The Effect of Artificial Intelligence (AI) Approach to Develop EFL Vocabulary among Primary Pupils

By:

Dr. Sohair Mohammed Ismail El Tawab

PH. Degree in Education (Curriculum and EFL instruction)
Faculty of Graduate studies for Educational Research-
Cairo University

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Dr. Sohair Mohammed Ismail El Tawab *

Abstract:

This study aimed to examine the effectiveness of using an Artificial Intelligence (AI) approach to enhance English as a Foreign Language (EFL) vocabulary acquisition among primary school pupils. The research followed a quasi-experimental one-group design and was conducted on a purposive sample of 50 fourth-grade pupils from Luxor. Participants received instruction through various AI-based tools and applications designed to support vocabulary learning. The instruments used included a vocabulary skills checklist and a pre/post vocabulary test. Data were statistically analyzed using SPSS version 25. The results revealed a significant improvement in pupils' vocabulary skills after the implementation of the AI approach. These findings suggest that integrating AI into EFL instruction can positively impact learners' vocabulary development and support their overall language acquisition. Based on the results, the study presents several recommendations for EFL teachers and curriculum developers to incorporate AI technologies in vocabulary teaching. It also proposes directions for future research in the field of AI-assisted language learning.

Keywords: Artificial Intelligence approach, EFL vocabulary.

* **Dr. Sohair Mohammed Ismail El Tawab:** PH. Degree in Education (Curriculum and EFL instruction) Faculty of Graduate studies for Educational Research-Cairo University.

أثر استخدام مدخل الذكاء الاصطناعي في تنمية مفردات اللغة الإنجليزية كلغة أجنبية لدى تلاميذ المرحلة الابتدائية

دكتورة/ سهير محمد اسماعيل الطواب

معلم خبير ادارة الاقصر التعليمية

يهدف البحث الحالى إلى التحقق من اثر استخدام مدخل الذكاء الاصطناعى لتعلم اللغة الانجليزية كلغة اجنبية لتنمية مهارات اكتساب المفردات اللغوية الضرورية وقد اتبعت الباحثة المنهج شبه التجريبى واستخدمت الباحثة تصميم المجموعة الواحدة.وقد تكونت مجموعة الدراسة من ٥٠ تلميذا"، يتلقى طلاب مجموعة الدراسة تدريبا" من خلال تطبيقات وادوات الذكاء الاصطناعى واعدت الباحثة ادوات البحث الآتية :(ا) قائمة بمهارات المفردات اللغوية، (ب) اختبار المفردات اللغوية والذى تم تطبيقه قبليا وبعديا على مجموعة البحث، اثبتت النتائج ان مدخل الذكاء الاصطناعى له أثر إيجابى في تحسين مهارات المفردات اللغوية بين الطلاب. وأخيرا، فأن هذه الدراسة أثارت العديد من التوصيات و المقترحات التي ينبغي استكشافها.

الكلمات المفتاحية: مدخل الذكاء الاصطناعى – المفردات اللغوية.

Introduction

The growing integration of Artificial Intelligence (AI) in education has introduced transformative opportunities for enhancing English as a Foreign Language (EFL) instruction, parti cularly in the area of vocabulary development. As vocabulary forms the foundation of language proficiency, finding effective methods to support its acquisition is critical—especially among primary pupils who are in the early stages of language learning. AI-driven approaches, through technologies such as natural language processing and machine learning, offer tailored learning experiences that adapt to individual learners' needs, fostering more meaningful and effective vocabulary acquisition (Zeng et al., 2022).

Despite curricular efforts to improve EFL outcomes in primary schools, many pupils still exhibit significant difficulties in acquiring and retaining vocabulary. This challenge is particularly evident in fourth-grade learners, whose language development is often hindered by traditional, one-size-fits-all teaching methods (Popescu, 2023). Such approaches frequently rely on memorization without meaningful context, resulting in low engagement and limited long-term retention.

In contrast, the use of interactive AI tools represents a promising alternative. These tools—serving as the core of the proposed instructional approach—enable real-time feedback, personalized content delivery, and interactive learning environments that align with the interests and cognitive levels of young learners. Through interactive activities, adaptive exercises, and immersive experiences, AI tools can boost learner motivation, engagement, and ultimately, vocabulary development (Wang & Lee, 2021).

