Development of English Lexical Competence Through AI-Based Learning Tools

by

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Розвиток англомовної лексичної компетентності засобами навчальних інструментів на основі штучного інтелекту

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Abstract

The study is devoted to developing lexical competence through artificial intelligence (AI) based learning tools. The main goal is to determine the effectiveness of AI-powered applications as tools for the formation and development of vocabulary skills in high school students. This study is based on the premise that by integrating personalized, interactive, and context-aware AI learning tools, teachers can facilitate more effective acquisition and active use of lexical items in both oral and written communication. The research examines the theoretical foundations of AI-assisted vocabulary learning, the work of scientists in the context of this method, and its advantages and limitations.

The empirical part includes an experimental study conducted in the 11th grade of secondary school. The target group engaged with AI-based learning tools such as intelligent flashcards, chatbots, and adaptive vocabulary platforms, with the main focus on learning new words, collocations, and contextually appropriate usage. The study used qualitative and quantitative methods. Data were collected through pre- and post-tests, classroom observations, and student feedback questionnaires.

The obtained data indicate positive improvement in the lexical competence of the students in the target group, which confirms the effectiveness of using AI-powered tools for vocabulary learning. The study emphasises the potential of AI-based learning tools to support the development of lexical skills and highlights that these tools create an engaging and motivating learning environment. The results are valuable for teachers, methodologists, and researchers in pedagogy, educational technology, and applied linguistics.

***Key words*:** lexical competence, vocabulary development, artificial intelligence, interactive learning tools, high school, teaching effectiveness.

Анотація

Дослідження присвячене розвитку лексичної компетентності за допомогою навчальних інструментів на основі штучного інтелекту (ШІ). Головною метою є визначення ефективності програм на основі ШІ як інструментів для формування та розвитку лексичних навичок у учнів середньої школи. Це дослідження базується на припущенні, що завдяки інтеграції персоналізованих, інтерактивних та контекстно-орієнтованих навчальних інструментів на основі ШІ вчителі можуть сприяти більш ефективному засвоєнню та активному використанню лексичних одиниць як в усній, так і в письмовій комунікації. Дослідження розглядає теоретичні основи вивчення лексики за допомогою ШІ, роботу вчених у контексті цього методу, а також його переваги та обмеження.

У теоретичній частині роботи проаналізовано основні підходи до формування лексичної компетентності, зокрема лексичний підхід, теорію обробки мовного вводу, гіпотезу помічання та положення соціокультурної теорії навчання. Значну увагу приділено аналізу наукових праць вітчизняних і зарубіжних учених, які досліджують можливості застосування штучного інтелекту в навчанні іноземних мов. Розглянуто переваги та обмеження використання ШІ в освітньому процесі, зокрема питання адаптивності, якості зворотного зв'язку, автономності учнів і ролі вчителя в умовах цифрового навчального середовища.

Емпірична частина дослідження включає педагогічний експеримент, проведений в 11 класі загальноосвітньої школи. У межах експерименту група учнів працювала з навчальними інструментами на основі штучного інтелекту, серед яких інтелектуальні флеш-картки з елементами адаптивного повторення, чат-боти для діалогічної практики та адаптивні лексичні платформи. Основний акцент було зроблено на засвоєнні нових слів, словосполучень, колокацій, а також на формуванні навичок контекстуально доцільного використання лексики. Дослідження було реалізовано з використанням як кількісних, так і якісних методів дослідження. Зокрема, використовувалися попередні та підсумкові тести для визначення рівня лексичної компетентності, педагогічні спостереження за навчальною діяльністю учнів, а також анкетування з метою з'ясування їхнього ставлення до використання AI-інструментів у навчанні.

Результати дослідження засвідчили покращення рівня лексичної компетентності учнів експериментальної групи, зокрема зростання точності, різноманітності та впевненості у використанні лексичних одиниць. Отримані дані підтверджують ефективність використання навчальних інструментів на основі штучного інтелекту для

вивчення лексики та формування позитивної мотивації до навчання. Дослідження підкреслює значний потенціал AI-технологій у створенні сучасного, інтерактивного й мотивуючого навчального середовища. Результати роботи можуть бути корисними для вчителів іноземних мов, методистів, а також дослідників у галузі педагогіки, освітніх технологій і прикладної лінгвістики.

Ключові слова: лексична компетенція, розвиток словникового запасу, штучний інтелект, інтерактивні навчальні інструменти, середня школа, ефективність викладання.

Contents

Introduction

Since lexical competence is an essential part of efficient language use in both oral and written communication, it receives considerable attention in modern foreign language pedagogy today. Vocabulary knowledge plays a central role in the development of communicative competence, as it enables learners to comprehend messages, express ideas accurately, and participate effectively in real-life communication. For high school kids who are getting ready for examinations, external assessment, and further academic or professional education, it is especially crucial that they actively learn and utilize terminology.

However, traditional approaches to vocabulary teaching, such as rote memorization, translation-based exercises, and the use of long word lists, often prove insufficient in achieving long-term retention and active vocabulary use. Despite teachers' efforts to include engaging tasks, games, and communicative activities, many students still perceive vocabulary learning as monotonous and demanding. This perception negatively affects their motivation, engagement, and overall learning outcomes. As a result, vocabulary acquisition frequently becomes fragmented and superficial, with learners struggling to transfer lexical knowledge into meaningful communication. These challenges highlight the need to explore innovative approaches and tools that can increase learners' involvement and support deeper lexical processing.

AI-powered platforms offer a promising solution for developing lexical competence because they provide personalized learning, adaptive feedback, and context-aware tasks. Unlike conventional methods, AI-based tools can adjust the level of difficulty according to learners' performance, track progress over time, and respond to individual learning needs. These tools allow students to engage with vocabulary through interactive exercises, intelligent flashcards, chatbots, and gamified activities that simulate authentic communication. Immediate feedback helps learners notice errors and refine their lexical choices, while contextualized practice supports the meaningful integration of new vocabulary into active language use. As a result, AI-based environments can enhance both the quantity and quality of lexical input and output.

This Master's paper aims to examine the effectiveness of AI-based learning tools in developing lexical competence among high school students and to demonstrate how these tools can be integrated into the language learning process. The research seeks to answer the following questions:

1. How can AI-based learning tools be used to enhance lexical competence in high school students in EFL lessons?

2. How does interaction with AI-powered platforms affect students' ability to use vocabulary effectively in EFL lessons?

The relevance of this research lies in the increasing role of technology in education and the need to adapt teaching methods to the individual needs and preferences of students. AI tools offer not only personalized support but also motivate students to engage actively with vocabulary learning, making it a more dynamic and effective process. Moreover, in today's digital world, students are accustomed to using technology daily, which further increases their interest and willingness to engage with AI-based platforms. By integrating these tools into classroom practice, teachers can provide students with authentic and interactive learning experiences that foster both receptive and productive lexical skills.

Furthermore, the integration of AI into vocabulary instruction supports the development of learner autonomy, as students gain greater control over their learning pace, strategies, and progress. This aligns with current educational priorities aimed at fostering lifelong learning skills and self-directed language acquisition. This study holds practical implications for educators, methodologists, and researchers, offering insights I nto the use of AI-based tools for teaching vocabulary. By adapting AI-supported exercises according to students' levels, interests, and learning goals, teachers can significantly enhance the effectiveness of vocabulary instruction and contribute to the sustainable development of students' lexical competence.

Literature review

The literature on Artificial Intelligence (AI) in language learning has highlighted several approaches to developing lexical competence. There are relatively few historical studies in the area of AI-assisted vocabulary learning, but a large and growing body of literature has investigated how digital tools can enhance lexical acquisition in second/foreign language learners (Simonnet, 2025; Zhao, 2023). Much of the current literature on AI-based learning tools pays particular attention to personalized feedback, interactive tasks, and context-aware explanations as key factors for successful lexical development. The literature on AI-assisted vocabulary acquisition has highlighted several recurring themes, including the role of adaptive learning algorithms, learner motivation, and engagement strategies.

