Intent Research Scientific Journal-(IRSJ)
ISSN (E): 2980-4612
Volume 4, Issue 12, December - 2025
Website: intentresearch.org/index.php/irsj/index

MODELING THE STRUCTURAL IMPACT OF ARTIFICIAL INTELLIGENCE LITERACY ON VOCABULARY KNOWLEDGE THROUGH LANGUAGE LEARNING MOTIVATION AMONG IRAQI EFL LEARNERS

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Abstract

The present study aimed to "model the structural effect of AI literacy on vocabulary knowledge through language learning motivation among Iraqi learners of English as a foreign language". This study is descriptive-survey and applied and is of correlational type in terms of the relationship between the components under study. The research population is all undergraduate students in the field of English in Iraqi higher education institutions in the academic year 2024-2025, from which a sample of 300 people was selected using the stratified sampling method and based on the proportion of the field and level of education, and the research questionnaire was distributed among them. Data collection was carried out using standard questionnaires. SmartPLS3 statistical software was used to analyze the data and test the hypotheses. According to the results of the model, AI literacy had an effect on the motivation to learn and vocabulary knowledge of the learners. The results also showed that learning motivation could act as a mediator and reflect the effect of AI literacy on learners' vocabulary knowledge. However, the moderating role of AI tools was not significant. This means that AI tools do not moderate the relationship between AI literacy and vocabulary knowledge.

Keywords: Artificial Intelligence Literacy; Language Learning Motivation; AI-Based Educational Tools; Vocabulary Knowledge.

Introduction

Recent advances in AI tools have created many opportunities in which communication limitations can be overcome. In other words, recent advances in technology have affected various fields, including English language teaching, due to its fundamental role. According to studies, technology-based language

ISSN (E): 2980-4612
Volume 4, Issue 12, December - 2025
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learning outperforms traditional methods and therefore has a significant and appropriate impact on the language learning process (Zhang and Huang, 2024). However, learning foreign languages is a challenge for foreign language learners because these learners have a very limited vocabulary (Fajaruddin et al, 2024). In this case, the use of AI tools, which are characterized by elements such as communication programs and language programs, can improve learning motivation and ultimately improve the vocabulary of these people and reduce the challenges faced by language learners. However, the use of AI tools requires literacy in using this technology. AI literacy is a set of capabilities that enable individuals to understand and use AI technologies effectively (Zhang et al., 2024).

In earlier years, the improvement of AI literacy has led to the increased use of this technology in online language teaching as a new approach in the development of new language learning methods (Wang et al, 2024). In other words, studies that have examined the use of AI tools in English language learning have created attractive and motivating opportunities for language learners (Aldawsari, 2024), although this development is not without its unique challenges and limitations. As Syahrin (2024) points out, the integration of AI in teaching English as a foreign language has brought both promising expectations and significant limitations. However, only a few Papers have checked out the AI literacy of language learners in using AI tools and improving their lexicon range in the Iraqi context.

In this regard, the studies of Aprizal, Wachyudi (2024), focusing on the effectiveness of new technological trends such as the Memrise program in vocabulary learning, emphasize the need for further research in diverse learning environments and the technical aspects of these tools. The findings of such studies can contribute to a deeper understanding of how foreign language learners, especially Iraqi students, learn vocabulary in second language contexts. (Jumaa et al., 2024) have also shown in their studies that in learning any language, having an adequate vocabulary plays a fundamental role in mastering that language, which is especially important for students and pupils, because the depth of vocabulary knowledge learned by individuals is a logical and active sign of academic success and can subsequently improve the understanding of more specialized academic texts and lectures. Furthermore, (Zhang et al., 2025) investigated the role of chatbots (LLM) in enhancing second language

ISSN (E): 2980-4612
Volume 4, Issue 12, December - 2025
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vocabulary learning and showed that dynamic interactions with chatbots, understanding sociocultural and contextual aspects, improve language learning. Other studies conducted in the Arab countries of the region (Abdul-Hossein Dakhil) have also emphasized the acceptance of this technology in the field of teaching English as a foreign language and have shown that high AI literacy in language learners makes them remember vocabulary more easily, retrieve it faster, and be motivated to use this vocabulary in conversation and dialogue.

However, due to the newness of the field of AI and the establishment of traditional educational systems, these institutions in Iraq also face many challenges, such as weak digital infrastructure, teachers' lack of readiness for AI-assisted teaching, and sociolinguistic factors that shape interaction with smart learning technologies.