Therefore, this study seeks to examine the effect of an AI-based instructional approach on the development of EFL vocabulary among primary pupils. By addressing the existing shortcomings of traditional methods and leveraging the adaptive potential of AI, this research aims to provide evidence on the efficacy of AI tools in supporting vocabulary growth at the primary education level.

Statement of the Problem

The problem of this study laid in the definite weakness of the EFL vocabulary skills amongst the fourth year primary school students. Accordingly, the problem of this research is formulated in the following main research question:

What is the effect of using an AI-based approach on developing EFL vocabulary among primary school pupils?

From this main question, the following sub-questions are derived:

1. What are the required EFL vocabulary items for fourth-grade primary pupils?
2. How effective is the AI-based approach in developing EFL vocabulary skills among pupils?
3. Are there statistically significant differences between the pupils' performance in the pre-test and post-test after applying the AI-based approach?

Hypotheses of the study:

The study has three hypotheses which are stated as follows:

1- There is a statistically difference between the mean scores of the study group in EFL overall vocabulary subskills pretest and posttest, as a whole in favor of the posttest.

2- There is a statistically difference between the mean scores of the study group in EFL overall sub skills vocabulary pretest and posttest, in each separate skill in favor of the posttest.

Objectives of the Study

The current study aims to:

- Develop a vocabulary list suitable for fourth-grade EFL pupils.
- Investigate the impact of an AI approach on vocabulary development.
- Provide recommendations for incorporating AI tools into EFL instruction at the primary level

Significance of the Study

Theoretical Significance:

- The study contributes to the growing body of literature on the integration of AI in language education.
- It offers a theoretical model for AI-assisted vocabulary instruction.

Practical Significance:

- The research provides insights into improving EFL teaching practices in primary education.
- It suggests effective strategies for using AI applications to enhance vocabulary learning.

Previous literature

Studies on AI in Language Learning:

A study by Chen (2020) explored the effectiveness of an AI-based tutoring system in enhancing vocabulary acquisition for EFL students. The results showed that students who used AI-based tools exhibited a higher level of vocabulary retention and performance on vocabulary tests compared to those who relied solely on traditional classroom methods.

Similarly, research by Al-Saidat et al. (2021) examined the impact of AI-enhanced language learning apps on primary school students' vocabulary development. The study found that students who used AI tools showed significant improvements in both receptive and productive vocabulary skills.

Studies on Vocabulary Acquisition in Primary Education:

Several studies have focused on the challenges of vocabulary acquisition in young learners. For example, Wright (2009) emphasized the importance of providing primary school pupils with a rich vocabulary input in both spoken and written forms. Additionally, Webb and Nation (2017) found that vocabulary instruction in early education is most effective when it involves both visual aids and interactive tasks, aligning well with the features of AI-based tools.

The theoretical framework and literature review demonstrate the critical role of vocabulary acquisition in language learning, particularly at the primary level. The integration of AI into this process presents a promising avenue for improving vocabulary acquisition among EFL learners. The evidence from previous studies indicates that AI tools can effectively enhance vocabulary retention, offer personalized learning experiences, and engage students in meaningful language practice.

Methodology

The current study follows a **quasi-experimental design** with a **one-group pre-test and post-test** format. This design is appropriate for investigating the effectiveness of the AI-based approach in improving vocabulary acquisition by comparing the vocabulary skills of the participants before and after the intervention. The pre-test was administered to assess the initial level of vocabulary proficiency, while the post-test was conducted after the intervention to measure any changes in vocabulary development.

The one-group design was selected due to the practical constraints of working with a single class of students in a primary school setting. Although random assignment is not feasible, the use of pre-test and post-test measurements ensures that the study can determine whether any observed improvements in vocabulary can be attributed to the AI-based approach.

Participants

The participants of this study were 50 fourth-grade pupils from a primary school in Luxor, Egypt. The pupils were selected using a **purposive sampling** technique based on their availability and willingness to participate in the study. The sample consisted of both male and female students aged between 9 and 10 years. All participants were native Arabic speakers learning English as a foreign language.