The literature presents a range of theories regarding the acquisition of lexical competence. A foundational theory underpinning lexical competence is the lexical approach, which argues that knowledge of lexical items, collocations, and phrases is central to fluent language use rather than grammar alone (Lewis, 1993, 1997). This viewpoint is supported by input processing theory, which emphasizes the importance of learners engaging meaningfully

with material to acquire vocabulary (Van Patten, 2004). Similarly, the noticing hypothesis emphasizes the importance of paying attention to lexical forms in context when learning (Schmidt, 1990). Other perspectives within the literature focus on sociocultural approaches to learning, highlighting the importance of interaction, scaffolding, and collaborative learning in promoting lexical competence (Vygotskyi, 1978; Lantolf & Thorne, 2006). These theoretical frameworks collectively suggest that lexical acquisition is not a purely passive process, but requires active engagement, contextual understanding, and repeated meaningful exposure.

More recent attention has focused on the provision of affective support through AI tools, which can reduce learner anxiety, increase motivation, and provide immediate feedback, as suggested by Krashen (1982). It is now well established from various studies that motivation, confidence, and affective factors play a significant role in lexical acquisition. Huang (2025) and Naimanova (2023) suggested that personalized AI interventions lead to higher retention of vocabulary and more effective engagement with lexical items. A considerable amount of literature has been published on learner motivation and AI-assisted vocabulary acquisition. These studies consistently demonstrate that AI tools can enhance learner autonomy by allowing students to control the pace and content of their learning, thereby increasing engagement and long-term retention (Godwin-Jones, 2019; Stockwell, 2012).

To date, several studies by Simonnet (2025) and Zhao (2023) have investigated the impact of AI-powered applications such as Memrise, intelligent flashcards, and chatbots on vocabulary learning outcomes. Moreover, these studies have examined how AI-supported platforms can incorporate spaced repetition, adaptive quizzing, and real-time error analysis to enhance lexical retention. Several lines of evidence suggest that AI tools can scaffold learners' lexical development effectively, particularly when they provide multimodal input, context-specific explanations, and gamified practice (PHZH, 2025–2027). Surveys such as those conducted by Simonnet (2025) have shown that AI-supported vocabulary learning can outperform traditional methods in both retention and learner engagement. Additionally, several linguists such as Chen & He (2022) and Zhang (2024) have begun to examine the role of AI in enhancing the acquisition of academic vocabulary, specialized terminology, and idiomatic expressions, demonstrating that adaptive algorithms can tailor vocabulary exposure according to learners' proficiency and interests.

Similarly, Huang (2025) found that mnemonics generated by AI models support effective word recall, demonstrating the potential of technology-enhanced memory strategies. Recent studies, such as Karimova (2024) and Zhao (2023), have also investigated the integration of AI chatbots that simulate conversational practice, allowing learners to

contextualize new vocabulary in authentic interactions, which strengthens both receptive and productive skills. AI-assisted lexical learning, personalized feedback, and context-aware tasks appear to be closely linked with improved learner outcomes (Zhao, 2023). Previous research has established that repeated interaction with AI tools, combined with immediate corrective feedback, leads to both receptive and productive knowledge of lexical items. There is a clear link between the use of AI-based learning tools and improved lexical competence, as proven by Karimova, (2024). This link is particularly evident among B2-level learners, but emerging evidence suggests similar benefits for intermediate and advanced learners when AI is integrated with traditional classroom instruction (Chen & He, 2022; Simonnet, 2025).

A broader perspective has been adopted by Vygotsky (1978), who argues that scaffolding within the learner's zone of proximal development supports the acquisition of complex skills. In the same way, AI platforms provide structured support that enables learners to operate slightly above their current proficiency level. Unlike traditional tools, AI-powered systems offer adaptive difficulty, immediate feedback, and personalized content, which together facilitate meaningful lexical engagement (Rocklage, 2023). Almost every paper that has been written on AI-assisted vocabulary learning includes a section relating to the importance of adaptive feedback and learner engagement. A number of studies have postulated a convergence between sociocultural theory and AI-supported learning (Lee & Lee, 2021; Zhao, 2023; Simonnet, 2025), suggesting that AI tools can simulate elements of guided participation and peer-assisted learning in digital contexts. In addition, AI platforms can provide collaborative features that enable learners to work in virtual groups, share vocabulary exercises, and engage in peer-feedback cycles, thereby supporting social interaction and co-construction of knowledge (Lantolf & Poehner, 2014).

In contrast, several studies have identified potential limitations of AI-based learning tools (Rocklage, 2023; Karimova, 2024; Zhang, 2024). Rocklage (2023) reported that AI-generated content can display lower lexical richness compared to human-produced texts. This raises concerns about over-reliance on AI input potentially reducing exposure to novel lexical items. Likewise, Karimova (2024) noted that learners may still encounter challenges with idiomatic competence and passive vs. active vocabulary, highlighting the need for careful integration of AI tools into language curricula. Previous research has also explored the relationships between learner autonomy and the efficacy of AI-mediated vocabulary practice (Godwin-Jones, 2019; Huang, 2025; Simonnet, 2025), indicating that students with limited self-regulation may require additional guidance to benefit fully from AI platforms. Furthermore, some studies have noted that without proper pedagogical scaffolding, AI tools

can inadvertently promote surface-level learning, emphasizing quantity over quality of lexical acquisition (Zhang, 2024; Chen & He, 2022).

It is also important to consider the role of feedback types in AI-supported vocabulary learning. Some studies have considered the effects of immediate corrective feedback, explicit versus implicit guidance, and multimodal annotations on learners' retention and application of new words (Huang, 2025; Zhao, 2023; Rocklage, 2023). Data from these studies identified the increased effectiveness of vocabulary acquisition when learners receive explanations contextualized within real-world scenarios, supported by AI-generated examples and usage patterns. Moreover, AI tools have been shown to improve meta-linguistic awareness by prompting learners to reflect on word usage, collocational patterns, and register (Karimova, 2024; Simonnet, 2025). Several studies have used longitudinal data to examine the impact of AI tools on vocabulary acquisition over time, showing that extended engagement with AI-based applications results in measurable improvements in both breadth and depth of lexical knowledge (Zhang, 2024; Simonnet, 2025).

In addition to the international research on AI-assisted vocabulary learning, Ukrainian scholars have begun to examine the role of artificial intelligence and digital technologies in foreign language education. For example, Davydiuk, Marusych, and Dierniaieva (2025) explored the impact of AI as a transformative factor in language teaching, emphasizing that AI tools can enhance individualized learning pathways, provide automated feedback, and support varied communicative activities in the classroom. Their work highlights the importance of balancing human instructional strategies with AI-mediated tasks, noting that AI can improve critical thinking and linguistic autonomy if used in pedagogically informed ways. Similarly, research by Humeniuk (2024) analyzed the use of AI-generated content, including GPT-based chatbots, as a tool for enhancing students' overall linguistic competence, demonstrating that interactive AI applications can assist in language practice, error correction, and contextual meaning-building, which are essential for both lexical and communicative development in language learners. These Ukrainian studies broaden the existing theoretical discourse by considering local educational contexts and teacher perspectives alongside empirical and conceptual insights.

Moreover, research conducted within the Ukrainian pedagogical landscape has examined AI in teacher preparation and its implications for future language educators. For instance, Grona and Semenog (2025) investigated the experiences of pre-service foreign language teachers with AI technologies in language training courses, finding that AI-based tools can support not only vocabulary acquisition but also pedagogical decision-making and

reflective practice. Their findings suggest that when integrated thoughtfully, AI tools can contribute to the development of critical pedagogical competencies, such as task design, assessment literacy, and adaptive instruction, thereby preparing future teachers to effectively select and implement educational technologies in diverse learning settings. Research from the Western Ukrainian National University also points to the potential of AI in supporting translation tasks, justified feedback, and enhanced interaction in foreign language learning, while also addressing challenges such as academic integrity and critical engagement with AI content (Rybina, Koshil & Hyryla, 2025). Collectively, these Ukrainian studies extend the global literature by foregrounding localized educational practices, linguistic diversity, and teacher development in AI-enhanced language education.

