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Integrating AI for Vocabulary Enhancement in EFL Pedagogy: A Quantitative Analysis with a Focus on Synonym Acquisition

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Abstract

The study aims to give empirical proof for the efficiency of AI technology in improving L2 learners' synonym acquisition in Pakistani EFL classrooms. This quantitative study investigates how well AI integration addresses EFL learners' difficulties in increasing their vocabulary and enhancing their language skills. Vygotsky's sociocultural theory of interactionism and Krashen's theory of second language acquisition (SLA) provide a solid theoretical foundation for the study. The Statistical Package for the Social Sciences (SPSS) was used to examine the data collected from a sample of 40 individuals enrolled in a public institution in Pakistan for this investigation. The study's conclusions highlight the profound influence of technology on language instruction and its transformative potential, in addition to making a substantial contribution to the evolution of educational approaches. The ultimate goal of this research is to improve the language learning experience of EFL students by guiding the development of creative, individualized teaching strategies perfectly tailored to their various requirements and preferences.

Keywords: Artificial Intelligence, Synonym acquisition, L2 learner, EFL pedagogy.

1. Introduction

In English as a Foreign Language (EFL) Pedagogy, acquiring synonyms is paramount for learners to expand their vocabulary and boost English language proficiency. Recognizing the importance of second language learners' challenges, educators have always striven to provide innovative methodologies to facilitate better learning experiences. Amid this pursuit, the integration of Artificial Intelligence has revolutionized the pedagogical landscape. Higa (1963) asserted that learning synonyms is much more difficult than learning two unrelated vocabulary words. Synonyms are one of those components of a language that can make learning words more complex (Laufer, 1990). However, learning synonyms is inevitable because expanding the lexicon is impossible without it. In today's fast-paced world, second language learners do not have time to open dictionaries and look for the synonyms of different words. Hence, the present research aims to bring an easier and more innovative method to enhance synonym acquisition in second language learners by integrating AI in the Pakistani EFL context. Second language acquisition is a complex

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process. As L2 learners, they face potential challenges, which include the failure to retain vocabulary in long-term memory or inefficient manipulation of the strategies of learning (Sun et al., 2023). Traditional approaches to enhance synonym acquisition in vocabulary enrichment cannot catch up with the fast-paced world. Therefore, modern and latest technologies like AI must be incorporated into learning experiences. It has become inevitable now. Artificial Intelligence is machines' simulation of human intelligence, specifically computers (Laskowski & Tucci, 2022).

AI-driven language learning tools can improve language comprehension skills by providing various platforms like digital dictionaries, grammar, and sample texts. This can broaden language learning to a great extent. ChatGPT and Quillbot are used in this study to enrich synonym acquisition for advancing linguistic abilities ("The Potential of Artificial Intelligence in Improving Linguistic Competence: A Systematic Literature Review," 2023). The present article embarks on a quantitative exploration into the efficacy of AI integration in enriching synonym acquisition among second language learners in Pakistani EFL pedagogy. Through systemic data collection through controlled experiments, the researcher tends to elucidate the impact of AI-driven interventions on the acquisition and retention of vocabulary. By quantifying the outcomes of these interventions, the researcher aims to provide empirical insights into the effectiveness of utilizing AI tools in the context of Pakistani EFL pedagogy. Furthermore, by assessing the potential of AI integration to address the unique demands and difficulties experienced by second language learners, this study hopes to contribute to the larger conversation on language learning approaches. We want to identify practical insights from our exploration of the complexities of AI-enhanced synonym learning, which can guide pedagogical methods and create more inclusive and productive learning settings for English as a foreign language learner around the globe.

1.1. Statement of the Problem

The study probes into the impact of Artificial Intelligence (AI) technology on English as a Foreign Language (EFL) pedagogy, specifically focusing on its effectiveness in improving synonym acquisition among L2 Learners of Pakistan.

1.2. Research Objectives

- To investigate the impact of AI integration on the enrichment of synonyms of L2 learners in Pakistani EFL classes.
- To explore the effectiveness of AI-integrated teaching methodology compared to traditional teaching methods.

1.3. Research questions

1. What is the role of AI integration in enriching synonym acquisition of L2 learners in Pakistani EFL pedagogy?
2. How do AI tools assist in enhancing synonym expertise in undergraduate students?