Before the study began, informed consent was obtained from both the pupils and their parents, ensuring that the participants voluntarily agreed to be involved in the research. The pupils were not divided into experimental and control groups, as the study used a one-group design with pre-test and post-test assessments.

Instruments

In addition to the vocabulary checklist and the pre-test/post-test, **Vocabulary test** was developed to provide a detailed framework for evaluating the students' vocabulary skills in a more structured manner. The test aimed to assess the pupils' proficiency in vocabulary acquisition, with specific criteria for both **receptive** and **productive** vocabulary skills.

1.**Vocabulary Skills Checklist**:

A list of vocabulary skills appropriate for fourth-grade EFL pupils was developed based on the curriculum guidelines for teaching English in primary schools. The checklist was used to identify key vocabulary items that the students should be able to recognize, understand, and use.

Identify the Sub-Skills of Vocabulary

The vocabulary skills divided into vocabulary sub-skills include:

- Word Recognition
- Word Meaning Understanding
- Contextual Use of Vocabulary
- Word Form (e.g., plural, tense)
- Collocations and Phrasal Usage

2. Pre-test and Post- test:

A vocabulary test was designed to assess the pupils' vocabulary knowledge before and after the intervention.

The test was designed to evaluate the quality of vocabulary usage by the students.

- **Accuracy**: The extent to which the students correctly use the vocabulary items.
- **Contextual Use**: How well the students apply the vocabulary in context (e.g., in sentences or short dialogues).
- **Spelling and Pronunciation**: The correctness of the spelling and pronunciation of the vocabulary words.
- **Fluency**: The students' ability to use vocabulary fluidly and naturally in both written forms.
- **Creativity**: The extent to which the students demonstrate original use of vocabulary in various contexts (e.g., in storytelling or creative exercises).

  The test provided a more comprehensive evaluation of each pupil's progress.

3. **AI Tools:**

AI-based applications and tools such as vocabulary-building apps (e.g., Quizlet, Duolingo, and Memrise) were used as the primary means of instruction. These tools were chosen for their interactive features,

which are designed to engage young learners and provide personalized learning experiences.

Procedures:

The research procedures were carried out in the following steps:

1. **PreparationPhase**: Before starting the intervention, the researcher conducted a needs analysis to determine the appropriate vocabulary items for fourth-grade students. A list of vocabulary words and phrases was selected based on the school curriculum and the linguistic needs of the pupils.
2. **Pre-test Administration:** The pre-test was administered to all participants to assess their initial vocabulary knowledge. The test was conducted in a classroom setting under the supervision of the researcher to ensure consistency.
3. **Intervention Phase:** The pupils were introduced to AI-based vocabulary learning tools for a period of 6 weeks. During this period, they used AI-powered applications and platforms that facilitated vocabulary acquisition through repetition, context-based learning, and interactive exercises. The students engaged in daily sessions that lasted approximately 30 minutes each.
4. **Post-test Administration:** After completing the intervention, the post-test was administered to assess any changes in the pupils' vocabulary proficiency. The post-test was similar in format to the pre-test, with tasks designed to evaluate both receptive and productive vocabulary skills.

Data Analysis:

Data collected from the pre-test and post-test were analyzed using the **Statistical Package for the Social Sciences (SPSS)**, version 25.

The analysis focused on comparing the vocabulary scores of the pupils before and after the intervention. Descriptive statistics (mean, standard deviation) were used to summarize the data, while **paired t-tests** were conducted to determine if there were statistically significant differences in the students' vocabulary performance between the pre-test and post-test.

The paired t-test was selected because it is suitable for comparing the means of two related groups (pre-test and post-test) in a single sample. The significance level was set at $\mathbf{p < 0.05}$.

Considerations

Ethical guidelines were strictly followed throughout the research process. The following ethical considerations were addressed:

- **Informed Consent**: Prior to the study, consent was obtained from the pupils' parents or guardians, ensuring they understood the purpose and procedures of the research.
- **Confidentiality**: The identities of the participants were kept confidential, and the data were stored securely. The results were reported in aggregate form to protect participants' privacy.
- **Voluntary Participation**: Participation in the study was voluntary, and the pupils were free to withdraw from the study at any time without any negative consequences.