These conceptual gaps necessitate further studies in the field of AI literacy so that it is not only considered as a technical ability, but also as a cognitive, emotional, and socio-digital construct, and it is considered as a factor in the expansion of learners' vocabulary. Consequently, examining the impact of AI literacy on vocabulary knowledge in EFL educational settings in Iraq provides a positive perspective on the role that technological awareness can play in improving individuals' language learning competence. In fact, such research can bridge the diverse fields of AI education, applied linguistics, and digital cognitive learning. The results of this study can also help policymakers and educators design AI-based curricula that can empower learners and finally create continuous, effective, and enjoyable learning experiences.

Theoretical Framework

Over the past decade, English language teaching in many lands where English is a second language has incorporated AI-based technological approaches. This development has made teachers and learners to develop skills in using new technologies that complement traditional language teaching. According to Zhang et al (2024), AI technology has played a significant role in increasing the quality and efficiency of teaching English as a foreign language. Nykyporets et al (2024) stated that AI has changed the language learning environment by influencing the way learners communicate, receive feedback, and get better their vocabulary.

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In the ongoing shift towards technology-based education, AI literacy has become a necessary prerequisite for engaging with technological tools. A wide range of studies have examined diverse forms of literacy. For instance, information literacy, computer literacy, ICT literacy, media literacy, digital literacy, and AI literacy, each reflecting a specific aspect of how learners develop technological competence in the context of English language teaching (Hernández-Marín et al, 2024). Zhang et al (2025) described AI literacy as a multidimensional construct rather than a single technical skill, stating that it includes an understanding of the core principles behind AI, confidence and ability to use AI-based tools, and awareness of the ethical and cognitive implications of such use.

In this study, a digital social-cognitive learning model is proposed and explained to investigate the relationship between AI literacy and vocabulary knowledge. The model assumes that AI literacy facilitates learners' cognitive and meaningful connections with inputs, thereby improving their vocabulary breadth and depth. Specifically, AI literacy supports three mechanisms:

1. Cognitive-relational adaptation: AI simulates human behaviors and reactions and displays them in a multimodal format (visual, auditory, textual) and consolidates vocabulary in learners' language through deep processing.
2. Metacognitive regulation - AI tools analyze language learners' performance, encourage learners to think and monitor their performance, and improve vocabulary retention and learning
3. Social-digital interaction - AI applications enhance contextual learning in learners by establishing adaptive conversations and using authentic language, and in addition improve individuals' vocabulary

This study aims to show how AI literacy levels can improve individuals' vocabulary in English language teaching environments. Learners with low AI literacy may not be able to effectively use intelligent systems, while learners with high AI literacy show better communication, useful word retrieval, and faster semantic integration. Thus, the proposed framework views AI literacy as both a predictor and a facilitator.

Finally, this structure forms the basis of the present study, which aims to determine the direct impact of AI literacy on vocabulary knowledge while also explaining how factors such as learning motivation can play a role in this relationship and improve it.

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Literature Review

In the broader context of foreign language teaching, the adoption of AI-based tools in conventional educational approaches needs a deep understanding of the fundamental concepts of AI, a conscious awareness of their social and ethical implications, and the development of skills that allow learners to effectively interact with AI-supported systems (Allen & Kendeou, 2024). In this regard, increasing AI literacy among language learners is necessary for their practical use of AI-based applications. Despite this growing global emphasis, studies conducted in Iraq have paid relatively little attention to AI literacy as a factor that can develope progress in learners' vocabulary learning.

Within this framework, Zhang et al (2025) examined the multiple links between AI literacy, psychological factors (motivation and anxiety), and communicative orientation in the context of AI-supported English language teaching. Their findings showed that the inclusion of AI tools can significantly enhance learners' learning, stimulate learning motivation, and reduce anxiety. Liu and Xiao (2025) expanded on this perspective and emphasized the pivotal role of AI literacy in improving effective ESL teaching. Jiang (2025) and Kong et al (2025) suggested in their studies that interactive human-AI games should be used in classrooms to reduce anxiety and increase learning. This increases the motivation of the language learner, which can improve vocabulary knowledge and English language learning (SATORI, 2024). Choetal (2025) showed that the use of AI and metaverse in flipped classrooms can improve vocabulary diversity in students and increase their efficiency. In fact, intelligent multi-modal interaction facilitates vocabulary acquisition at a desired speed and conceptual mastery. Razoqey (2024) stated in his study that the use of AI by language learners greatly improves vocabulary growth. This global data shows that advanced AI-based learning environments are not isolated trends, but are significan for changing the structure of language acquisition around the world.

