Artificial Intelligence (AI) In ESL Vocabulary Learning: An Exploratory Study on Students And Teachers' Perspectives

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Abstract

This study investigates the perceptions and implications of Artificial Intelligence (AI) in the context of English as a Second Language (ESL) vocabulary learning. The study primarily focuses on the perspectives of both students and teachers, examining their beliefs, attitudes, and expectations regarding using AI in vocabulary acquisition. It also explores the benefits and challenges of incorporating AI in ESL vocabulary learning. 77 college students and 22 English language teachers at a local university in Pakistan participated in the study. The primary data collection method involves two Likert scale questionnaires (Student-Variant and Teacher-Variant) that serve as quantitative tools to gauge participant opinions. Exploratory analysis was used to validate the questionnaire consisting of eight factors related to AI integration in vocabulary learning: effectiveness and benefit of AI, comfort level with AI tools, advantages of AI over traditional methods, challenges, and difficulties, compared effectiveness of AI usage over traditional methods, trust in AI Recommendations, frequency of AI tool usage, recommendation to peers. A comparative analysis of students' and teachers' responses was displayed in the Venn diagram.

Additionally, an exploratory thematic analysis was carried out on qualitative data gathered by open-ended items in the questionnaire. The findings show that students generally have a positive stance towards AI's role in vocabulary learning. They value AI's personalized and immersive learning experiences, marking it more efficient than traditional methods. However, the study also highlights challenges, including technical issues and a perceived lack of human interaction in AI-assisted learning. Furthermore, teachers' perceptions vary based on age and experience. Younger teachers demonstrate a more favorable to neutral view of AI, appreciating its contribution to efficiency and innovative teaching methods. Conversely, older teachers express resistance, voicing concerns about overshadowing traditional teaching methods and advocating for AI's complementary role in education. The findings from this study may contribute to a deeper understanding of how AI is perceived in vocabulary learning for ESL/ EFL contexts and how it can potentially impact teaching and learning practices.

Keywords*: artificial intelligence (AI), chatbot, teacher, student perceptions, language, and ESL vocabulary learning*

1. Introduction

The recent techno[1]logical advances in artificial intelligence (AI) have resulted in an unprecedented transformation in the field of language learning over the past couple of years

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(Kessler, 2018; Xia, 2022). AI, known as Artificial Intelligence, is the simulation of human intelligence in computer models that are programmed to think and learn like humans and perform tasks such as problem-solving, data analysis, and interpretation (Hassani et al., 2020). Specifically, AI is utilized in adaptive learning systems, socially assistive robots, intelligent tutoring systems, and administrative support systems. These technologies aim to support language learners in improving their linguistic skills, such as reading, writing, vocabulary, oral communication, and grammatical skills (De La Vall & Araya, 2023). In vocabulary learning, AI can take up roles such as personal assistant, teacher, and reviewer for second language (L2) learners and revolutionize conventional learning methods and practices into more innovative and effective learning solutions (Kessler, 2018). However, this area is still in its early phase of exploration. The recent boom in AI chatbots following the release of ChatGPT has proven that AI is the world's future, is going everywhere, and is potentially an extremely powerful ally in education and vocabulary learning. Therefore, it is essential to effectively incorporate it in current vocabulary learning programs and devise efficient classroom strategies that allow L2 learners to get the most out of AI technology regarding their vocabulary learning efforts. Incorporating this cutting-edge technology in education has also had a significant impact, and attempts are ongoing to integrate AI into teaching and learning (Kim & Kim, 2022). Filling this pressing need, the present study generally addresses AI applications in various educational contexts and, specifically, in language and vocabulary learning.

Communication is one of the most critical aspects of human interaction. English has been widely adopted as the official language in most countries and is often regarded as the lingua franca. Researchers have extensively worked on the broad fields of ESL and Foreign (EFL) vocabulary over the years, and the research efforts are now focusing on incorporating modern tools in vocabulary learning. The emergence of Computer Assisted Language Learning (CALL) and Mobile Assisted Language Learning (MALL) have resulted in technological developments, and it would not be a far-fetched thing to assume that AI language learning (AILL) is burgeoning as an entirely new field in L2 learning.

Integrating AI into language and vocabulary learning has great potential to transform conventional teaching regimes positively, which still needs to be explored by future research (Chen et al., 2021; Semerikov et al., 2021). For instance, learners' individualized training and personalized experience are often complex tasks for teachers in the classroom setting, where they have to cater to the needs of multiple students. As a solution, AI-powered LL programs could offer personalized learning experiences to each student, specially curated to their strengths and weaknesses (Gallacher et al., 2018). This could be further complemented by the 24/7 availability of AI-powered vocabulary learning tools, which allows for flexible learning schedules and is particularly beneficial for adult learners with other commitments (Alemi et al., 2015). Similarly, students can employ AI to prepare for their tests and assessments since it could provide the opportunity for immediate, personalized feedback (Lee et al., 2022). The immediacy of feedback from AI tools could also enhance the learning experience for vocabulary learners, which can correct their mistakes and help them learn in real time.