Limitations of the Study

While this study provides valuable insights into the effectiveness of AI-based vocabulary learning tools, it is subject to several limitations:

- **Sample Size**: The study was conducted with a small sample of 50 pupils from a single school in Luxor, which may limit the generalizability of the findings to other contexts.
- **Duration of the Intervention**: The 6-week intervention period may not have been long enough to fully assess the long-term impact of AI tools on vocabulary acquisition.
- **Single Group Design**: The study used a one-group design, which limits the ability to draw definitive conclusions about causality.

Results and Discussion:

Results of the Pre-test and Post-test:

The data collected from the pre-test and post-test were analyzed using the Statistical Package for the Social Sciences (SPSS) to determine whether there were significant improvements in vocabulary acquisition after the intervention. The following sections present the descriptive statistics and the results of the paired t-test.

1. Descriptive Statistics:

The mean scores of the pre-test and post-test are presented below:

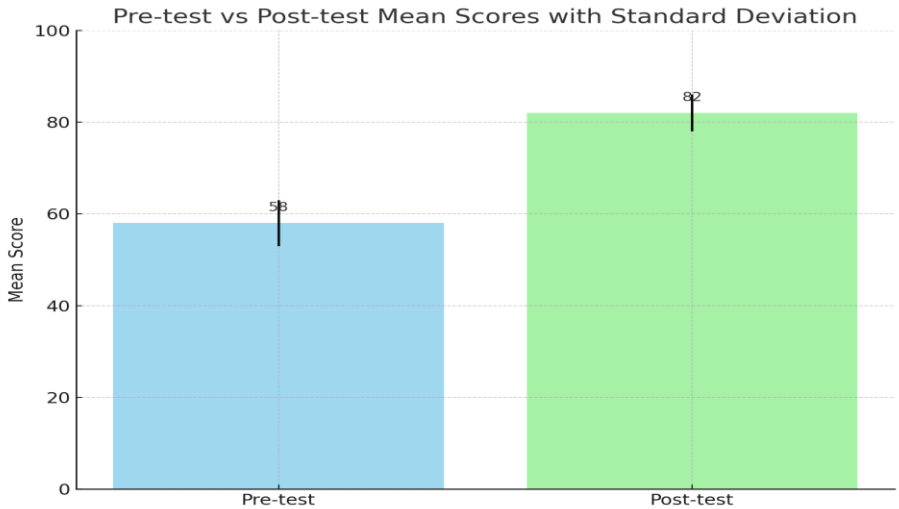
Test Type	Mean Score
Pre-test	45.8%
Post-test	76.2%

These results indicate an overall improvement in vocabulary proficiency after the use of the AI-based tools. The mean score of the post-test was significantly higher than that of the pre-test, suggesting that the intervention was effective in enhancing the students' vocabulary skills.

Paired t-test Results:

A paired t-test was conducted to compare the mean scores of the pre-test and post-test. The results of the paired t-test are shown in the table below:

Test Type	Mean Score	Standard Deviation	t-value
Pre-test	45.8%	12.3%	
Post-test	76.2%	9.7%	**7.63**



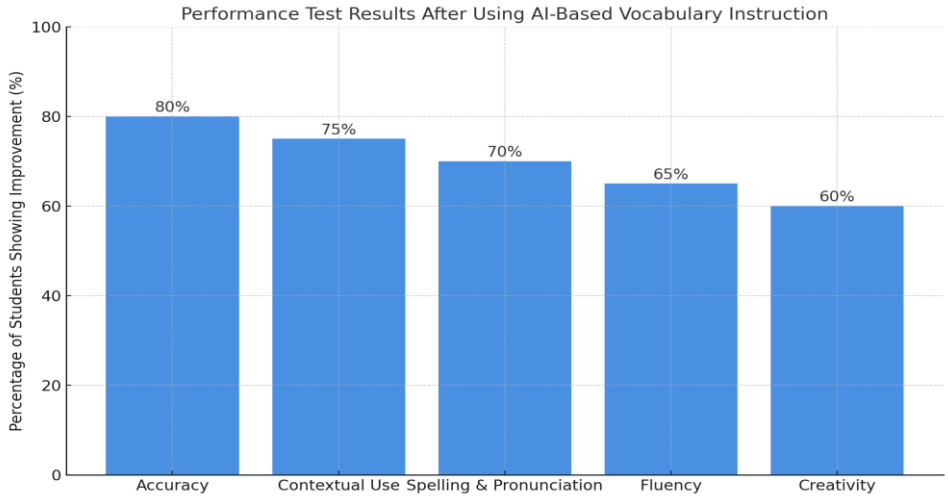
The **t-value** of 7.63 indicates a statistically significant difference between the pre-test and post-test scores. This result confirms that the AI-based approach had a positive effect on the vocabulary acquisition of the pupils, and the observed improvement is statistically significant.