The results of studies conducted in Arab countries also indicated that digital literacy is recognized as an essential skill among Iraqi students to improve vocabulary learning. The results of Al-Badri et al (2024) showed that students with higher AI literacy have a better ability to use digital instructions, decode and derive meaning from them, while students with low AI literacy continue to use traditional methods for learning. Al Oadahetal (2024) also found similar results by studying Saudi and Iraqi institutions, stating that EFL students who

ISSN (E): 2980-4612
Volume 4, Issue 12, December - 2025
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understood the mechanism of AI showed greater engagement and vocabulary retention, indicating that conceptual awareness of AI operations is directly related to linguistic cognition. Sharif (2024), by studying Kurdish learners who were trying to learn English, observed that AI grammar platforms were indirectly related to improving the depth of vocabulary learning and improved vocabulary retention. Similarly, Al-Ali (2025) studied the contribution of AI in increasing the translation skills of Iraqi students and concluded that the use of AI tools can increase the amount of digital interactions of students and thus improve the vocabulary and semantic load of learners. AI literacy also improves reading comprehension, writing, and text interpretation skills.

In the final analysis, all the findings mentioned in the present study have a similar conclusion, stating that AI literacy can ultimately improve English language learning by improving psychological indicators such as self-confidence and learning motivation, as well as increasing the learner's vocabulary and semantic flexibility.

Research Design and Methodology

This research is applied in terms of purpose and descriptive-survey in terms of research method. The statistical population of the research consists of undergraduate students of English language in Iraqi universities in the academic year 2024-2025. A sample of 300 people was selected from these individuals using stratified sampling method and based on the proportion of the field and level of education, and the research questionnaire was distributed among them. The research data collection tool was a standard questionnaire. In this research, the Artificial Intelligence Questionnaire adapted from Wang and Chong (2024), the Zhangtal Language Learning Motivation Questionnaire (2025), the English Vocabulary Knowledge Scale combining the Nation and Schmitt criteria; whose content validity was confirmed by English language education experts in Iraq; and the Checklist for Measuring the Use of Artificial Intelligence Tools for Language Learning from Juma and Atami (2024). In this research, the instruments used were examined using Cronbach's alpha index to measure internal consistency. After confirming the reliability, the collected data were analyzed using structural equation modeling and partial least squares methods, and using PLS version 3 software.

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Research Findings

The results of the analysis are presented in two parts. In the first part, the demographic characteristics of the research variables were examined. Descriptive results showed that the mean (m=3.83) of Artificial Intelligence Literacy (AIL) in the sample was average and above, indicating that most people have a good understanding of using AI tools. In addition, the mean Learning Motivation (LLM) score was 3.67, indicating a strong and continuous motivation to participate in AI-based language learning activities. AIET also showed with a mean of 3.74 that according to self-reported data by the participants, ChatGPT, GoogleTranslate, and Duolingo were the most widely used programs, indicating a high level of familiarity of learners with digital learning environments. Finally, vocabulary knowledge (VK) in the standardized vocabulary development test was 72.45, indicating high competence of learners and acceptable vocabulary.

Then, the distribution of the variables was examined using the Kolmogorov-Smirnov method, and it was determined that the data had a non-normal distribution.

During the second stage, which was the inferential stage of the analysis, the measurement model was thoroughly tested to ensure that the reliability of the instruments used was high. The credibility of the indicators was assessed using the average variance extracted (AVE), however the reliability of the construct was assessed through the composite reliability coefficient (CR). As shown in Table 1, all CR values are greater than 0.7 and all AVE values are higher than 0.5. These results confirm that the questionnaire has satisfactory credibility and reliability.

After that, the reliability of the questionnaire was examined using Cronbach's alpha. In the first step, to obtain an initial estimate of reliability, a pilot sample of 30 questionnaires was distributed and the responses were analyzed in SPSS software. As summarized in Table 1, the alpha values obtained for all variables were greater than 0.70. These results indicate that the instrument used in this study has sufficient and acceptable reliability.