Despite the countless benefits, the use of AI tools happens to have several challenges as well. One of those challenges is the need for more human interaction. While AI can simulate conversations, it has yet to fully replicate the nuances of human interaction, which can limit the development of conversational skills and cultural understanding (Gallacher et al., 2018). Further, like any other tool, the advantages and drawbacks of its usage depend upon the user. In that regard, the use of AI in vocabulary learning has generally obtained mixed reviews from students and teachers. According to the teachers, the most common worrisome implication of AI falls in the domain of plagiarism and unethical practices. Students have been found copying entire assignments from AI tools like ChatGPT, and this has resulted in a bad image of AI tools in the minds of many teachers who need to be more technologically educated. Consequently,

they have no choice but to make significant changes in the assessment methods so that the students can avoid getting an unfair advantage through AI tools. On the other hand, many teachers have identified the potential of AI as a vocabulary learning assistant; therefore, they have urged students to employ AI in their work ethically.

The greatest challenge in AI-powered LL programs is the execution of proper training for students and teachers to employ AI technology effectively in vocabulary learning. Program designers would require special training programs/seminars to introduce AI features to students and teachers and the methodology to use them fully in LL programs. However, before implementing these strategies, there is a solid need to gauge the initial perceptions of students and teachers regarding AI. This study aims to explore students' and teachers' perceptions, beliefs, and attitudes concerning AI, which could greatly assist the program designers in effectively implementing AI-powered vocabulary learning programs.

However, the rapid pace at which AI is advancing necessitates a thorough investigation into the key factors that influence the integration of AI in the instruction and acquisition of ESL vocabulary. With this in mind, the present study seeks to answer the following research questions:

1. What are the attitudes and beliefs of students and teachers towards the use of AI in vocabulary learning?
2. What are the perceived benefits and challenges of incorporating AI in vocabulary learning, according to the students and teachers?

2. Materials and Methods
2.1 Participants

The participants in this study were divided into two groups: the student group and the teacher group.

The student group comprised ($n_s = 77$) university-level students enrolled at a local university in Pakistan. The students' ages ranged from 19 to 21 (M = 19.89, SD = 0.596).

The teacher group consisted of ($n_t = 22$) English language teachers currently teaching at the university. These teachers had various teaching experiences, from novice teachers to those with several years of experience in the field. Their experiences with using AI in English and vocabulary varied, providing a broad perspective on the research questions. A preliminary survey was conducted to collect details about the teacher group, such as their ages, years of English Language teaching experience, and attitudes towards AI in vocabulary education, tabulated in Table 1.

Table 1. Distribution and Attitudes of Teachers Based on Age Towards AI Integration in English Teaching.

Age Slab	Number of Teachers	Average English Teaching Experience (Years)	Average Experience in AI Usage (Years)	Predominant Attitude Towards AI
25-35	8	8.8	3.2	Positive to Neutral
36-45	11	17.7	1.6	Neutral to Slightly Resistant

46-55	3	28.2	0.6	Resistant to Very Resistant

Since the focus of the present study is ESL vocabulary learning through AI, the division of participants into these two groups allows for a comprehensive exploration of the perceptions of both learners and teachers towards using AI from this aspect. This dual perspective is crucial for understanding the perceptions of AI integration with vocabulary learning.

2.2 Data Collection and Analysis

Questionnaires were used to collect data from both groups. Given the context of the study, opting for a paper-based questionnaire over an electronic one was a strategic decision due to the need for more instructional time and the lack of availability of electronic devices in classrooms. In this case, paper-based questionnaires ensured inclusivity and practicality by providing all participants an equal opportunity to respond without relying on external tech devices or internet access.

The items were crafted to address the research questions about the attitudes and beliefs of students and teachers towards using AI in vocabulary learning and the perceived benefits and challenges of such integration. Therefore, the items were similar for both groups, except they were asked from the participant's point of view. The student group answered the Student-Variant Questionnaire, whereas the teacher group's participants responded to the Teacher-Variant Questionnaire. Moreover, three experienced ESL teachers scrutinized and approved the questionnaire items after some modifications.

Both variants of the questionnaire consisted of eight closed-ended items related to AI integration in ESL vocabulary learning: effectiveness and benefit of AI, comfort level with AI tools, advantages of AI over traditional methods, challenges and difficulties, compared effectiveness of AI usage over traditional methods, trust in AI Recommendations, frequency of AI tool usage, recommendation to peers. Likert scale was used to collect the responses from the participants. The scale ranged from 1 to 5, where 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5= Strongly Agree. Finally, both groups answered two open-ended questions for deeper insights.

The rationale behind their selection was multifold. Each question was designed to provide specific information about the primary research objectives. Questions were framed in clear, simple language to prevent misunderstandings. Finally, both closed-ended (for quantitative data) and open-ended (for qualitative insights) questions were used to gather comprehensive feedback from both groups.