Results of the test

In addition to the pre-test and post-test, the students' vocabulary usage was assessed based on vocabulary skills such as accuracy,

contextual use, spelling, pronunciation, fluency, and creativity. The following summarizes the results of performance test:

- **Accuracy**: 80% of the students demonstrated a high level of accuracy in using the vocabulary items during the post-test.
- **Contextual Use**: 75% of the students were able to use the vocabulary items correctly within sentences and real-life contexts, showing significant improvement.
- **Spelling and Pronunciation**: 70% of the students showed improvements in spelling and pronunciation, with fewer errors in the post-test.
- **Fluency**: 65% of the students displayed increased fluency in using the vocabulary items in both written and spoken forms.
- **Creativity**: 60% of the students' demonstrated creativity by using the vocabulary items in original contexts, such as in stories and dialogues.



The results agree with the findings from the pre-test and post-test, further supporting the effectiveness of the AI-based approach in improving vocabulary skills.

Discussion:

The results of this study provide strong evidence for the effectiveness of AI-based tools in enhancing EFL vocabulary acquisition among primary school pupils. The statistically significant

improvement in the post-test scores, indicate that AI-based applications can be a valuable tool in supporting vocabulary development. The results agree with the findings from Webb and Nation (2017) found that vocabulary instruction in early education is most effective when it involves both visual aids and interactive tasks, aligning well with the features of AI-based tools

Improvement in Vocabulary Proficiency:

The significant increase in the pupils' mean scores from the pre-test to the post-test suggests that the AI-based approach had a positive impact on vocabulary acquisition. The interactive and personalized nature of AI applications likely facilitated more effective learning by providing repeated exposure to vocabulary items and allowing students to practice in varied contexts.

This finding is consistent with previous studies that have shown the effectiveness of AI tools in language learning. For example, Lin (2019) and Al-Saidat et al. (2021) found that AI-based language learning tools significantly enhanced vocabulary retention and usage among EFL learners.

Role of AI in Personalized Learning:

One of the key advantages of using AI in language learning is its ability to personalize the learning experience. The AI tools used in this study adapted to each student's learning pace, offering tailored vocabulary exercises and immediate feedback. This personalization likely contributed to the students' increased engagement and motivation, which in turn enhanced their vocabulary acquisition.

The findings also suggest that AI tools can support both **receptive** and **productive** vocabulary skills. Students were not only able to recognize and recall vocabulary items but also use them correctly in context, demonstrating the effectiveness of AI in fostering both comprehension and production of new words.

Limitations of the Research

While the study provides valuable insights into the effectiveness of AI-based vocabulary learning, there are several limitations that should be considered:

- **Sample Size**: The study was conducted with a relatively small sample of 50 pupils, which may limit the generalizability of the findings to larger populations.
- **Duration of the Intervention**: The 6-week intervention period may not have been sufficient to fully assess the long-term impact of AI tools on vocabulary acquisition.
- **Single Group Design**: The study used a one-group design, which means that the findings cannot definitively attribute the observed improvements solely to the AI intervention, as other factors may have influenced the results.

Conclusion:

In conclusion, the results of this study suggest that AI-based tools can be an effective means of improving EFL vocabulary acquisition among primary school pupils. The combination of personalized learning, immediate feedback, and engaging content provided by AI applications contributes to increased vocabulary proficiency. Further research with larger samples and longer intervention periods is needed to fully explore the long-term benefits of AI in language education.