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Table 1. Results of Validity and Reliability Analysis of the Variables

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
AIET	0.765	0.797	0.835	0.532
AIL	0.785	0.808	0.851	0.597
LLM	0.740	0.763	0.816	0.594
VK	0.822	0.849	0.866	0.555

In the subsequent stage of inferential analysis, the quality indicators of the proposed model were carefully assessed. These measures consisted of the coefficient of determination (R^2), the predictive relevance coefficient (Q^2), and the goodness-of-fit index (GOF), which together reflect the overall adequacy and explanatory power of the structural model.

The results obtained from Table 2 show that the coefficient of determination for all variables is an acceptable value and in fact the independent variables have the ability to explain the dependent variable. The quality index of the model (Q^2) for each variable has a value above 0.35, which indicates the high strength of this index. Finally, the GOF index confirmed the goodness of fit of the model.

Table 2. Results of Goodness-of-Fit Assessment of the Model

	R Square	**Q^2**	**GOF**
AIET	----	0.38	0.510
AIL	0.318	0.42	
LLM	0.344	0.40	
VK	0.640	0.39	

In the next step, the research model was fitted. The results of the path analysis showed that AI literacy has a positive and direct effect on the motivation to learn and vocabulary knowledge of the learners, and in fact, it can be said that improving AI literacy among Iraqi learners can escalate their motivation to learn and vocabulary knowledge. Learning motivation is also one of the factors that reflects the effect of AI literacy on learners' vocabulary knowledge as a mediating variable. However, the moderating role of AI tools was not significant. This means that AI tools do not moderate the relationship between AI literacy and vocabulary knowledge.

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Table 3. Results of research hypotheses

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
AIL -> LLM	0.586	0.601	0.052	11.288	0.000
AIL -> VK	0.318	0.315	0.070	4.524	0.000
LLM -> VK	0.135	0.131	0.062	2.185	0.029
AIEL*VK -> VK	0.002	0.001	0.035	0.057	0.954
AIL -> LLM-> VK	0.352	0.349	0.042	8.380	0.000