Despite the growing body of research supporting the pedagogical benefits of AI-based tools, there are various challenges and limitations associated with their use in language learning contexts. For instance, some scholars such as Rocklage (2023) and Karimova (2024) note that the integration of AI technologies may inadvertently shift the focus from meaningful linguistic engagement to surface-level interaction with language forms, especially if learners rely on AI for quick answers without deeper cognitive processing or conscious attention to lexical structures. This concern is echoed by educational researchers who argue that AI systems, particularly those based on generative models, occasionally produce content that lacks cultural or contextual sensitivity, which can lead to misconceptions or reinforce stereotypes if learners are not provided with sufficient human guidance and critical evaluation skills (Buddemeyer, Walker & Alikhani, 2021; Ponomarenko, Tymchenko & Neustroeva, 2024). Such findings suggest that learners may benefit from employing enhanced critical thinking and reflective strategies when interacting with AI tools, rather than relying solely on them as sources of lexical information.

Moreover, practical and institutional challenges have been identified in the broader educational literature on AI adoption, which directly affect its implementation in vocabulary instruction. Research examining the use of AI in foreign language teaching in higher education highlights that technical and methodological issues, such as insufficient teacher preparation, lack of teacher digital literacy, and limited availability of high-quality, language-specific AI resources, can hinder effective integration of these tools into the curriculum (Astapova & Izotova, 2025; Karpova & Bublyk, 2025). Ukrainian studies on AI in education also emphasize that the presence of AI should not replace but rather augment traditional pedagogical roles, as learners still require structured guidance, critical feedback, and pedagogical scaffolding that only trained educators can provide (Astapova & Izotova, 2025; Ponomarenko, 2024).

Summarizing all the information, we can highlight that the academic literature on AI-based learning tools has revealed the emergence of several contrasting themes. While the benefits of AI in fostering lexical competence are widely recognised – particularly through personalization, gamification, and context-aware tasks – the generalisability of much published research on this issue is problematic. Nonetheless, it is now well established from various studies that AI-assisted interventions can provide meaningful support for vocabulary acquisition, provided that the materials are authentic, learners are guided appropriately, and individual differences are considered (Simonnet, 2025; Zhao, 2023; Huang, 2025). Previous research has explored the relationships between learner motivation, engagement with AI tools, and lexical outcomes, demonstrating a close linkage between these factors. Similarly, studies have highlighted that AI-based vocabulary learning can be effectively integrated into blended or hybrid instructional models, complementing traditional methods while enhancing personalized and adaptive learning opportunities (Chen & He, 2022; Lee & Lee, 2021). Emerging research also explores the integration of AI tools with mobile-assisted language learning (MALL) environments, which further expands opportunities for on-the-go vocabulary practice and personalized scaffolding (Zhang, 2024).

Altogether, the literature suggests that AI-powered learning tools have significant potential to enhance lexical competence by providing personalized, adaptive, and context-aware support, promoting learner motivation and autonomy, and offering multimodal input for meaningful interaction with lexical items. The convergence of theoretical frameworks, including the lexical approach, input processing, noticing hypothesis, and sociocultural theory, provides a strong rationale for the pedagogical use of AI in vocabulary learning. At the same time, the literature underscores the importance of carefully selecting AI tools and integrating them thoughtfully into curricula to mitigate potential limitations and ensure that learners achieve optimal outcomes in lexical competence development. Future studies are increasingly focusing on hybrid models, combining AI-assisted exercises with teacher-led instruction, to balance technology-mediated learning with human guidance and social interaction (Lee & Lee, 2021; Simonnet, 2025).

Methodology and Procedure

This study was conducted in 2025 at a secondary school in Nizhyn, Ukraine, in the 11th-grade class with 14 students aged 15 and 16. The study took place in a multi-level ESL classroom with a mix of different learning styles and researches. The lessons lasted 45 minutes 4 times a week. Based on the observation of the class and speaking with students, most of them

had an upper-intermediate (B2) level of English, and some of them had an intermediate (B1) level.

The research was conducted in five main stages: the preparatory stage, which involved identifying the problem, formulating research questions, analyzing the curriculum, and selecting appropriate AI-based resources; the practical integration stage, where AI tools were used during lessons for introducing, practicing, and consolidating vocabulary through interactive tasks; the data collection stage, which included pre- and post-tests, observations, and questionnaires for both students and teachers; the data analysis stage, involving statistical processing of quantitative data and qualitative evaluation of observations and open-ended responses; and the final stage, which focused on summarizing findings, drawing conclusions about the effectiveness of AI-assisted vocabulary learning, and providing recommendations for future research and classroom practice.

In the first (preparatory) stage the task was to find the problem and formulate the main questions for the research. This stage included an analysis of the school curriculum of 11th-grade students, emphasizing lexical material recommended for study in the 11th form. It was identified and examined for the use of key lexical items, and a range of vocabulary-based tasks will be created. When choosing AI-based applications and online platforms, the most attention was paid to the following main aspects:

- the presence of target lexical units
- the range and variety of vocabulary provided
- the context of usage (avoiding culturally inappropriate or oversaturated content)
- correspondence of the lexical material to the students' level of proficiency
- motivational and interactive appeal.

Around 13 digital resources appeal to teach target vocabulary, such as phrasal verbs, collocations, and topic-specific word groups.

At this stage, a framework was designed to apply the method of enhancing lexical competence through the use of AI-based tools in the educational process, with reference to curriculum requirements and the number of English lessons scheduled per week. In addition, this stage involved reviewing relevant academic sources to identify effective strategies and activities for integrating this approach. The research employed a mixed-method design, incorporating both qualitative and quantitative aspects. The qualitative part, which included diagnostic tests and students' surveys, made it possible to measure the influence of AI-assisted vocabulary learning and to compare learners' lexical performance before and after the

intervention. The qualitative part consisted of teacher questionnaires aimed at discovering whether they had previously implemented AI technologies in vocabulary teaching and, if so, what outcomes they reported.

The next stage involved the practical integration of AI tools into vocabulary learning. During this phase, a sequence of lessons was conducted in which students engaged in a variety of AI-assisted tasks designed to expand and reinforce their lexical knowledge. Artificial intelligence was applied both at the stage of introducing new vocabulary and at the stage of practicing and consolidating it. Activities were diverse and interactive, making use of digital platforms and AI applications, which helped students to be encourage into the process of learning new information. Examples of such activities include the following:

- interactive drilling with AI chat-bots. Learners practiced new words through repeated use in automatically generated dialogues. The chatbot adjusted the level of difficulty and introduced synonyms or collocations to strengthen retention.
- gap-filling exercises with AI support. Students received texts generated by AI where certain vocabulary items were intentionally omitted. Their task was to listen to or read the material and insert the missing lexical items or to change them into new one.
- lexical transformation. Learners were asked to replace basic vocabulary in sentences suggested by AI with more advanced synonyms, idiomatic expressions, or contextually suitable alternatives.
- matching and categorization. With AI assistance, students grouped new words into thematic or semantic fields (e.g., technology, emotions, education). The program also provided instant feedback.
- error detection. AI-generated texts intentionally contained lexical mistakes or inappropriate word usage. Students had to identify and correct them.
- creative expansion. Learners were prompted by AI to generate their own short stories, dialogues, or examples using target vocabulary, which allowed them to apply words in meaningful contexts.
- speaking with AI chat-bot. Learners tried to create interesting stories with the use of new vocabulary. Chat-bot immediately corrected their mistakes and gave alternatives.