In the data analysis, statistical and qualitative methods were employed to interpret the findings from the questionnaires. For the Likert scale responses, the percentages were calculated to discern general trends of responses. Responses were also cross-referenced with demographic data where appropriate. Meanwhile, open-ended questions underwent thematic analysis. Responses were grouped into themes and then interpreted in the context of the present study. This dual approach ensured a comprehensive understanding of both the quantitative data and the more profound sentiments of participants.

3. Results and Discussion

3.1 Student-Variant Questionnaire

Table 2. Results of the student-variant questionnaire

	QUESTIONNAIRE ITEMS	1	2	3	4	5
1	Using AI for vocabulary learning is effective and beneficial for me.	2.6%	5.2%	11.7%	40.3%	40.3%
2	I am completely comfortable with using AI-based tools or apps for vocabulary learning.	7.8%	13.0%	32.5%	35.1%	11.7%
3	I believe the advantages of using AI for vocabulary learning over the traditional method are: faster learning, more personalized learning, better retention, fun and engaging methods, etc.	2.6%	5.2%	10.4%	32.5%	49.4%
4	I have not encountered any challenges or difficulties when using AI for vocabulary learning.	7.8%	20.8%	29.9%	22.1%	19.5%
5	Especially compared to traditional vocabulary learning methods, I consider AI-based vocabulary learning more effective.	5.2%	6.5%	13.0%	50.6%	24.7%
6	I completely trust the vocabulary words or phrases recommended by AI tools.	10.4%	15.6%	24.7%	35.1%	14.3%
7	I often use AI tools or applications for vocabulary learning.	10.4%	15.6%	24.7%	35.1%	14.3%
8	I would recommend AI-based vocabulary learning tools to my peers.	2.6%	2.6%	10.4%	24.7%	59.7%

The Student-Variant questionnaire's results in Table 2 illuminate the students' stance on integrating AI into vocabulary learning. The Cronbach's alpha for the Student-Variant Questionnaire was 0.82, indicating high reliability and internal consistency of results.

To answer RQ1, the data vividly shows that 80.6% of students perceive AI's incorporation in vocabulary learning as effective and beneficial, with an equal distribution of 40.3% each for 'agree' and 'strongly agree.' This aligns with the study by Sumakul et al. (2022), in which participants of English as a Foreign Language (EFL) learners exhibited favorable attitudes toward integrating AI in their classrooms. Furthermore, according to Sumakul et al. (2022), using AI enhanced learners' comprehension of theoretical topics, aided the writing process, and facilitated the acquisition of grammatical structures and vocabulary in their written work. On that note, only a minority, about 19.5%, express neutrality or disagreement.

Talking about students' comfort level using AI tools evinces a more dispersed sentiment. Notably, the perception of easiness is one of many characteristics significantly correlating with students' behavioral intention toward language acquisition through AI (Chen et al., 2021). In the present study, although 46.8% leaned towards the positive side (35.1% agreeing and 11.7% strongly agreeing), 32.5% hovered around the neutral mark, possibly indicating a lack of complete familiarity or confidence with the technology. Since AI in language learning programs is relatively new, those who remained neutral or disagreed may have needed more previous exposure to advanced technological tools or devices and technological knowledge that could apply to vocabulary learning with AI.

Interestingly, 81.9% of respondents concur that AI offers benefits such as quicker, tailored, and immersive vocabulary learning, overshadowing traditional approaches. In this regard, Nong et al.'s (2021) study demonstrated that implementing the AI-assisted language teaching approach

can enhance the overall English proficiency of primary school pupils and the general cognitive capabilities of elementary school students. Moreover, this result also aligns well with De La Vall and Araya (2023), who opines that using AI tools for language learning may have several benefits, such as accelerating the learning process, personalizing it for each student, and exposing them to new cultural perspectives and perspectives. Also, Aihua (2021) emphasizes that AI-assisted language instruction demonstrates cost-effectiveness, enhanced efficiency, and heightened learner engagement. On the other hand, a study conducted by Gallacher et al. (2018) showed that students believe that using AI in the classroom is a "novelty" rather than a valuable tool for language acquisition as it does not allow for the same level of rich interaction and engagement as with human peers. However, AI technology has come a long way since 2018, especially with the free availability of interactive chatbots like ChatGPT that can track user information and adapt accordingly for a personalized experience. Therefore, further research is required to gauge students' perceptions in comparing the learning interaction between AI and humans.

However, on the challenges front, the views spread across the spectrum. While only 41.6% felt they did not encounter significant challenges (22.1% agreed and 19.5% strongly agreed), 28.6% of the participants signified facing some difficulty, and 29.9% stayed neutral. These responses could be due to the need for more awareness of the use of AI and its implications in language and vocabulary learning.