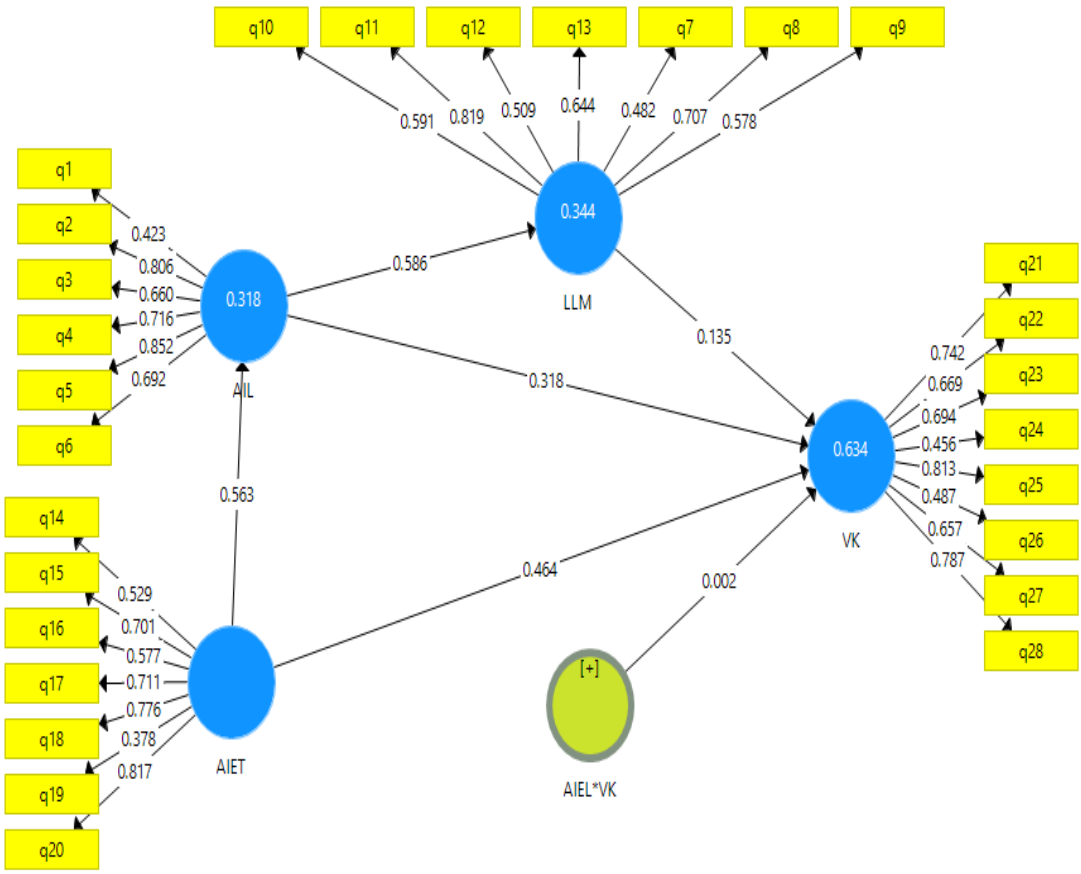

Figure 1. Confirmatory Factor Analysis Using Partial Least Squares (PLS)

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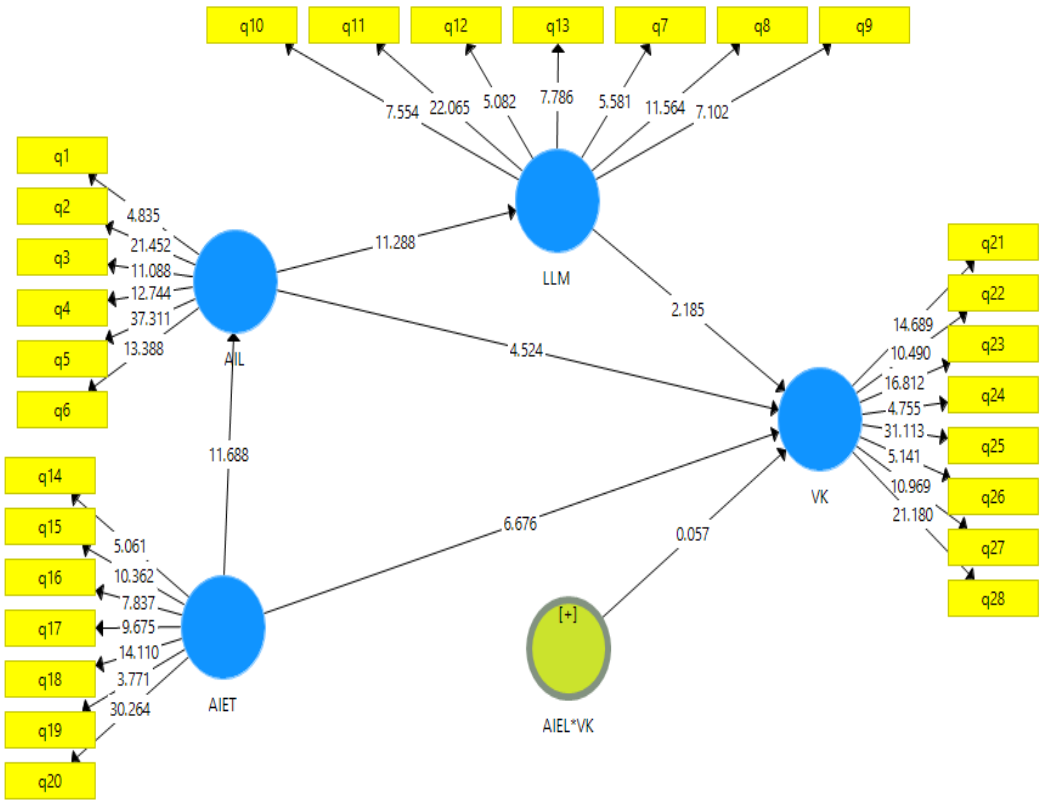

Figure 2. Significance Model of the Study (t-Value Statistics)

Discussion and Conclusion

The present study investigated the structural relationships between AI literacy (AIL), language learning motivation (LLM), AI-based instructional tools (AIET), and vocabulary knowledge (VK) among Iraqi English language learners. The results indicated that the analytic path AIL→LLM was significant and that a higher level of AI literacy led to increased language learning motivation. This analysis confirmed the positive effect of language learning motivation (LLM) on vocabulary acquisition (VK) and highlighted motivation as a key psychological driver in vocabulary development. Furthermore, the mediation analysis revealed that LLM acts as a necessary path linking AIL and VK, indicating that AI proficiency enhances vocabulary knowledge primarily by enhancing learners' motivational engagement.