1.4. Significance of the Study

This work addresses a significant aspect of language competency by analyzing the effectiveness of AI-driven interventions and offering insights into pedagogical strategies. In addition to promoting vocabulary teaching, the findings inform the development of customized learning experiences tailored to each learner's needs. Furthermore, by shedding light on the transformative potential of technology in language training, the study paves the way for integrating interventions into conventional EFL courses. The study's worth ultimately lies in its capacity to further our knowledge of the function of technology in language instruction, support pedagogical practices, and enhance the language learning experiences of EFL students.

2. Literature Review

This literature review seeks to integrate past research to provide insights into the present state of knowledge in this subject and create the framework for the current study's investigation into the efficacy of AI integration in EFL lessons. According to Bisera (2018), acquiring synonyms is an inevitable process. This is because the wealth of vocabulary lies in the greater number of synonyms learned. She further suggested that the recognition and practice of these types of words are crucial aspects of language learning, specifically in the EFL context. According to Dilek (2017), vocabulary knowledge substantially contributes to the reading, writing, and mastering of foreign languages. The actual purpose of the author's study was to confirm the multifaceted and progressive character of vocabulary growth in a foreign language and how it related to the participants' reading and writing abilities as well as their general proficiency in English as a foreign language. This study also demonstrated the relationship between receptive and productive vocabulary. The results of the Lexical Frequency Profile indicate that the students' productive vocabulary and the lexical level of their essays can be improved in this manner.

Larsen and Anderson (2011) provided evidence for this claim, stating that technology offers instructional tools and expands students' learning realm. According to Keser and Huseyin (2011), technology improves students' cooperation. Collaboration is a crucial learning tool. As a result, Peer groups are formed, further fostering a learning atmosphere. Susikaran (2013) claims that many changes have taken place in classrooms due to the belief that teaching approaches such as chalk and talk are insufficient for effective learning. According to the context, L2 word learning can be impacted in various ways by synonyms. As compared to incidental learning settings, intentional settings are more effective. Moreover, learning synonyms of known words is easier than learning synonyms of unknown words. Cognate word learning is one of its significant aspects. Metalinguistic knowledge of L1 synonyms can also improve the learning of synonyms in L2 (Antón & Duñabeitia, 2020). Among the teaching of four basic skills, which are speaking, listening, writing, and reading, and the sub-skills, including grammar, phonetics, and vocabulary to learners, many problems have emerged nowadays. One of these problems is teaching and learning vocabulary, as the Common European Framework indicates. The traditional solution for this problem is teaching synonyms and antonyms in both the mother tongue and the target language respectively (Büker & Zeyti nkaya, 2021).

It is suggested by Serroukh et al. (2022) that the traditional learning and teaching methods are not working. Eady and Lockyer (2013) added another point, stating that technology has always been a crucial part of the teaching and learning process. It is now a fundamental aspect of teachers' jobs that they might utilize to help students pick up a language more quickly. In linguistic contexts, "integration" is used while discussing technology. It is finally time to reconsider how curriculum development and instruction could use technology to support learning. Because such methods only put teachers in charge of making students passive learners. As compared to them, modern methods make learners independent. Its evaluation becomes an activity engaging both teachers and learners. It uses a strategic approach to teaching. Why we want to teach is the aspect that is taken into account by such teachers. Hence, there is a need for modern teaching methods.

Many researchers are working on modern methods to teach vocabulary, specifically synonyms, to EFL learners.

Finding synonyms or near-synonyms is crucial for many NLP applications, such as textual entailment recognition and paraphrasing (Bentivogli et al., 2009). Lexical resources like WordNet are frequently employed to increase performance in these jobs. Nevertheless, although these resources cover much ground in generic domains, they lack terminology unique to other topics. The quantity and restricted accessibility of lexical resources for languages other than English present additional issues (Andrade et al., 2013). Therefore, the researcher has considered using one of the latest technologies, Artificial Intelligence (AI), to enhance the vocabulary, specifically the synonyms of a Pakistani EFL learner. ChatGPT and Quillbot are used in the current study for this purpose. Artificial technology encompasses a wide range of methods, instruments, and uses. The AI bots considered in this work are chatbots, particularly generative chatbots, which are particularly significant since they help L2 learners become more creative and proficient communicators. AI chatbots use various AI technologies, such as natural language processing (NLP) and natural language understanding (NLU), to accurately comprehend user inquiries and link them with specific intents and machine learning for response refinement. AI bots come in various forms, including chatbots, virtual, gaming bots, etc.