Additionally, in comparing AI with conventional learning methods, 75.3% of students highlighted AI's superior efficacy in vocabulary learning. However, it should be noted that the trust in AI's vocabulary suggestions was more evenly spread out. While 49.4% trusted the recommendations (35.1% agreeing and 14.3% strongly agreeing), 50.7% held reservations, either staying neutral or leaning towards skepticism.

The frequency pattern mirrors the trust metrics, with 49.4% acknowledging their frequent use of AI tools (35.1% agreeing and 14.3% strongly agreeing) and 50.7% being neutral or dissenting. Finally, a positive sentiment emerges in students' willingness to recommend AI tools to their peers, with 84.4% showing approval.

3.2 Teacher-Variant Questionnaire

Table 3. Results of the Teacher-Variant Questionnaire

	QUESTIONNAIRE ITEMS	1	2	3	4	5
1	Using AI for vocabulary teaching is effective and beneficial for my students.	4.5%	13.6%	9.1%	45.5%	27.3%
2	I am completely comfortable with using AI-based tools or apps for vocabulary teaching.	4.5%	22.7%	13.6%	50.0%	9.1%
3	I believe the advantages of using AI for vocabulary teaching over the traditional method are: faster teaching pace, more personalized teaching methods, better retention among students, more engaging and interactive sessions, etc.	4.5%	4.5%	18.2%	54.5%	18.2%
4	I have not encountered any challenges or difficulties when using AI for vocabulary teaching.	18.2%	9.1%	18.2%	36.4%	18.2%
5	Compared to traditional vocabulary teaching methods, I consider AI-based vocabulary teaching more effective.	9.1%	13.6%	13.6%	45.5%	18.2%

6	I completely trust the vocabulary words or phrases recommended by AI tools for teaching.	9.1%	27.3%	31.8%	18.2%	13.6%
7	I often use AI tools or applications for vocabulary teaching.	13.6%	18.2%	18.2%	40.9%	9.1%
8	I would recommend AI-based vocabulary	4.5%	9.1%	13.6%	36.4%	36.4%

The results from the Teacher-Variant Questionnaire shed light on teachers' perceptions regarding the integration of AI in vocabulary teaching to answer RQ1. The Cronbach's alpha for the Teacher-Variant Questionnaire was 0.79, indicating acceptable reliability and internal consistency of results.

72.8% of the teachers found that using AI for vocabulary teaching was practical and beneficial for their students, with 45.5% agreeing and 27.3% strongly agreeing. However, a % of teachers, amounting to 18.1%, expressed reservations, while 9.1% remained neutral. Research shows that AI offers efficiency and convenience for language learning, and for these features, it has exceptionally among its users (De La Vall & Araya, 2023).

Teachers' comfort with using AI tools exhibits some divergence. More than half of teachers, 59.1%, showed positive inclinations (50.0% agreeing and 9.1% strongly agreeing) towards comfort level with AI usage. However, 22.7% disagreed, reflecting hesitance or potential lack of technological proficiency. One possible reason could be age and experience in language teaching. The teachers accustomed to the traditional teaching methodologies resist the new technological changes and feel uncomfortable with recent technology. As highlighted in Table 3, this notion is further corroborated by teachers' responses to the open-ended questions, especially experienced teachers. Another reason could be the teachers' lack of training and awareness. Nevertheless, the utilization of AI tools for language and vocabulary instruction is frequently disregarded, and many language instructors lack familiarity with the comprehensive range of research and practical knowledge generated by experts in the technological domain (Kessler, 2018). AI may take time to become a part of teacher training programs and be a challenge for the curriculum designers and policymakers to keep the language teaching stream in the technologically equipped loop; the training programs to incorporate AI in the ESL/EFL teaching methodologies are required (Nazaretsky et al., 2022).

For the third item, the majority, 72.7%, concurred that AI offered pronounced advantages over traditional teaching methods, underscoring aspects such as a faster teaching pace and enhanced student engagement. However, the responses indicate a mixed bag regarding challenges. While 54.6% have yet to face significant challenges or are neutral, 27.3% of teachers experienced difficulties integrating AI into their teaching practices. These findings may indicate that AI is expected to advance in ESL vocabulary learning. It is imperative to utilize these resources to optimize language teaching and learning to leverage technologically-equipped learners and the rapid emergence of various technologies such as language learning media, AI, and augmented reality (Kessler, 2018). However, it should be noted that AI integration in vocabulary learning depends on its usage because of the users. i.e., teachers and students must be adequately trained (De La Vall & Araya, 2023). Studies reveal that the potential benefits and applications of AI cannot ensure that teachers are likely to be competent enough to implement it effectively and enhance the quality of their teaching (Kim & Kim, 2022), and teacher's attitudes towards AI and its applications (Fernández-Batanero et al., 2021).

63.7% of respondents leaned towards AI's superiority over traditional teaching methodologies for vocabulary, with 45.5% agreeing and 18.2% strongly agreeing. However, a segment of

36.3% showcased reservations or remained neutral. These responses align with Alemi et al. (2015), who recommend that teachers and educators include technology in language learning materials. As Kessler (2018) asserts that the use of technological tools such as AI has become a part of daily lives and learning to use these gadgets is a "societal norm" (p.2), AI integration in ESL vocabulary learning appears to be appealing for students and teachers, and this study calls for more in-depth future research in this area.