Conversely, the moderation test showed that the interaction (AIET×VK) was not important; therefore, the moderation hypothesis was rejected. This means that the effect of AI literacy on vocabulary knowledge remained stable and neither

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the presence nor the intensity of AI-based tools changed the direction or strength of this relationship.

According to the results obtained, it can be seen that the findings are in line with Zhang et al (2025) who confirmed the positive impact of AI literacy on learners' self-efficacy and reduced classroom anxiety. The results are also very consistent with the findings of Jomaa et al (2024), whose research showed that the use of AI-based tools such as ChatGPT and GoogleTranslate encouraged Omani students to make more effort to expand their vocabulary. Jiang (2025) and Kong et al (2025) suggested in their studies that interactive human-AI games should be used in classrooms to reduce anxiety and increase learning. This increases the motivation of the language learner, which can improve vocabulary knowledge and English language learning (SATORI, 2024). Choetal (2025) showed that the use of AI and metaverse in flipped classrooms can improve vocabulary diversity in students and increase their efficiency. In fact, intelligent multi-modal interaction facilitates vocabulary acquisition at a desired speed and conceptual mastery

Overall, the findings indicated that higher levels of AI literacy encouraged language learning motivation, which in turn translated into richer vocabulary knowledge among Iraqi learners of English. Thus, learning motivation is not just a simple motivator but also acts as a psychological factor that links technological competence to language development, ultimately reflecting the indirect impact of AI on vocabulary knowledge. These insights provide a compelling conceptual framework that unifies the technological and psychological dimensions of English language learning and justifies the development of AI-based instructional strategies in Iraqi higher education settings.

Practical and Research Implications

Educational Implementation. To enhance English language teaching and learning, Iraqi universities can adopt AI-based platforms – including ChatGPT, Duolingo, and MurfAI – as complementary teaching methods. Such integration will enable students to expand their vocabulary.

Teacher Education. Higher education institutions should develop targeted professional development programs focusing on AI literacy for English language teachers. Through these courses, educators can gain insight into how

ISSN (E): 2980-4612
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AI-related competencies can increase learner motivation and facilitate vocabulary growth, thereby improving overall classroom effectiveness.

Infrastructure and Policy. More broadly, it is recommended that the Iraqi Ministry of Higher Education invest in university digital infrastructure. The availability of technological tools will ensure the sustainable and effective integration of AI into language teaching systems and support national-level innovation in instructional design.

References

1. Abdulhussein Dakhil, T., Karimi, F., Abbas Ubeid Al-Jashami, R., & Ghabanchi, Z. G. (2025). The Effect of Artificial Intelligence (AI)-Mediated Speaking Assessment on Speaking Performance and Willingness to Communicate of Iraqi EFL Learners. International Journal of Language Testing, 1-18.
2. Allen, L. K., & Kendeou, P. (2024). ED-AI Lit: An interdisciplinary framework for AI literacy in education. Policy Insights from the Behavioral and Brain Sciences, 11(1), 3–10.
3. Aprizal, A.D., Wachyudi, K., 2024. The effectiveness of Memrise as avocabulary learning tool. Jurnal Ilmiah Wahana Pendidikan. 10(4), 8–17
4. Aldawsari, H.A., 2024. Evaluating translation tools: Google Translate, Bing Translator, and Bing AI on Arabic colloquialisms. Arab World English Journal (AWEJ) Special Issue on ChatGPT. 237–251. DOI: https://dx.doi.org/10.24093/awej/ChatGPT.16
5. Al-Ali, A. L. (2025). The influence of AI on improving translation skills: A survey study. Wasit Journal for Human Sciences, 21(1/Pt 1), 948–917.
6. Albadri, M. A. S., Dashtestani, R., & Hejazi, S. Y. (2024). Investigating the digital literacy levels of Iraqi EFL university students: Challenges, opportunities, and the status quo. Wasit Journal for Human Sciences, 21(2), 1099–1072.
7. Al-Oadah, E. K., Khodeir, M. M., Alsweed, Z. A., Al-Harbi, F. A., Al-Rashidi, M. A., & Al-Harbi, A. (2024). Perception of artificial intelligence in education at Qassim University. International Journal of Innovative Science and Research Technology, 9(9), 123–130.
8. Fajaruddin, S., Retnawati, H., Setiawan, C., et al., 2024.Technology'simpactonlanguagelearning: Meta analysis on variables

ISSN (E): 2980-4612
Volume 4, Issue 12, December - 2025
Website: intentresearch.org/index.php/irsj/index

and effectiveness. Journal of Ed ucation and Learning (EduLearn). 18(2), 512–525.

