, M., Nandita, S., Sathesh, S., Murugesan, G., & Duraisamy, P. (2023). The Exploitation of Artificial Intelligence in Developing English Language Learners' Communication Skills. *2023 14th International Conference on Computing Communication and Networking Technologies, ICCCNT 2023*, *06*(01), 750–757. https://doi.org/10.1109/ICCCNT56998.2023.10307203

Hesham Suleiman Alyousef. (2006). Teaching Reading Comprehension to ESL / EFL Learners. *Journal of Language and Learning*, *5*(1), 379–380.

Hsiao, J. C., & Chang, J. S. (2023). Enhancing EFL reading and writing through AI-powered tools: design, implementation, and evaluation of an online course. *Interactive Learning Environments*. https://doi.org/10.1080/10494820.2023.2207187

Karunia. (2016). *No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析Title*. *4*(June), 2016.

Keles, A., & Keles, A. (2010). Intelligent Tutoring Systems. *Intelligent Tutoring Systems in E-Learning Environments*, *2579*, 1–26. https://doi.org/10.4018/978-1-61692-008-1.ch001

Lestari, S., Usadiati, W., & Misrita. (2021). Bahasa : Jurnal Keilmuan Pendidikan Bahasa dan Sastra Indonesia THE CORRELATION BETWEEN STUDENTS ' ARTIFICIAL INTELLIGENCE AND THEIR ENGLISH READING SKILLS ACHIEVEMENT Bahasa : Jurnal Keilmuan Pendidikan Bahasa dan Sastra Indonesia. *Jurnal Keilmuan Pendidikan Bahasa Dan Sastra Indonesia*, *3*(2), 103–111.

Li, Y. (2024). *Study on the Role and Influence of AI in Personalized Learning for Second Language Acquisition*. *38*, 125–131.

Liu, Y., Chen, L., & Yao, Z. (2022). The application of artificial intelligence assistants to deep learning in teachers' teaching and students' learning processes. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.929175

Longcope, P. (2009). Differences between the EFL and the ESL Language Learning Contexts. *Studies in Language and Culture*, *30*(2), 303–330.

Oluwafemi Ayotunde, O., Jamil, D. I., & Cavus, N. (2023). The Impact of Artificial Intelligence in Foreign Language Learning Using Learning Management Systems: A Systematic Literature Review. *Information Technologies and Learning Tools*, *95*(3), 215–228. https://doi.org/10.33407/itlt.v95i3.5233

Parmer, R. M. (2011). *SUCCESSMAKER ® SOFTWARE - THE EFFECTS ON READING FLUENCY AND READING COMPREHENSION : A TRUE EXPERIMENTAL DESIGN through Presented to the Faculty of The University of Houston-Clear Lake in Partial Fulfillment of the Requirements for the Degree DOCTOR OF EDUCATION THE UN*.

Pourhosein Gilakjani, A., & Sabouri, N. B. (2016). A Study of Factors Affecting EFL Learners' Reading Comprehension Skill and the Strategies for Improvement. *International Journal of English Linguistics*, *6*(5), 180. https://doi.org/10.5539/ijel.v6n5p180

Somià, T., & Vecchiarini, M. (2024). Navigating the new frontier: the impact of artificial intelligence on students' entrepreneurial competencies. *International Journal of Entrepreneurial Behaviour and Research*, *30*(11), 236–260. https://doi.org/10.1108/IJEBR-08-2023-0788

Thuraisingam, T. G. (2017). Implementing Pre-Reading Strategies to Improve Struggling ESL Learners' Interest and Comprehension in English Reading Lessons. *International Journal of Education, Culture and Society*, *2*(3), 94. https://doi.org/10.11648/j.ijecs.20170203.13

Vistorte, A. O. R., Deroncele-Acosta, A., Ayala, J. L. M., Barrasa, A., López-Granero, C., & Martí-González, M. (2024). Integrating artificial intelligence to assess emotions in learning environments: a systematic literature review. *Frontiers in Psychology*, *15*(June). https://doi.org/10.3389/fpsyg.2024.1387089

Waleed Daweli, T., & Abdulrahman Moqbel Mahoub, R. (2024). Exploring EFL Learners' Perspectives on Using AI Tools and Their Impacts in Reading Instruction: An Exploratory Study. *Arab World English Journal*, *10*, 160–171. https://doi.org/10.24093/awej/call10.11

Wang, T., Lund, B. D., Marengo, A., Pagano, A., Mannuru, N. R., Teel, Z. A., & Pange, J. (2023). Exploring the Potential Impact of Artificial Intelligence (AI) on International Students in Higher Education: Generative AI, Chatbots, Analytics, and International Student Success. *Applied Sciences (Switzerland)*, *13*(11). https://doi.org/10.3390/app13116716

Wang, Z., Cai, L., Chen, Y., Li, H., & Jia, H. (2021). The Teaching Design Methods Under Educational Psychology Based on Deep Learning and Artificial Intelligence. *Frontiers in Psychology*, *12*(October), 1–10. https://doi.org/10.3389/fpsyg.2021.711489

Wei, L. (2023). Artificial intelligence in language instruction: impact on English learning achievement, L2 motivation, and self-regulated learning. *Frontiers in Psychology*, *14*(November), 1–14. https://doi.org/10.3389/fpsyg.2023.12619 55

Yousefi, M., & Askari, M. I. (2024). *Exploring the Effectiveness of Artificial Intelligence (AI) on Reading Comprehension among Iranian EFL Learners*. 1–13.