The method was applied consistently, with each lesson structured so that students could interact with AI not only to acquire vocabulary but also to practice using it in communicative situations. This systematic integration ensured that new lexical items were reinforced both receptively and productively.

The following stage involved collecting empirical data to evaluate the effectiveness of integrating AI tools into vocabulary learning for 11th-grade students. A variety of research instruments were employed, including teacher and student questionnaires, pre- and post-tests, as well as classroom observations. These methods aimed to determine both the pedagogical impact of AI-assisted vocabulary instruction and the participants' perceptions of its use.

Pre-testing was conducted to establish the students' baseline vocabulary knowledge before introducing AI-based tasks. The pre-test was specifically generated with the assistance of an AI chat-bot, which created exercises tailored to the students' current level of English (B1–B2) and aligned with the target lexical items identified in the curriculum. The test included a combination of gap-filling and finding an appropriate choice to comprehensively assess both receptive and productive knowledge. To ensure validity, the AI-generated items were reviewed and adapted by the teacher to match the topics and lexical content already studied by the students, such as Food, Healthy Way of Life, My Favourite Lunch.

Post-testing took place after the intervention to measure the learners' progress in mastering new lexical items. The pre-test was specifically generated with the assistance of an AI chat-bot, which created exercises tailored to the students' current level of English (B1–B2) and aligned with the target lexical items identified in the curriculum. The test included a combination of vocabulary recognition, gap-filling, multiple-choice, and context-based usage tasks to comprehensively assess both receptive and productive knowledge. To ensure validity, the AI-generated items were reviewed and adapted by the teacher to match the topics and lexical content already studied by the students, such as Food, Healthy Way of Life, My Favourite Lunch.

Comparing the results of these two testing phases allowed for an assessment of the extent to which the AI-supported approach contributed to vocabulary acquisition and retention.

The pre-test consisted of vocabulary exercises focusing on previously studied topics such as Food, Healthy Way of Life, My Favourite Lunch. The post-test included similar items to check consolidation of the same lexical units, as well as new tasks that assessed the ability to use newly introduced words in context.

An observation method was also implemented both before and after the intervention to evaluate students' active vocabulary use in authentic communicative situations. Observations were conducted during pair and group work, class discussions, and individual speaking or writing tasks to capture a variety of interactions. Particular attention was paid to:

- accuracy – how appropriately students used new words in context;

- range – the diversity and complexity of lexical choices in their speech and writing;
- fluency – the ability to use vocabulary smoothly and logically in spontaneous conversation.

Additionally, observation sheets with predefined criteria and rating scales were used to increase consistency and objectivity. Both quantitative data (e.g., frequency of target word usage) and qualitative notes on students' communicative strategies were used, providing a comprehensive picture of how AI-supported activities influenced active lexical competence. This method allowed triangulation with pre- and post-test results to better assess learning outcomes.

In addition, a student questionnaire was administered to explore learners' attitudes towards studying vocabulary with the help of AI. The questionnaire included questions such as: "Has your motivation to learn new words increased after using AI tools?", "Do you find AI applications helpful for remembering and using new vocabulary?", "Has your confidence in speaking or writing improved after using AI-based activities?", "Would you recommend AI-assisted vocabulary learning to other students?"

The responses provided valuable insights into students' emotional and cognitive engagement with the method. Teachers also completed a separate questionnaire aimed at identifying their previous experience with AI in language teaching and the challenges they observed during implementation.

Combining these data collection tools, such as testing, observation, and surveys, made it possible to conduct a comprehensive analysis of the effectiveness of the experiment. Pre- and post-testing, in particular, proved to be the most informative techniques, offering clear quantitative evidence of students' progress.

During the data analysis phase, all collected information was processed using basic statistical methods. Observation notes and open-ended questionnaire responses were analyzed qualitatively to identify patterns in student behavior, engagement, and lexical improvement. Teacher interviews further enriched the interpretation of results by providing professional perspectives on the use of AI technologies in the EFL classroom. During the interviews, teachers were asked about their prior experience with AI-assisted learning, the challenges they faced while integrating AI tools, their observations of student motivation and engagement, and their perceptions of the impact of AI on students' lexical competence. The interviews also explored teachers' opinions on the appropriateness of different AI applications, suggestions for

improving AI-based tasks, and recommendations for sustainable integration of AI tools into vocabulary instruction. These insights helped cross-check the data from tests, observations, and questionnaires, providing a more comprehensive understanding of the effectiveness and limitations of AI-supported vocabulary learning.

The final stage involved summarizing and interpreting the findings to draw conclusions about the appropriateness and efficiency of AI integration in vocabulary instruction. Recommendations were formulated for further research and classroom practice, emphasizing sustainable and ethical implementation of AI-based language learning.

Before conducting the research, potential challenges and ethical considerations were thoroughly examined. Among the main challenges was ensuring that AI tools corresponded to students' age, proficiency level, and educational goals. Another consideration involved guaranteeing equal access to technology, as occasional power cuts and internet instability could limit the use of AI applications.

Ethical principles were strictly followed: participants were fully informed about the purpose of the study, their consent was obtained, and their privacy was protected. Students could review their results at any time, and all personal data remained confidential throughout the study.

Results

Data collection methods helped obtain the study results of the influence of AI applications on the development of lexical competence of high school students in EFL lessons, particularly 11th graders.

As a result of a questionnaire conducted among teachers to identify their previous experience in integrating artificial intelligence into the teaching of lexicological material, 4 out of 6 respondents reported relying mainly on traditional approaches to vocabulary instruction. Educators note that students are already accustomed to these techniques, and their consistent application supports more effective assimilation of lexical units. At the same time, over half of the surveyed teachers incorporate various interactive practices when working with vocabulary, such as pair and group tasks, role-plays, short video fragments, and similar activities. Although all participants were aware of AI-based teaching tools, most of them still viewed artificial intelligence primarily as a means of enriching and practicing vocabulary rather than a universal method. 2 out of 5 English teachers confirmed that they had experimented with AI tools (such as chatbots or automated vocabulary trainers) during English lessons, yet only one teacher

noted a clear improvement in students' mastery of lexicological material as a result of using such technologies.

Figure 1.

Results of pre-intervention testing

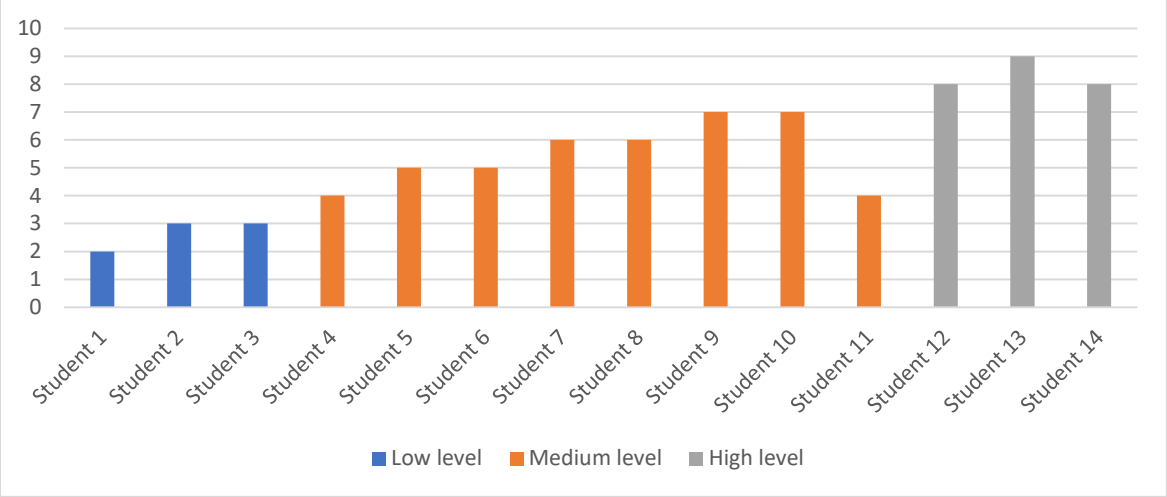

Figure 1 presents the summary of the pre-test outcomes. Based on the collected data, the students' results were categorized into low, medium, and high levels of lexical proficiency. According to the distribution, the low level accounts for 21% (3 out of 14 students), the medium level makes up 57% (8 out of 14 students), and the high level represents 22% (3 out of 14 students). These findings indicate that most learners demonstrated an average understanding of lexical material before the introduction of AI-based instructional tools.