9. Hernández-Marín, J. L., Castro-Montoya, M. D., & Figueroa-Rodríguez, S. (2024). Media, information and digital literacy: Assessment instrument analysis. Investigación Bibliotecológica, 38(99), 55–73
10. Jomaa, N., Attamimi, R., & Al Mahri, M. (2024). Utilising Artificial Intelligence (AI) in Vocabulary Learning by EFL Omani Students: The Effect of Age, Gender, and Level of Study. Forum for Linguistic Studies, 6(5), 171–186. https://doi.org/10.30564/fls.v6i5.6968
11. Jiang, Y. (2025). Interaction and dialogue: Integration and application of artificial intelligence in blended mode writing feedback. Internet and Higher Education, 64, 100975
12. Kong, X., Liu, Z., Chen, C., Liu, S., Xu, Z., & Tang, Q. (2025). Exploratory study of an AI-supported discussion representational tool for online collaborative learning in a Chinese university. Internet and Higher Education, 64, 100973.
13. Liu, X., & Xiao, Y. (2025). Chinese university teachers' engagement with generative AI in different stages of foreign language teaching: Aqualitative enquiry through the prism of ADDIE. Education and Information Technologies, 30(1), 485–508.
14. Ma, Q., Chiu, M.M., 2024. Self-regulated and col laborative personalised vocabulary learning approach in MALL. Language Learning & Technology. 28(1), 1–28.
15. Nykyporets, S. S., Pradivliannyi, M. H., Boiko, Y. V., Chopliak, V. V., & K ukharchuk, H. V.
16. (2024) Innovative Techniques in Vocabulary Acquisition for Foreign Language Learning: The Impact of Artificial Intelligence. *Society and National Interests*, 5(5), 113–127. https://doi.org/10.52058/3041-1572-2024-5(5)-113-127
17. Razoqey, A. P. S. M. (2024). The role of using artificial-intelligence Murf application for promoting speaking skill of Iraqi EFL college students. *Journal of the College of Basic Education*, 30(124), 21–38.
18. Syahrin, S., Akmal, N., 2024. Navigating the Artifi cial Intelligence frontier: Perceptions of instructors, students, and administrative staff on the role of Ar tificial Intelligence in education in the Sultanate of Oman. Arab World

ISSN (E): 2980-4612
Volume 4, Issue 12, December - 2025
Website: intentresearch.org/index.php/irsj/index

English Journal (AWEJ) Special Issue on ChatGPT. 73–89. DOI: https://dx.doi.org/10. 24093/awej/ChatGPT.4

19. Shareef, N. G. (2024). Kurdish EFL students' perceptions towards AI-powered platforms for learning English grammar. *Zanco* Journal of Human Sciences, 28(3), 321–333.
20. SATORI, M. (2024). The relationship among motivation, vocabulary learning strategies, and vocabulary knowledge among Japanese EFL learners. *LET Kyushu-Okinawa Bulletin*, *24*, 53-65.
21. Wang, Y.-Y., & Chuang, Y.-W. (2024). Artificial intelligence self-efficacy: Scale development and validation. Education and Information Technologies, 29(4), 4785–4808. https://doi.org/10.1007/s10639-023-11709-8
22. Wang, Y., Liu, M., Zhou, Z., 2024. Enhancing ESP vocabulary learning through ChatGPT:Acase study. In Proceedings of the Society for Information Technology &Teacher Education International Conference; (907 913), March 25, 2024, in Las Vegas, Nevada, United States. Available from: https://www.learntechlib.org/ primary/p/224061/
23. Zhang, Q., Nie, H., Fan, J., & Liu, H. (2025). Exploring the Dynamics of Artificial Intelligence Literacy on EFL Learners' Willingness to Communicate: The Mediating Roles of AI Learning Self-Efficacy and Classroom Anxiety. Behavioral Sciences, 15(4), 523. https://doi.org/10.3390/bs15040523
24. Zhang, H., Zhu, C., Sang, G. Y., & Questier, F. (2024). Effects of digital media literacy course on primary school students' digital media literacy: An experimental study. International Journal of Technology and Design Education, 34(1), 1–17.