

The Impact of AI-Assisted Vocabulary Learning on EFL Students in Chinese Higher Vocational Colleges

Chuanli He

Faculty of Education, Universiti Kebangsaan Malaysia, Jalan Temuan, 43600 Bangi, Selangor, Malaysia. & Faculty of Education, Nanchong Vocational College of Science and Technology, No. 12 Southwest Avenue, Duofu Industrial Park, Xichong County, Nanchong City, Sichuan Province, China (Postal Code: 637200)
ORCID iD: <https://orcid.org/0009-0008-4747-5632>
Email: p119188@siswa.ukm.edu.my

Harwati Binti Hashim*

Faculty of Education, Universiti Kebangsaan Malaysia, Jalan Temuan, 43600, Bangi, Selangor, Malaysia.
ORCID iD: <https://orcid.org/0000-0002-8817-427X>
Email: harwati@ukm.edu.my

Nur Syafiqah Binti Yacob

Faculty of Education, Universiti Kebangsaan Malaysia, Jalan Temuan, 43600 Bangi, Selangor, Malaysia.
ORCID iD: <https://orcid.org/0000-0002-5935-9793>
Email: nursyafiqahyacob@ukm.edu.my

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Abstract: This study examined the impact of AI-assisted vocabulary learning on EFL students in Chinese higher vocational colleges. The study focused on three independent variables: perceived usefulness of AI-assisted vocabulary learning, learning motivation and learning engagement. Vocabulary learning effectiveness was treated as the dependent variable. A quantitative cross-sectional survey design was adopted, and data were collected from 250 EFL students in Chinese higher vocational colleges in Sichuan Province, China. The questionnaire contained demographic items and Likert-scale items measuring the four main constructs. SPSS was used to conduct frequency analysis, reliability analysis, Pearson correlation and multiple regression analysis. The findings showed that AI tools were widely used by respondents, with 60.8% using them often or very often for English vocabulary learning. Reliability results confirmed excellent internal consistency for all scales. Correlation analysis showed strong positive relationships among perceived usefulness, learning motivation, learning engagement and vocabulary learning effectiveness. Regression results confirmed that all three predictors had significant positive effects on vocabulary learning effectiveness, with learning engagement emerging as the strongest predictor. The study concludes that AI-assisted vocabulary learning can enhance EFL vocabulary outcomes when students perceive AI tools as useful, remain motivated and actively engage in learning activities.

Keywords: AI-assisted Vocabulary Learning, EFL Students, Perceived Usefulness, Learning Motivation, Learning Engagement.

1. Introduction

1.1. Background of the Study

English vocabulary knowledge is a central component of English as a Foreign

Language (EFL) development because vocabulary supports reading comprehension, listening recognition, oral expression, writing accuracy and academic communication. According to Leong et al. (2024), vocabulary learning in a higher education context is not only about memorising the meaning of isolated words and the meaning of words in isolation, but also in context with collocations, grammatical patterns, word families, contextual meaning and classical application in communicative contexts. Schmitt (2019) suggests that vocabulary learning is a research need that continues to be a research priority since lexical knowledge influences nearly all aspects of second language competence. Learners in Chinese higher vocational colleges in particular find vocabulary education to be of particular essentiality since courses in English are anticipated to facilitate employability, occupational communication and future professional mobility. However, many vocational students enter college with uneven English foundations, limited learning confidence and insufficient opportunities for authentic English use, making vocabulary acquisition a persistent challenge (Xu, 2023; Zheng & Cui, 2024). Artificial intelligence (AI) has become a noticeable part of language education within recent years.

AI-aided vocabulary learning can feature smart tutoring services, chatbots, adaptive vocabulary applications, automated feedback applications, translation-based systems, speech-based assistants and generative AI systems. According to Kohnke, Moorhouse and Zou (2023), language learning can be facilitated by using chat-based generative AI like ChatGPT, with scaffolding and explanation provided to learners and their specifics in mind, as well as ethical and accuracy concerns to be addressed. Likewise, Huang, Hew and Fryer (2022) discovered that language learning using chatbots could provide pedagogical, technological and social affordances that promote interaction and practice in a first, second and foreign language learning environment. AI-assisted vocabulary learning is also linked to learner perception. Digital tools are more likely to be adopted by students, who believe that they are helpful, pertinent, and beneficial to the learning objectives. Technology Acceptance Model describes that perceived usefulness is a significant predictor of technology acceptance (Davis, 1989). Recent investigations into EFL settings also indicate that learners tend to express positive apprehensions towards AI tools in case they assume that tools can enhance vocabulary learning and efficiency (Alsakaker, 2025; Belda-Medina & Kokošková, 2024). Perceived usefulness can come in the form of faster word comprehension, more readily available examples, better retention and higher confidence in word usage in vocabulary learning.