Figure 2.

Results of post-intervention testing

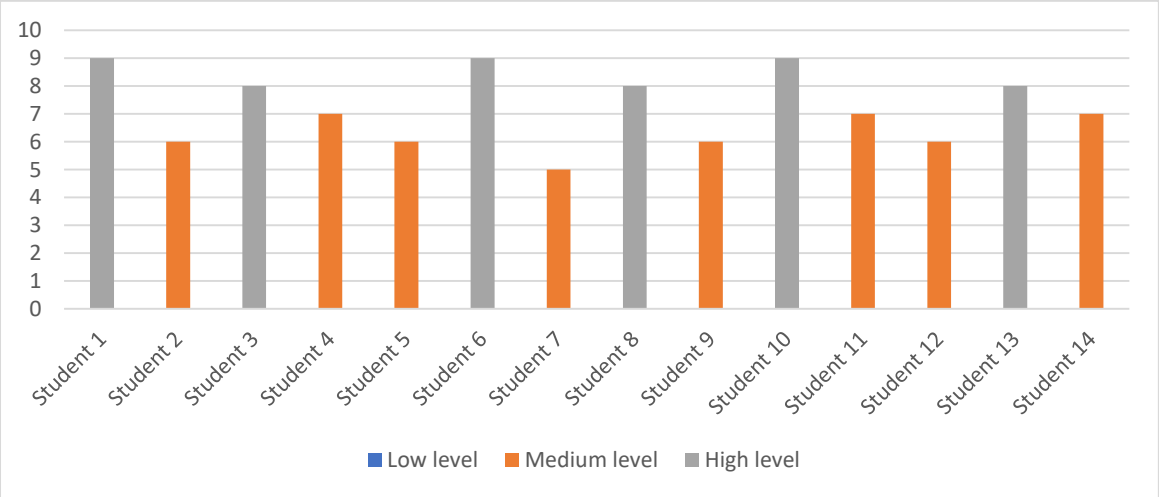

Figure 2 summarises the post-test outcomes. The results demonstrate a clear improvement in students' performance. None of the participants showed a low level (0%), while 57% of students (8 out of 14) reached a general level by correctly completing 5-7 out of 10 questions. A high level was demonstrated by 43% of the students (6 out of 14), who successfully answered 8-10 questions. These results confirm a noticeable positive shift in achievement compared to the pre-test results.

Comparing the pre-test and post-test results, it can be observed that the proportion of students with a high level of lexical proficiency increased by 21%, while the medium level remained stable at 57%, and the low level decreased by 21%. These results suggest a positive shift in lexical mastery, particularly among students who initially performed at the high and low ends of the spectrum. Interestingly, the medium-level group did not show notable progress, which may be explained by their already moderate proficiency, making substantial gains more gradual and less immediately visible. The best improvement was observed in students who initially had a low level, as they were able to move up to the medium category, while some higher-performing learners further consolidated their lexical competence. This pattern reflects the differentiated impact of AI-based tools, which appear to support both struggling and advanced learners, though students with moderate proficiency may require more targeted or challenging tasks to demonstrate measurable growth.

Table 1.

Progress before and after the intervention

Level	Before the intervention	After the intervention	Progress
High level	22%	43%	+21%
Medium level	57%	57%	0%
Low level	21%	0%	-21%

The pre-observation results demonstrated that most students experienced difficulties with lexical use in spontaneous oral communication. While many could produce isolated sentences using familiar vocabulary, challenges emerged when selecting appropriate lexical items during unplanned speech. Students with weaker proficiency levels relied primarily on simple and high-frequency words, and when attempting to use more advanced vocabulary–

such as idiomatic expressions, collocations, or topic-specific lexical units, they often hesitated, demonstrated prolonged pauses, or reformulated their sentences.

Despite these challenges, approximately one third of the learners showed relatively strong lexical performance during the pre-observation stage. These students attempted to incorporate a wider range of vocabulary, including multi-word units and more sophisticated lexical items. Their speech demonstrated greater fluency and accuracy, although even strong students tended to revert to simpler vocabulary during spontaneous interaction.

Following the AI-based intervention, notable improvements in learners' lexical performance were observed. Students who had previously struggled to retrieve appropriate words began to demonstrate fewer hesitations and more accurate word choice. The number of inappropriate pauses decreased, and overall fluency increased, which may indicate greater confidence in using newly acquired lexical items.

Additionally, several students began to self-correct lexical mistakes, showing increased metalinguistic awareness. Although errors were still present, learners demonstrated more active attempts to use target vocabulary and broaden their lexical range. Overall, the post-observation results suggest a positive shift in the development of lexical competence among 11th-grade students. While the progress was moderate, students showed more confidence in selecting, using, and integrating lexical units into oral speech.

Table 2.

Results of the Observation

	Before intervention	**After the intervention**
Accuracy of language use	58%	69%
Range and complexity of language use	42%	51%
Fluency and coherence	49%	61%

According to the updated data presented in Table 2, students demonstrated encouraging progress in the use of lexical units during oral speech. The accuracy of lexical use increased by 11%, which indicates that learners became more precise in selecting appropriate vocabulary items after the intervention. The range and complexity of vocabulary improved by 9%, suggesting that students began to incorporate a wider variety of lexical units, including more complex expressions and topic-specific words. Additionally, fluency and coherence increased

by 12%, reflecting a more confident and smoother use of vocabulary in spontaneous communication.

Although the improvement is moderate, it nevertheless confirms the positive influence of AI-based learning tools on the development of lexical competence among 11th -grade students.

Table 3 presents the results of the students' questionnaire administered after the implementation of AI-based lexical learning tools. According to the data, most students expressed a positive attitude toward integrating artificial intelligence into vocabulary learning, which further supports the effectiveness of this approach.

Table 3.

Results of the students' post-intervention questionnaire

Students' answers	N	%
I feel my interest in learning new vocabulary has increased	12	86%
It is easier for me to learn and remember new lexical items through AI-based tools	11	79%
I find it easy to learn vocabulary both through traditional methods and AI-based tools	4	29%
I believe that AI-based tools are an effective way to build lexical competence	10	71%
I still experience difficulties learning and using new vocabulary	2	14%
I learned lexical items that were previously difficult for me	11	79%
It became easier for me to use new vocabulary in oral speech	7	50%
I would recommend AI-based vocabulary learning tools to other students	12	86%
I was not interested in learning vocabulary through AI-based applications	1	7%

Summarising the findings from Table 3, most 11th -grade students reported an increase in their interest in learning new vocabulary after the introduction of AI-based tools. Learners noted that acquiring lexical items became more accessible and engaging, and a large proportion believed that artificial intelligence is an effective means of developing lexical competence. More than half of the students indicated that it became easier for them to incorporate new vocabulary into oral speech, and the majority stated they would recommend this method to others. However, the data also revealed that a small number of students still experienced

difficulties in mastering new lexical items, indicating that while AI-based tools are beneficial for most learners, they may not be equally effective for everyone.

Moreover, the analysis of students' performance revealed that the AI-based intervention helped to reduce discrepancies between higher- and lower-performing learners. Students who initially demonstrated weaker lexical competence were able to reach a more comparable level to their peers in several tasks, indicating that adaptive AI exercises provided individualized support that catered to different proficiency levels. Additionally, collaborative activities facilitated by AI, such as group chat exercises or paired dialogue simulations, encouraged peer interaction and mutual scaffolding, allowing students to learn from each other while practicing new vocabulary. These outcomes suggest that AI tools not only enhance individual lexical acquisition but also positively influence classroom dynamics and collaborative learning.