For teachers, trust in AI recommendations is a contentious area. A combined total of 59.2% either remained neutral or showcased dissent towards fully trusting AI's vocabulary recommendations, hinting at a need for further validation or corroborative methods. The data reveals a bifurcated approach. While 50.0% of the teachers acknowledged employing AI tools frequently or occasionally for vocabulary teaching, an equal segment was more cautious or less frequent. Recent research highlighted that in this technological era, it can be challenging to decide which materials, technologies, or websites would be most appropriate for a particular lesson, task, or objective, even for individuals who tend to experiment with developing technology (Kessler, 2018). This may be a reason for this almost equal distribution of the respondents.

A noteworthy 72.8% of teachers were positive about recommending AI tools to their counterparts, signifying an overarching optimism about the technology's potential. Moreover, it is essential that experienced teachers can mentor the incorporation of AI-powered tools into the classroom and impart knowledge and experience to their colleagues who have yet to have that experience (De La Vall & Araya, 2023).

3.3 Comparison of the AI integration perceptions from students' and teachers' perspectives
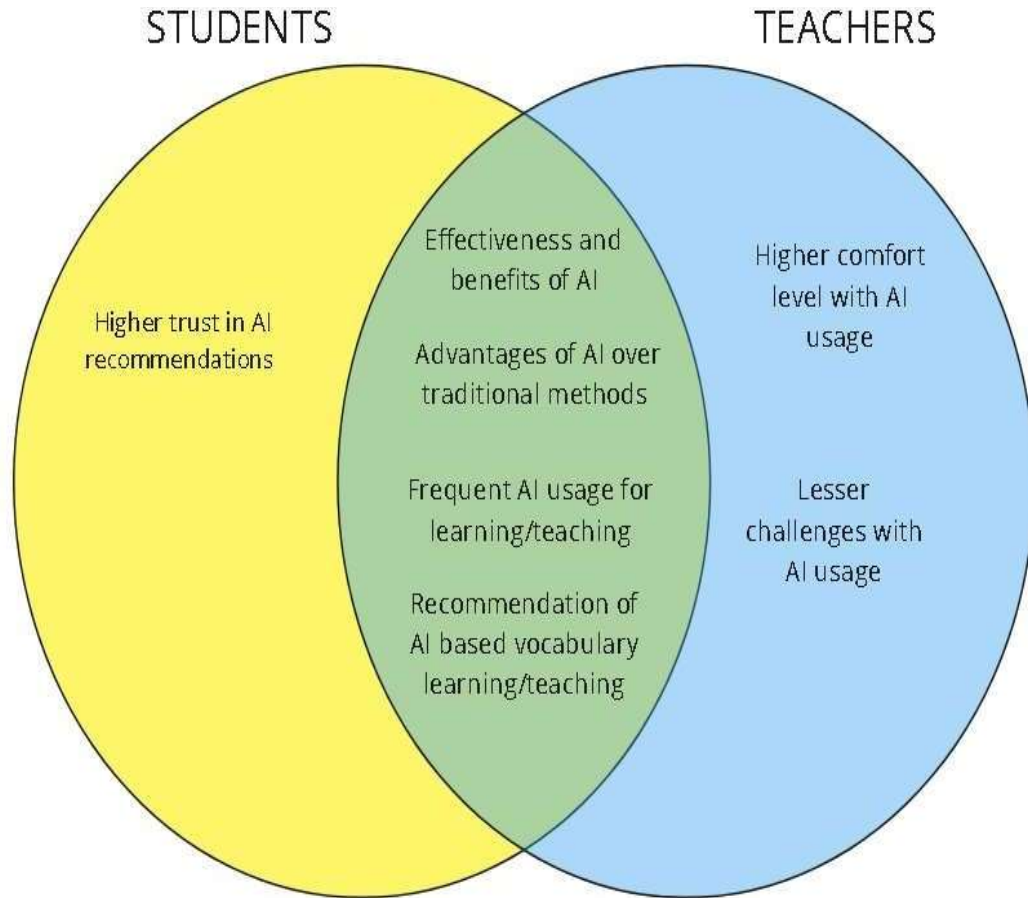
Figure 1. A Venn diagram illustrates students' and teachers' common and uncommon perceptions concerning AI-based vocabulary learning.

The Venn Diagram constructed to represent the perceptions of students and teachers regarding AI in ESL vocabulary learning is a visual embodiment of shared and unique viewpoints. It comprises two overlapping circles, each representing one of the two groups: students and teachers. The overlapping section of the circles delineates the common perceptions of both groups, while the distinct areas highlight the unique perspectives of each group.