The academic community is not new to using artificial intelligence (AI) by students and learners to enhance their language ability (Du Boulay, 2016). To make learning exciting and engaging, various artificial intelligence-supported tools are used inside and outside the classroom, including online discussion boards, transcriptions of teachers' lectures, exam integration, management systems, assisted Chatbots, and more. A new AI tool added to the list is a generative Chatbot called ChatGPT (Generative Pertained Transformer). In reality, Open AI created a language model that can recognize human voice as text and produce responses (Brown et al., 2020).

This latest AI tool, along with Quillbot, is utilized in this research. Both are used to see the impact of integrating AI to enrich lexical acquisition, especially in EFL pedagogy. An EFL context is merely a setting or circumstances in which English has been taught to speakers of other languages. Since English is the official language of Pakistan and is utilized in all public sectors, this is quite significant. We must, therefore, consider how

English language learning techniques could be enhanced as we are formally L2 learners. This literature review synthesizes the works of various researchers that have inspired the investigation undertaken in this paper.

3. Theoretical framework

Theory of Second Language Acquisition (SLA) by Stephen Krashen (1982):

One well-known figure in the field of second language learning is Stephen Krashen. He left the University of South California in retirement. In the 1970s, Krashen proposed a monitor model, which he expanded upon to create a model of input hypotheses by the 1980s. The five main theories he put out are the acquisition learning hypothesis, the natural order hypothesis, the monitor hypothesis, the input hypothesis, and the affective-filtering hypothesis (Hunkler, 2017). The "I + 1" formula denotes the learner's current level (i) and slightly higher input (1). Effective input should be comprehensible and engaging, facilitating acquisition rather than mere learning. A sufficient amount of comprehensible input makes language acquisition easier (Krashen, 1999). Krashen posits two approaches to learning: acquisition (subconscious, natural) and learning (conscious, effortful). He suggests that akin to children learning a native language, adults also follow the same learning procedure (Krashen, 1982). According to the Monitor Hypothesis, three factors: enough time, an emphasis on form over meaning, and conformity to grammatical rules and concepts, serve as an eye for language development. Language acquisition is improved by efficient error tracking and correction (Krashen, 1999).

According to the affective filter hypothesis, emotional factors influence language acquisition through input filtering. Learning efficacy is influenced by motivation, emotional state, and confidence (Krashen, 1999). The natural order hypothesis suggests that language learning follows a universal sequence independent of age or learning environment and begins with grammatical rules. It emphasizes how the formal learning process follows an organized development. (Krashen & Terrell, 1985).

Interactionist Theory by Lev Vygotsky (1978):

The Interactionist Theory, pioneered by Lev Vygotsky, asserts that language learning happens due to interactions in cultural and environmental contexts. It established the foundation for later theories and emphasized that communication is important to language acquisition.

The Zone of Proximal Development (ZPD) consists of three stages:

1. Tasks the learner can do unaided, tasks achievable with assistance,
2. Tasks beyond the learner's capability, even with support.
3. Adjusting task difficulty according to the learner's stage fosters progress.

4. Research Methodology

The research methodology employed in the contemporary study follows a quantitative approach to examine the effectiveness of AI integration upon the enrichment of synonym acquisition of L2 learners in Pakistani EFL education. Through rigorous data collection and thorough analysis, this study strives to provide empirical evidence regarding the impact of AI-driven interventions on vocabulary, specifically synonym acquisition. The research design for the present study is Experimental research design, which involves the manipulation of independent and dependent variables. In this study, the independent variable is the intervention of AI tools, whereas the dependent variable is the result of this experimental intervention. In the present study, data is collected through pretest and posttest. The population of this research consists of undergraduate students in the Pakistani public sector. The sample chosen comprised 40 students from The Women's University Multan. Out of these, 20 were participants of the experimental group, and the remaining 20 were the control group participants. The experimental intervention was aided with AI-driven tools (ChatGPT and Quillbot). Finally, the results were analyzed through SPSS.

5. Results and Discussion

This part will use advanced statistical methods and sophisticated data analysis tools to accurately measure the impact of AI-led interventions on vocabulary acquisition results. First, the study uses sophisticated statistical tools to examine participant data. These methods include descriptive statistics, which summarize the central patterns of the results, and inferential statistics, which determine the significance of observed differences. Intervention performance and shed light on the AI tool's direct effect on synonym retrieval. The research also contains effect size calculations, which quantify the influence of the intervention and provide a clearer understanding of its practical significance.

For example, the study looks into whether different subgroups of learners gain more from AI interventions, considering factors like age, ability level, and previous exposure to technology. Furthermore, the analysis section emphasizes the study's methodological rigor. It describes the techniques to assure the data's reliability and validity, including measures for potential confounding variables and biases.