Discussion

The results of the study confirm that AI-based learning tools can positively influence the development of lexical competence among high school students in EFL lessons. Analysis of quantitative and qualitative data demonstrated noticeable improvements in learners' vocabulary knowledge, accuracy, range, and fluency following the intervention. These outcomes align with contemporary perspectives on technology-enhanced vocabulary learning, which emphasize the value of adaptive feedback, personalized learning pathways, and interactive tasks as crucial mechanisms for deepening lexical acquisition (Zhang, 2024; Simonnet, 2025; Huang, 2025). The findings of this study further support the assertion that AI tools, when used thoughtfully and systematically, provide a meaningful enhancement to the language learning process.

A comparison of the pre-test and post-test results reveals a distinct shift toward higher levels of lexical proficiency among the students. Before the intervention, most participants demonstrated a medium level of lexical competence, while only a small proportion reached a high level. After the AI-based intervention, a larger number of students exhibited improved ability to understand, recall, and use vocabulary in meaningful contexts. Notably, the proportion of learners with high lexical proficiency increased, while the number of students with low proficiency decreased. This progress can largely be attributed to the immediate feedback, repeated exposure, and contextually relevant tasks provided by AI platforms, all of which facilitated deeper cognitive processing and better retention of newly introduced words. The dynamic and interactive nature of AI applications allowed learners to encounter vocabulary in varied contexts, enhancing semantic associations and promoting long-term memorization.

Observational data also confirmed the effectiveness of the AI-assisted approach. Initially, a significant number of students faced difficulties retrieving appropriate lexical items during spontaneous oral communication, often hesitating or relying on high-frequency words and basic constructions. Individuals with weaker proficiency levels exhibited longer pauses and more frequent reformulations when attempting to use more complex vocabulary, such as idiomatic expressions or topic-specific lexemes. By contrast, students who already demonstrated higher lexical ability attempted a wider range of words but occasionally reverted to simpler alternatives under time pressure. Following the intervention, a clear improvement in oral lexical performance was observed across most participants. Students hesitated less, selected vocabulary more accurately, and displayed increased fluency, indicating greater confidence in the practical use of newly learned words. These results suggest that AI-supported tasks not only facilitate vocabulary memorization but also help learners internalize and apply lexical knowledge in real communicative situations, reinforcing both receptive and productive skills (Karimova, 2024; Rocklage, 2023).

Questionnaire data further substantiated the positive impact of AI tools on students' attitudes and motivation toward vocabulary learning. A majority of learners reported increased interest in studying new words and described AI-powered activities as more engaging than traditional exercises. They also noted that these tools facilitated the learning of previously challenging lexical items and improved their ability to integrate new vocabulary into oral speech. The non-judgmental environment created by AI applications reduced anxiety associated with making errors and encouraged learners to experiment with unfamiliar words. This affective support aligns with Krashen's (1982) affective filter hypothesis, highlighting the importance of motivation and confidence in facilitating language acquisition. Moreover, the results echo findings by Huang (2025) and Naimanova (2023), who observed that personalized AI interventions enhance learner engagement and promote long-term retention of vocabulary.

The specific tasks employed during the intervention, including adaptive flashcards, dialogue simulations with chatbots, context-aware explanations, synonym–antonym exercises, and AI-generated examples, played a crucial role in lexical development. These activities emphasized the meaningful use of vocabulary, focusing on collocations, lexical chunks, and multi-word expressions. In line with the sociocultural perspective on language learning (Vygotsky, 1978; Lantolf & Thorne, 2006), AI tools functioned as digital scaffolds, providing structured support that allowed learners to operate slightly above their current level of proficiency. The adaptive nature of these tasks ensured that students engaged with vocabulary

at a level appropriate to their individual needs, promoting effective cognitive processing and skill consolidation.

Despite the overall positive outcomes, certain limitations of AI-supported vocabulary learning emerged. While AI tools were beneficial in promoting engagement and practice, they did not consistently provide lexically rich or nuanced input. Some students continued to experience difficulties with idiomatic expressions, low-frequency words, and complex vocabulary, highlighting the need for complementary teacher guidance. Additionally, although most learners demonstrated improvement, a subset of medium-level students showed less progress than expected. This pattern aligns with research indicating that learners with intermediate proficiency may require more structured support and scaffolding to transfer lexical knowledge into productive use (Godwin-Jones, 2019; Huang, 2025). It is also important to note that AI-based interventions are most effective when integrated with traditional pedagogical methods, ensuring that learners encounter authentic, contextually rich language input alongside digital practice.

In terms of addressing the research questions, the study provides clear insights. Regarding the first question, “How can AI-based learning tools be used to enhance lexical competence?”, the findings indicate that AI tools are most effective when embedded in structured, context-rich activities. Platforms offering adaptive flashcards, multimodal explanations, chatbot interactions, synonym–antonym exercises, collocation practice, and spaced repetition were particularly beneficial. Learners engaged most actively when tasks were meaningful, personalized, and applicable to real-life communication. These results support prior research by Zhang (2024) and Simonnet (2025), who highlighted that AI-mediated vocabulary practice facilitates semantic processing and strengthens the ability to recall and use lexical items in varied contexts. The study demonstrates that AI applications can enhance not only memorization but also comprehension, pattern recognition, and integration of vocabulary into authentic discourse.

Regarding the second question, “How does interaction with AI-powered platforms affect students’ ability to use vocabulary?”, the results indicate substantial improvements in confidence, range, and fluency of lexical production. Students hesitated less during spontaneous speech, demonstrated broader lexical repertoire, and self-corrected errors more frequently. These findings align with previous studies emphasizing that technology-assisted language learning supports productive lexical competence and facilitates transfer of knowledge from controlled exercises to communicative practice (Chen & He, 2022; Lee & Lee, 2021).

The combination of immediate feedback, context-aware exercises, and interactive tasks strengthened learners' ability to apply vocabulary in both spoken and written formats.

A key finding of the study is the differential progress among learners with varying initial proficiency levels. In contrast to some expectations, learners with higher pre-test scores demonstrated more measurable gains in vocabulary usage, while medium-level students exhibited moderate improvement and low-level students achieved notable advancement in accuracy but limited expansion of lexical range. This pattern may reflect the scaffolding effect of AI tools: advanced learners could exploit the adaptive and personalized features of the platforms more effectively, whereas learners in the middle proficiency band may require additional teacher mediation to maximize gains. Such findings are consistent with research by Rocklage (2023) and Karimova (2024), emphasizing that AI alone cannot fully substitute for human guidance, particularly when targeting nuanced vocabulary and context-dependent usage.

The observational data provided further insight into the nature of lexical improvement. Prior to the intervention, learners frequently relied on basic, high-frequency words and produced limited collocational or idiomatic combinations. Post-intervention observations revealed an increase in lexical sophistication, with students employing topic-specific vocabulary, multi-word units, and appropriate collocations with greater confidence. Fluency measures, including smoothness of speech, logical sequencing of ideas, and reduced hesitation, improved across most participants. Furthermore, students began to self-monitor their lexical choices and correct errors autonomously, indicating enhanced metalinguistic awareness and self-regulatory skills. These outcomes corroborate previous research showing that AI-mediated learning environments can enhance learner autonomy, metacognitive engagement, and awareness of lexical patterns (Godwin-Jones, 2019; Huang, 2025).

The results also highlighted important pedagogical implications. First, AI tools should be integrated at multiple stages of the vocabulary lesson, including introduction, guided practice, consolidation, and revision, to maximize their effectiveness. Second, teachers should carefully select AI platforms that provide authentic, contextually rich examples and ensure lexical variety. Third, AI-assisted learning should complement, not replace, traditional instruction, especially for low-frequency words, idiomatic expressions, and specialized academic vocabulary. Fourth, sustained engagement with AI tools is critical, as repeated exposure and practice correlate with stronger lexical gains. Finally, teacher training is essential to equip educators with strategies for integrating AI-based interventions effectively and for monitoring student progress in using digital tools (Simonnet, 2025; Zhao, 2023).