In the overlapping section, four main themes emerge, reflecting the shared opinions of students and teachers. Firstly, both groups acknowledge the "Effectiveness and Benefits of AI" in enhancing vocabulary learning experiences. This consensus underscores the recognized value of AI integration in educational contexts. Previous research indicates that teachers and students express positive experiences with AI integration in education (Holmes & Tuomi, 2022; Kim & Kim, 2022; Nazaretsky et al., 2022), language, and vocabulary (Alemi et al., 2015; Kessler, 2018; De La Vall & Araya, 2023).

Secondly, the "Advantages of AI Over Traditional Methods" is another mutual perception, highlighting the superior efficacy of AI in providing tailored and immersive learning experiences. Thirdly, students and teachers report "Frequent AI Usage for Learning/Teaching," indicating a growing acceptance and reliance on AI technology in educational settings. Lastly,

both groups' "Recommendation of AI-based Vocabulary Learning/Teaching" reflects a collective positive attitude toward adopting and endorsing AI tools in vocabulary learning and teaching (Gallacher et al., 2018).

The "Higher Trust in AI Recommendations" theme emerges in the non-overlapping section representing students. This theme indicates that students generally exhibit a higher level of trust in the vocabulary suggestions provided by AI tools. Despite some reservations, many students lean towards trusting AI recommendations, showcasing their confidence in the technology's capabilities. As observed by researchers, students may need more confidence in their abilities to discern wrong and right recommendations, or maybe some students use the prompts well to get the proper recommendations. However, they trust AI powered options, which may provide them with personalized learning experiences in vocabulary learning (De La Vall & Araya, 2023).

Conversely, two distinct themes are observed in the non-overlapping section for teachers. Teachers demonstrate a "Higher Comfort Level with AI Usage," expressing optimism and readiness to integrate AI tools into their teaching practices. This comfort level may be attributed to their experience and familiarity with technology, enhancing their confidence in navigating and utilizing AI tools effectively (Kim & Kim, 2022). Additionally, teachers report "Lesser Challenges with AI Usage," suggesting their adeptness in overcoming or avoiding potential difficulties associated with AI tool utilization.

In conclusion, the Venn Diagram encapsulates the multifaceted perceptions of students and teachers regarding AI in ESL vocabulary learning. It succinctly conveys the commonalities and differences in the viewpoints of the two groups, offering valuable insights for educators, policymakers, and researchers aiming to understand and navigate the landscape of AI integration in vocabulary learning.

3.4 Thematic Analysis

3.4.1 Students' Responses to Open-Ended Questions

Apart from the eight closed-ended questions, the student group was asked two open-ended questions to gain further insights into students' benefits and challenges when employing AI for vocabulary learning. These findings provided considerable details to answer RQ2. The open-ended questions in the Student-Variant Questionnaire were:

1. In your own words, how would you describe your experience with using AI for vocabulary learning?
2. Are there any specific features or aspects of AI-based vocabulary learning tools that you find particularly helpful or problematic?
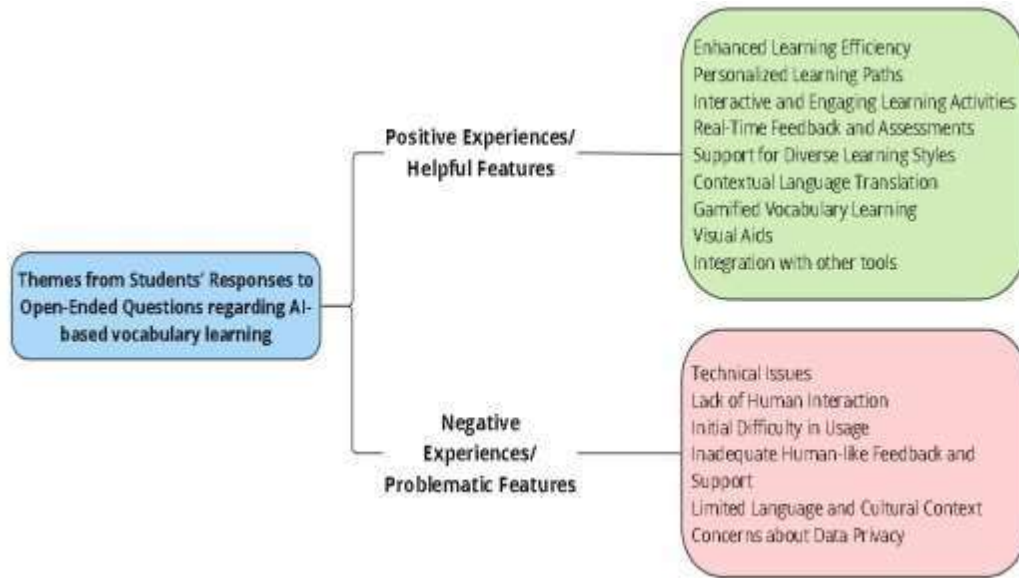
Figure 2. Thematic Analysis of students' responses to open-ended questions regarding AI-based vocabulary learning