"The results of this careful analysis provide valuable insights into the effectiveness of AI technologies in overcoming the challenges EFL learners face in expanding their vocabulary and language proficiency. The data demonstrates how AI-driven tools can enable more efficient and engaging synonym acquisition and improve the learners' overall language skills and capabilities.

Finally, the analysis section of this study provides a thorough and sophisticated investigation of the impact of AI integration on Pakistani EFL learners' synonym acquisition."

The students' expertise in synonyms was checked in this manner. The performance of the experimental group and the control group in the synonyms section of the pretest is analyzed in this section. In order to assess the students' present vocabulary proficiency before the experimental treatment, there were ten multiple-choice questions. The general statistical results regarding the student's performance in the pretest are presented here. For this purpose, the sample size, mean, standard deviation, and p-value are described in the following table. This table shows the results obtained after providing the experimental group with experimental treatment and the control group.

Finally, the analysis section of this study provides a thorough and sophisticated investigation of the impact of AI integration on Pakistani EFL learners' synonym acquisition. This section comprehensively explains how AI-driven interventions can contribute to vocabulary acquisition and language proficiency through in-depth statistical analysis and a focus on methodological rigor.

Table 1: Significance of the difference in mean scores between the experimental and control groups regarding achievement in the synonym section of the pretest

Group	N	M	SD	p-value
Experimental Group	20	7.05	1.94	0.099
Control Group	20	7.95	1.35	

N = number of observations M = mean scores

SD = standard deviation

The average score for the 20 participants in the experimental group was 7.05, with a 1.94 SD. In contrast, the control group, including 20 people, had a slightly higher mean score. A value of 0.099 indicates that the difference in mean scores between the two groups is not statistically significant.

Table 2: Significance of the difference in mean scores between the experimental and control groups regarding achievement in the synonym section of the posttest

Group	**N**	**M**	**SD**	**p-value**
Experimental Group	20	7.20	2.11	0.012
Control Group	20	6.80	1.36	

N=number of observations

M= mean scores

SD = standard deviation

Table 2 provides information on how the experimental and control groups compared in the posttest's synonym sections. The mean score for the twenty subjects in the experimental group was 7.20, with a standard deviation of 2.11. On the other hand, with a standard deviation of 1.36, the mean score in the control group of the same size was slightly lower at 6.80. Interestingly, a p-value of 0.012 indicated a statistically significant difference in mean scores between the two groups, according to the analysis. This statistical significance indicates that, compared to the control group, the experimental intervention probably impacted participants' performance in the posttest's synonym section. As such, these results suggest that the experimental methodology may have enabled an observable enhancement in performance in the synonym section of the posttest when juxtaposed with the control group.

Huang and Wang (2021) reported the same findings. They suggested in their research that in an EFL classroom, AI integration could improve vocabulary to a great extent. Retention of vocabulary was not finished even 14 days after the posttest had been conducted. It attributed a positive effect of AI to the enrichment of vocabulary and its retention. The results of this analysis section are also consistent with those of a study conducted by (Song et al., 2022), who reported that the use of AI improved vocabulary to the highest level, only hinting at the beneficial aspects of AI in improving vocabulary. This performance result of the experimental group aligns with the view that AI can improve

English skills, including vocabulary, through various applications and tools such as ChatGPT and Quillbot. Lewis's study concluded that AI could potentially be used to improve English speaking and writing skills, especially in EFL classrooms.

6. Findings and Conclusion

Table 1: Comparison of Pretest Results

- The experimental group had an average score of 7.05 with a standard deviation of 1.94.
- In contrast, the control group had a slightly higher average score of 7.95 with a standard deviation of 1.35.
- While there was a numerical difference of 0.9 points in mean scores between the two groups, it was not statistically significant ($p = 0.099$).
- This suggests that the observed difference in mean scores could be attributed to random chance rather than the effect of the experimental manipulation. Therefore, there is no compelling evidence to conclude that the experimental intervention significantly impacted participants' performance in the synonym section of the pretest compared to the control group.

Table 2: Comparison of Posttest Results

- In the experimental group, participants achieved a mean score of 7.20 with a standard deviation of 2.11.
- Conversely, in the control group, the mean score was slightly lower at 6.80, with a standard deviation 1.36.
- The difference in mean scores between the two groups was statistically significant ($p = 0.012$), indicating that the experimental intervention likely impacted participants' performance in the synonym section of the posttest.
- Based on these results, it can be inferred that the experimental intervention led to a statistically significant improvement in performance in the synonym section of the posttest compared to the control group.

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