While the study demonstrated clear benefits, it also highlighted areas requiring further research. Longitudinal studies are needed to examine retention of lexical items over extended periods and to determine whether gains persist across academic terms. Future research could also investigate the effects of AI tools on specific aspects of lexical competence, such as idiomatic usage, collocational knowledge, and academic vocabulary acquisition. Additionally, the integration of AI with cultural content could provide insights into how learners develop sociolinguistic awareness alongside lexical proficiency. Comparative studies involving different proficiency levels, age groups, and learning contexts would further illuminate the conditions under which AI-supported vocabulary learning is most effective.

In conclusion, the findings of this study contribute significantly to the growing body of research demonstrating that AI-based learning tools can enhance lexical competence in high school learners. The positive effects observed in motivation, accuracy, range, fluency, and confidence suggest that AI applications are a valuable resource in modern language classrooms. When integrated with thoughtfully designed instructional activities and guided by pedagogical principles, AI technologies can create personalized, adaptive, and engaging learning environments that promote meaningful vocabulary acquisition. Importantly, the study underscores the need for a balanced approach that combines AI-based practice with traditional teaching methods, ensuring that all learners, regardless of initial proficiency level, benefit from technology-enhanced instruction. By considering both the advantages and limitations of AI tools, educators can implement strategies that support sustainable and effective development of lexical competence among secondary school students.

Conclusion

The conducted research confirms that artificial intelligence-based learning tools have substantial potential for enhancing the lexical competence of high school learners. The integration of AI-powered platforms into the vocabulary learning process demonstrated clear pedagogical benefits for students, including increased learner motivation, more consistent engagement with lexical material, and improved retention of newly introduced vocabulary items. The adaptive and personalized nature of these tools enabled learners to work at their own pace, interact actively with tasks, and receive immediate feedback, which supported both the receptive and productive aspects of vocabulary acquisition. As a result, students not only memorized new words but also applied them more accurately and confidently in oral and written communication.

The analysis of pre- and post-testing revealed that the intervention led to measurable improvements in lexical proficiency. While the pre-test results indicated that most students were at a medium level, with only a few at a high level, the post-test showed that a larger proportion of students advanced to higher proficiency. In particular, learners demonstrated an increased ability to recall vocabulary, recognize appropriate collocations, and use words accurately in context. Although the group with medium-level proficiency remained relatively stable, it is noteworthy that students who initially struggled with low-level vocabulary achieved noticeable progress, demonstrating that AI-supported instruction can effectively assist learners across different starting levels. The positive shift in lexical performance was further reinforced by classroom observations, which indicated improvements in accuracy, range, and fluency.

Observation results highlighted that students were initially hesitant to use newly learned vocabulary in spontaneous speaking tasks, often relying on simple and familiar words or pausing to search for appropriate expressions. After the intervention, students exhibited fewer hesitations and began incorporating more advanced lexical items, including topic-specific words, collocations, and multi-word units, into their speech. The fluency of their communication improved, as they were able to produce longer and more coherent sentences, while accuracy also increased, reflecting a better understanding of word meanings and appropriate usage. Some students even began to self-correct mistakes, showing enhanced awareness of lexical choices and a growing ability to monitor their own language output.

Feedback from student questionnaires indicated that AI-based activities had a positive impact on attitudes toward vocabulary learning. Most learners reported increased interest in learning new words and found the tasks engaging and motivating. The majority stated that using AI platforms made it easier to remember and apply new vocabulary, particularly in oral communication. Many students highlighted that the immediate feedback and interactive nature of AI exercises encouraged active participation and reinforced learning. At the same time, a small number of students still experienced difficulties with complex or less familiar lexical items, suggesting that while AI tools are highly effective for many learners, some students may require additional guidance and support.

The use of diverse AI-assisted tasks, such as interactive drills, gap-filling exercises, lexical transformations, and chatbot dialogues, contributed to the overall progress observed in the study. These activities provided repeated exposure to new vocabulary, offered contextualized practice, and encouraged learners to explore different ways of using words in meaningful situations. By combining multiple task types, students were able to develop both receptive and productive vocabulary skills, strengthen their confidence in using language

spontaneously, and improve their ability to integrate new lexical items into connected speech and writing.

In summary, the findings demonstrate that AI-based learning tools can effectively enhance lexical competence in high school learners. Students showed clear gains in vocabulary knowledge, range, accuracy, and fluency. The intervention also fostered greater motivation, autonomy, and engagement, as learners were able to interact with the material in a supportive and stimulating environment. While some challenges remained for a few students, the overall results confirm that AI-assisted instruction provides meaningful benefits when thoughtfully incorporated into the curriculum. These outcomes suggest that AI tools can play a valuable role in modern language classrooms, supporting both the acquisition and practical use of vocabulary and creating conditions for sustained and effective language learning.

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Appendices

Appendix A

Samples of activities for developing lexical competence through AI-based learning tools within the intervention.

Sample 1

Give me 10 advanced English words about cooking, food, or eating habits, with definitions and example sentences. Choose 5 words you didn't know. Write your own sentence using each word. Ask AI to check your sentences and suggest improvements.

Example Target Words: Sauté, marinate, simmer, tangy, bland, nutritious, indulgent, cuisine, gourmet, seasoning.

Sample 2

Step 1: Read the Recipe

Recipe: Crispy Lemon Herb Chicken

Ingredients:

- 4 chicken breasts
- 2 tablespoons olive oil
- 1 lemon (juice and zest)
- 2 garlic cloves, minced
- 1 teaspoon dried thyme
- 1 teaspoon rosemary
- Salt and pepper to taste

Instructions:

1. Preheat the oven to 200°C (400°F).
2. In a bowl, marinate the chicken with olive oil, lemon juice, garlic, thyme, rosemary, salt, and pepper for 30 minutes.
3. Place the chicken on a baking tray and bake for 25–30 minutes until golden and crispy.
4. Remove from oven and let it rest for 5 minutes.
5. Serve with a side of vegetables or rice.

Taste: tangy, aromatic, savory, crispy

Step 2: Vocabulary Discovery Task

Instructions for Students:

1. Read the recipe carefully.

2. Find and underline all the words that describe:

- Cooking verbs (actions in the kitchen)
- Ingredients
- Taste or texture adjectives

Step 3: Vocabulary Transformation Task

Instructions:

1. Take the words you underlined.
2. Transform them into:

- Synonyms: e.g., “crispy” → “crunchy”
- Different forms: e.g., “marinate” → “marinated”
- Use in a new sentence: e.g., *“I marinated the chicken in lemon juice yesterday.”*

Optional Extension:

- Rewrite the recipe using your own words but include at least 8 of the new/underlined words.

Sample 3

Text: Eating Habits of Teenagers

Eating habits play a crucial role in maintaining good health, energy levels, and overall well-being. Teenagers, in particular, often have irregular eating patterns due to busy school schedules, extracurricular activities, social events, and personal preferences. Many teens skip breakfast in the morning, which can lead to low energy, difficulty concentrating at school, and even mood swings. Others rely heavily on fast food, snacks, and sugary drinks, which are high in salt, sugar, and unhealthy fats. Over time, these habits can contribute to weight gain, poor nutrition, and reduced physical and mental performance.

On the other hand, balanced eating habits include having three regular meals a day, incorporating a variety of foods such as fruits, vegetables, whole grains, proteins, and dairy products. Drinking plenty of water, limiting sugary beverages, and eating home-cooked meals can improve nutrition and overall health. Sharing meals with family or friends not only encourages healthier eating habits but also strengthens social bonds and communication skills.