Exploring students' experiences and perceptions regarding using AI in vocabulary learning reveals a spectrum of insights. Figure 2 depicts two main themes positive experiences/helpful features and negative experiences/problematic features, encompassing various subthemes. Students often reported positive experiences with AI, highlighting the enhanced learning efficiency and personalized learning paths facilitated by AI tools. The ability of AI to provide personalized and adaptive learning experiences contributes to improved vocabulary acquisition, aligning with the findings of a study that examined the effect of an AI-based application on English vocabulary learning, showing positive results despite some limitations (Pei-Lin Liu & Chiu-Jung Chen, 2023). Furthermore, the subthemes of interactive and engaging activities with real-time feedback were common among students' responses. Some students felt that AI-based vocabulary learning provided support for various learning styles. A couple of exciting responses also mentioned gamification of vocabulary learning through AI. Visualization aid through AI and integration possibilities with other tools through Application Programming Interfaces (API) were also mentioned by some students as helpful features.

However, the negative experiences reported by students cannot be overlooked. Although rare, technical issues and server/internet-related disruptions were felt as negative experiences by several students. Secondly, the perceived lack of human interaction emerged as a significant concern, and students' responses included a "lack of human touch" and a "lack of human teacher-like feedback." Some students found using AI for vocabulary learning complex, possibly due to a lack of training or comprehensive tutorials. In this regard, students highlight specific challenges, including a "lack of customization options" and "initial difficulty in navigation and usage of ai tools". These issues underscore the need to develop more user-friendly and customizable AI tools for vocabulary learning. Furthermore, several responses were related to the lack of cultural and language context when using AI for vocabulary learning, and a few responses were concerned about data privacy.

Despite these challenges, a segment of students reports neutral experiences, acknowledging both the advantages and limitations of AI in vocabulary learning. This balanced perspective reflects an understanding of the multifaceted nature of AI integration in educational contexts.

The insights gained from students' responses underscore the importance of addressing the challenges and limitations of AI tools while leveraging their benefits to enhance vocabulary learning experiences. Continuous research and development efforts are essential to optimize the integration of AI in vocabulary learning, ensuring that it effectively meets students' diverse needs and preferences.

3.4.2 Teachers' Responses to Open-Ended Questions

Like the student group, the teacher group answered two open-ended questions to gain further insights into changes in teaching dynamics and suggestions they would like to see in AI-based vocabulary teaching. These findings provided teachers' perspectives in detail to answer RQ2. The open-ended questions in the Teacher-Variant Questionnaire were:

1. How do you feel AI has changed the dynamics of teaching vocabulary, if at all?
2. Are there specific suggestions or improvements you'd like to see in AI-based vocabulary teaching tools?

Teachers Responses to Open-Ended Questions (Categorized according to age slabs)			
Themes	**25-35**	**36-45**	**46-55**
Change in Teaching Dynamics	Increased efficiency and automation Enhanced student engagement More opportunities for innovative teaching methods	Concerns about the diminishing role of traditional teaching amidst AI integration Concerns about overdependence on technology Willingness to adapt to AI tools, albeit at a slower pace	Preference for traditional teaching methods and resistance to significant changes in teaching dynamics Limited comfort and familiarity with AI tools, leading to minimal usage Desire for AI to play a complementary rather than a dominant role in teaching
Challenges and Concerns	Younger teachers may face challenges in navigating technical issues and ensuring the smooth integration of AI tools. Ensuring that the use of AI does not overshadow the essential human interaction in teaching	Some teachers in this age group may resist adopting new technology, leading to challenges in effective AI integration. Worries about becoming overly dependent on AI and the potential loss of traditional teaching values	Limited familiarity and comfort with AI tools can lead to reluctance in using them effectively. A strong preference for traditional teaching methods over AI integration
Suggestions for Improvement	Availability of enhanced technical support to assist in navigating and resolving technical issues efficiently AI tools need to incorporate more interactive aspects to engage students during learning sessions.	Training and Workshops to help teachers become more comfortable and adept at using AI tools. More focus on achieving the balance between AI and traditional teaching methods to ensure that AI complements rather than replaces traditional teaching methods.	More Simplified User Interface to make AI tools more accessible and user-friendly for teachers with limited familiarity with technology. AI platforms need to provide clear and comprehensive guidelines for effective usage in educational context.