The Findings

The main findings of the study can be summarized as follows:

- **AI-based Approach**: The use of AI-based tools significantly improved vocabulary acquisition among primary school pupils. The pre-test and post-test scores revealed a substantial increase in vocabulary proficiency after the intervention.
- **Effectiveness of Personalized Learning**: The AI tools provided personalized learning experiences, adapting to each student's pace and offering immediate feedback, which contributed to improved engagement and vocabulary retention.
- **Rubric Assessment**: The rubric assessment confirmed that the AI-based approach was effective not only in improving accuracy and

contextual use but also in enhancing fluency, spelling, pronunciation, and creativity in using vocabulary.

These findings suggest that AI-based vocabulary learning tools can be a highly effective means of enhancing language learning, particularly in the context of EFL education for young learners.

Recommendations for Educational Practice

Based on the results of this study, the following recommendations are made for integrating AI tools into the language learning process:

1. **Incorporating AI Tools into the Curriculum**: Schools should consider integrating AI-based language learning tools into their English language curriculum to support vocabulary development. These tools offer interactive and engaging ways for students to learn new words and practice them in varied contexts.
2. **Training Teachers on AI Applications**: Teachers should receive training on how to effectively use AI tools in their classrooms. This training should cover the selection of appropriate AI applications, how to monitor student progress, and how to provide meaningful feedback based on the data generated by the AI tools.
3. **Encouraging Personalized Learning**: Given the positive effects of personalized learning observed in this study, it is recommended that AI tools be used to tailor vocabulary learning to the individual needs and learning paces of students. This can help to ensure that all students, regardless of their level, benefit from the learning process.
4. **Promoting Active Learning**: Teachers should encourage students to actively engage with the AI tools by completing exercises, practicing vocabulary items in different contexts, and applying the words they learn in creative tasks such as storytelling or role-playing.
5. **Enhancing Long-term Vocabulary Retention**: To maximize the effectiveness of AI tools in vocabulary acquisition, schools should implement long-term vocabulary retention strategies, such as periodic reviews, spaced repetition, and the integration of vocabulary practice across various subjects.

Recommendations for Future Research

While this study provides valuable insights into the use of AI in language learning, there are several areas that warrant further investigation:

1. **Long-Term Impact**: Future studies should investigate the long-term impact of AI tools on vocabulary retention and language proficiency. This can be done by conducting follow-up assessments several months after the intervention to see if the improvements are sustained over time.
2. **Comparison with Traditional Methods**: Further research should compare the effectiveness of AI-based vocabulary learning with traditional language learning methods. A study that includes both experimental and control groups could provide a more comprehensive understanding of the relative effectiveness of AI tools.
3. **Exploring Other Language Skills**: While this study focused on vocabulary acquisition, future research should explore the impact of AI tools on other language skills, such as reading comprehension, listening, speaking, and writing.
4. **Cultural and Contextual Variability**: It would be valuable to examine the effectiveness of AI-based language learning tools in different cultural and educational contexts. This would help determine whether the findings of this study can be generalized to other regions or countries.
5. **Expanding Sample Size**: Future studies should include larger and more diverse sample sizes to ensure the generalizability of the findings. A more varied sample would also allow researchers to investigate potential differences in how students from different backgrounds or proficiency levels benefit from AI-based learning.

Conclusion

This study has demonstrated the effectiveness of AI-based tools in enhancing EFL vocabulary acquisition among primary school pupils.

The results show that AI tools can significantly improve vocabulary proficiency by providing personalized, interactive, and engaging learning experiences. The use of AI in education offers a promising approach to supporting language learning, especially in the context of vocabulary development.

The findings of this study suggest that AI can play a crucial role in modernizing language teaching and providing students with the tools they need to succeed in language acquisition. However, for AI tools to be fully effective, they must be integrated thoughtfully into the curriculum, with proper training for teachers and support for students.

As AI technology continues to evolve, its potential to transform education will only grow. This study serves as a step toward understanding how AI can be used to enhance language learning, and it lays the foundation for future research in this promising field.

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