Developing healthy eating habits early in life helps maintain long-term physical and mental health. Planning meals in advance, reading nutrition labels, and being aware of portion sizes are additional strategies to support a balanced diet. Teens who eat healthily tend to have better concentration at school, more energy for sports and physical activities, and a lower risk of developing diet-related health problems in the future.

Step 1: Vocabulary Identification

- Underline all words and phrases related to:

1. Food and meals (e.g., breakfast, fruits)
2. Eating habits (e.g., skip, rely on)
3. Health and nutrition (e.g., energy levels, mood swings)

Step 2: Word Transformation

- Choose 5 words or phrases from the text.
- Transform them into another form or synonym.
- Write a new sentence for each.

Example:

- Skip → skipped → *I skipped breakfast yesterday and felt very tired in class.*
- Sugary drinks → sweet beverages → *Sweet beverages should be limited for better health.*

Appendix B

Students' pre-test

Task 1. Match the food-related words with their correct definitions.

Words:

1. Marinate
2. Whole grains
3. Savory
4. Condiments
5. Fermented

Definitions:

a) Foods like kimchi, yogurt, or sauerkraut, produced through natural processes of fermentation

b) To soak food, usually meat or vegetables, in a seasoned liquid before cooking

c) Foods that are not sweet but flavorful, often salty or spicy

d) Products added to food to enhance its flavor, such as sauces, spices, or dressings

e) Unprocessed cereal products like brown rice, oats, or whole wheat

Task 2. Read the sentences carefully and choose the best option.

1. Many teenagers prefer _____ meals because they are quick, but they are often high in sugar and fat.
2. a) processed
3. b) organic
4. c) fermented
5. d) seasoned
6. A diet rich in _____ can improve digestion and provide more sustained energy.
7. a) whole grains
8. b) condiments
9. c) sugary snacks
10. d) savory dishes
11. When cooking chicken, it's recommended to _____ it overnight to enhance flavor and tenderness.
12. a) boil
13. b) marinate
14. c) fry

15. d) serve
16. Soy sauce, mustard, and ketchup are examples of _____.
17. a) ingredients
18. b) condiments
19. c) snacks
20. d) desserts
21. Cheese, bread, and olives can all be part of a _____ platter, which emphasizes taste over sweetness.
22. a) savory
23. b) fermented
24. c) spicy
25. d) sugary

Appendix C

Students' post-test

Task 1. Match the words or idioms with their correct definitions.

Words/Idioms:

1. Gourmet
2. Farm-to-table
3. To have a sweet tooth
4. Umami
5. To leave a bad taste in one's mouth

Definitions:

a) The taste sensation associated with certain savory foods, like mushrooms, soy sauce, or aged cheese

b) Someone who enjoys and appreciates high-quality or sophisticated food

c) A movement emphasizing locally sourced, fresh ingredients prepared and served directly from farms

d) To strongly dislike or feel disappointed about something, leaving an unpleasant feeling

e) A strong liking for sweet foods

Task 2. Choose the best option for each sentence.

1. The restaurant is famous for its _____ cuisine, which combines traditional recipes with high-quality ingredients.

a) fast-food

b) gourmet

c) processed

d) bland

2. Many nutritionists recommend reducing _____, like chocolate bars and sugary drinks, to maintain a healthy diet.

a) indulgences

b) proteins

c) condiments

d) whole grains

3. This dish has a rich _____ flavor because it contains mushrooms, parmesan, and soy sauce.

a) tangy

b) spicy

c) umami

d) sour

4. After trying the undercooked fish at the restaurant, the experience really _____.

a) had a sweet tooth

b) left a bad taste in my mouth

c) was farm-to-table

d) was umami

5. The café promotes _____ products, ensuring all ingredients are fresh and locally sourced.

a) processed

b) farm-to-table

c) indulgent

d) canned

Task 3. Write down a small story from your life, where you had an experience eating something unusual. Use at least 10 new words you have learnt during the lessons.

Appendix D

Observation list

Student Name / ID: _____

Date: _____

Task / Activity: _____

Observer: _____

1. Accuracy

- Correct use of target vocabulary in context
- Correct collocations and phrases
- Correct word form (noun, verb, adjective, etc.)
- Appropriate use of idiomatic expressions
- Minimal interference from first language

Comments / Examples:

2. Range

- Variety of vocabulary used (basic vs. advanced words)
- Use of synonyms to avoid repetition
- Topic-specific vocabulary applied correctly
- Use of AI-suggested vocabulary (phrasal verbs, collocations)
- Incorporation of newly learned words into spontaneous speech/writing

Comments / Examples:

3. Fluency

- Smooth and continuous speech without long pauses
- Logical and coherent use of vocabulary in sentences
- Ability to create meaningful sentences using new words
- Confidence in speaking or writing
- Willingness to experiment with new lexical items

Comments / Examples:

4. Interaction / Engagement

- Actively participates in group/pair work
- Responds to AI feedback or prompts
- Initiates use of new vocabulary without being prompted
- Demonstrates interest in AI-assisted activities
- Collaborates effectively with peers using target vocabulary

Comments / Examples:

5. Overall Notes

- Strengths: _____
- Areas for Improvement: _____
- Observer's Suggestions: _____

Appendix E

Teacher questionnaire on the use of AI in vocabulary instruction

Purpose: this questionnaire aims to explore teachers' experiences, perceptions, and attitudes toward the use of artificial intelligence (AI) tools in teaching vocabulary to high school students.

Section 1. Background and Experience

1. How many years of experience do you have in teaching English?
2. Have you previously used AI-based tools or applications in your English lessons?

   ☐ Yes

   ☐ No
3. If yes, which AI tools or applications have you used for vocabulary instruction? (e.g., chatbots, AI-generated exercises, vocabulary trainers)
4. For what purposes did you mainly use AI tools?

   ☐ Introducing new vocabulary

   ☐ Practising and consolidating vocabulary

   ☐ Assessing students' lexical knowledge

   ☐ Increasing student motivation

   ☐ Other (please specify)

Section 2. Implementation and Challenges

5. What challenges did you face when integrating AI tools into vocabulary teaching? (e.g., technical issues, lack of time, insufficient training, students' digital skills)
6. How easy was it for you to adapt AI-based tasks to students' language level and learning needs?

   ☐ Very easy

   ☐ Rather easy

   ☐ Rather difficult

   ☐ Very difficult
7. In your opinion, what limitations do AI tools have in vocabulary instruction?

Section 3. Student Engagement and Motivation

8. How did students respond to AI-assisted vocabulary activities?

   ☐ Very positively

   ☐ Positively

☐ Neutrally

☐ Negatively

9. Did you notice any changes in students' motivation or engagement when AI tools were used? Please explain.
10. In which areas did students appear to benefit the most from AI-based vocabulary tasks?

☐ Memorising new words

☐ Using vocabulary in speaking

☐ Understanding word meanings in context

☐ Learning collocations and lexical chunks

☐ Other (please specify)

Section 4. Perceived Impact on Lexical Competence

11. In your opinion, how did AI tools influence students' lexical competence?

☐ Significantly improved

☐ Slightly improved

☐ No noticeable change

☐ Negative impact

12. Which aspects of lexical competence improved the most?

☐ Accuracy

☐ Range of vocabulary

☐ Fluency

☐ Confidence in using new words

13. Did you observe any difficulties students continued to experience despite using AI tools?

Appendix F

Students' questionnaire to explore learners' attitudes towards studying vocabulary with the help of AI.

Statements	Agree	Don't agree
I feel my interest in learning new vocabulary has increased		
It is easier for me to learn and remember new lexical items through AI-based tools		
I find it easy to learn vocabulary both through traditional methods and AI-based tools		
I believe that AI-based tools are an effective way to build lexical competence		
I still experience difficulties learning and using new vocabulary		
I learned lexical items that were previously difficult for me		
It became easier for me to use new vocabulary in oral speech		
I would recommend AI-based vocabulary learning tools to other students		
I was not interested in learning vocabulary through AI-based applications		