Figure 3. Teachers' responses to open-ended questions categorized according to three age slabs

From the teachers' responses, three predominant themes emerge across different age slabs of teachers: Change in Teaching Dynamics, Challenges and Concerns, and Suggestions for Improvement. Figure 3 delineates the nuanced perspectives of teachers within the age brackets of 25-35, 36-45, and 46-55, offering a comprehensive insight into their experiences and viewpoints.

a) Change in Teaching Dynamics

Teachers in the 25-35 age bracket highlighted the augmented efficiency and automation brought about by AI. They acknowledged the enhancement in student engagement and the emergence of innovative teaching methods. A teacher noted, "I've noticed a significant boost in efficiency. Automated tasks allow me to focus more on interactive teaching." However, for the 36-45 age group, the shift in teaching dynamics elicited mixed reactions. Concerns about

the diminishing role of traditional teaching and overdependence on technology were prevalent. A teacher from this group expressed, "I find it hard to trust AI completely. I'm used to traditional methods, and this shift isn't easy for me." Another teacher responded as: "Although AI is new for me, I am excited to employ it in my teaching style and see what I can do with it for my students". The 46-55 age group predominantly preferred traditional teaching methods, limited comfort with AI tools, and a desire for AI to complement rather than dominate the teaching process. A senior teacher with the English Language teaching experience of 21 years answered, "I believe in the human touch in teaching. AI can assist but should not dominate the teaching process." Interestingly, one senior teacher aged 49 responded, "I remember the days when the internet was a new thing. Times are changing, and technology has become an important part of our lives. Therefore, we need to happily accept the change. Using AI to teach is definitely very difficult for me, but one must never stop learning."

b) Challenges and Concerns

Younger teachers in the age of 25-35 articulated responses discussing challenges in navigating technical issues and mentioned ensuring that AI does not overshadow essential human interaction in teaching. Quotes such as "Technical glitches can be a hurdle. It's crucial to have robust support to resolve these issues promptly." and "It's good to see technology becoming a part of education, but we shouldn't let the human aspect of teaching erase as a result of it.", show these concerns. The middle age group highlighted resistance to new technology and concerns about over-dependence on AI. A teacher stated, "Overdependence on AI is a concern. It's important not to lose the essence of traditional teaching. "The concern about over-relying on technology seems to be common between the young and middle-aged teachers. The older age group emphasizes limited familiarity with AI tools and strongly prefers traditional methods. They expressed resistance to change, especially at the end of their career. A teacher humorously responded noted, "I'm not very familiar with AI tools, and it feels overwhelming to learn them at this stage. I can't even use my iPhone to its fullest. I think I've gotten old ". Another senior teacher sternly responded, "I believe there's no room for AI-assisted teaching in my teaching style. I prefer to be direct, straight and engage students with my own ideas, and I'll continue to teach this way".

c) Suggestions for Improvement

Suggestions from the young teachers' group included enhanced technical support. A teacher suggested, "Having a dedicated technical support team for AI tools would make the integration much smoother." Moreover, "I really think that if you want to learn a language, you need to be creative. I would love to see more interactive AI vocabulary apps personalized for each of my students to play with, for example it could be some engaging vocabulary learning games, adaptive flash cards, etc. This will surely help them to learn as creatively as possible", a teacher responded, emphasizing the further development of interactive AI apps for vocabulary learning and language learning in general.

The 36-45 age group calls for training, workshops, and a balance between AI and traditional teaching methods. A quote from this group is, "Organizing training sessions and workshops would help us get more acquainted with AI tools and their effective usage." In contrast, the most senior teacher group emphasizes the need for a simplified user interface and clear guidelines for AI tools. A teacher states, "A simpler and more intuitive user interface for AI tools would encourage more teachers like me to use them."

Conclusion, study implications, and limitations

This study explores the possible integration of AI in ESL vocabulary learning, specifically on eight factors. It concludes that most students and teachers consider integrating AI in vocabulary learning effective and beneficial with personalized learning experiences. However, some factors, such as the comfort level in using AI tools and trust in AI recommendations, show a

more dispersed sentiment among students and teachers. Given several benefits, including enhanced learning efficiency and personalized learning supporting diverse learning styles, the study also highlights the difficulties instructors and students encounter with AI in vocabulary learning, such as technical challenges, the absence of face-to-face communication, lack of human touch, and tendency to over-rely on technology. Another intriguing outcome is the universal call across all age groups of teachers for a balance between AI and traditional teaching methods, highlighting the enduring value placed on human interaction and traditional teaching values amidst technological advancements. The varying levels of comfort and familiarity with AI tools across different age groups of teachers underscore the importance of tailored training and support to enhance the effective integration of AI in vocabulary teaching. The collective insights emphasize the multifaceted impact of AI on teaching dynamics, elucidating the opportunities, challenges, and the path forward for holistic and effective AI integration in education. Moreover, it calls for the pressing need for proper professional training programs for teachers and students to effectively implement AI tools in learning vocabulary.

The study provides valuable insights into the perceptions, benefits, and challenges of integrating AI in vocabulary learning from the perspectives of both students and teachers. Based on the elicited data provided by this study, we suggest the integration of AI in language and vocabulary teaching for ESL and EFL learners based on an ethical framework with precautionary measures taken by policymakers and educators.

The present study has several limitations. Despite the small sample size of teachers and students, these findings exhibit the potential to be extended to a broader and more representative group of teachers, making them worthwhile for further investigation in future research. Furthermore, future research could gauge the effects of AI-based language learning on other aspects, such as grammar, collocation learning, listening, and reading comprehension.

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