Engagement and motivation are also crucial. According to Self-Determination Theory, intrinsic motivation and maintaining effort can be reinforced by the learning environment which promotes autonomy, competence and relatedness (Ryan & Deci, 2000). Artificial Intelligence vocabulary tools could help increase motivation by making practice more flexible, personalised and interactive. They can also enhance interaction by enhancing active engagement of learners in terms of frequency and attention as well as their participation. The research on AI-powered language learning technologies suggests that students tend to find AI platforms advantageous since they are personalised, flexible, and provide real-time feedback (Benek, 2025; Dizon & Tang, 2020). Nevertheless, focused quantitative evidence of Chinese higher vocational colleges, specifically in Sichuan Province, where vocational EFLs might not be the same as students in general universities in terms of English background, professional orientation and digital learning needs are still demanded (Harun et al., 2026). Therefore, this study examines how perceived usefulness, learning motivation and learning engagement influence vocabulary

learning effectiveness among EFL students in Chinese higher vocational colleges.

1.2. Problem Statement

Although AI-assisted vocabulary learning is increasingly promoted in English education, its perceived impact on EFL students in Chinese higher vocational colleges remains insufficiently examined. The majority of recent research is concentrated on general university students, teacher students or general language-learning outcomes instead of the effectiveness of vocabulary learning in vocational college settings (Huang et al., 2022; Kohnke et al., 2023). Current studies also reveal that the perceived usefulness, motivation and engagement, determine how learners will accept AI tools but these three variables have rarely been combined in one quantitative SPSS-based study on vocational EFL students (Alsakaker, 2025). This puts a practical or empirical gap: educators can promote AI vocabulary tools, but they might not be aware of which aspects related to learners are the most significant predictors of vocabulary learning success. Thus, the current study examines how the factors of perceived usefulness, learning motivation and learning engagement can influence vocabulary learning effectiveness of EFL students in Chinese higher vocational colleges in Sichuan Province.

1.3. Research Objectives

- To examine the impact of perceived usefulness of AI-assisted vocabulary learning on vocabulary learning effectiveness among EFL students in Chinese higher vocational colleges.
- To determine the effect of learning motivation in AI-assisted vocabulary learning on vocabulary learning effectiveness among EFL students in Chinese higher vocational colleges.
- To assess the influence of learning engagement in AI-assisted vocabulary learning on vocabulary learning effectiveness among EFL students in Chinese higher vocational colleges.

1.4. Research Questions

- What is the impact of perceived usefulness of AI-assisted vocabulary learning on vocabulary learning effectiveness among EFL students in Chinese higher vocational colleges?
- What is the effect of learning motivation in AI-assisted vocabulary learning on vocabulary learning effectiveness among EFL students in Chinese higher vocational colleges?
- What is the influence of learning engagement in AI-assisted vocabulary learning on vocabulary learning effectiveness among EFL students in Chinese higher vocational colleges?

1.5. Significance of the Study

This study is significant for EFL teachers, students, curriculum designers and vocational college administrators. To the teachers, the results can determine which factors associated with AI can most effectively facilitate vocabulary learning. To students,

the research can demonstrate how meaningful use of AI-tools can enhance vocabulary practice, motivation and engagement. In the case of higher vocational colleges in the Sichuan Province, the findings can be used to aid evidence-based decision making on the need to incorporate AI in English classes. The research is also valuable to the body of EFL and educational technology literature as it offers a quantitative paradigm of the connection between perceived usefulness, learning motivation and learning engagement and vocabulary learning effectiveness.

2. Literature Review

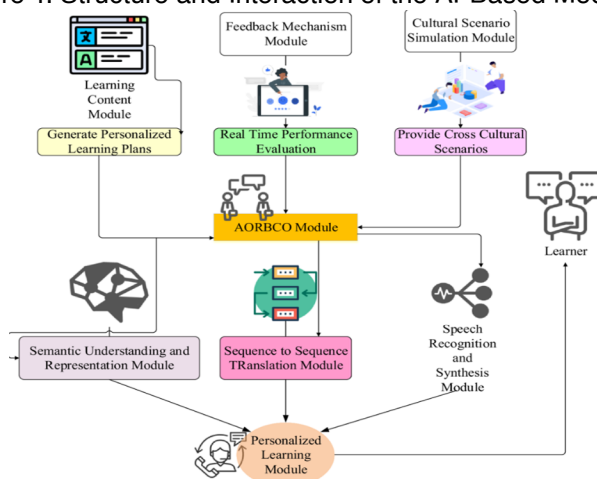
2.1. Overview

The section is a review of the recent literature on AI-assisted vocabulary learning, perceived usefulness, learning motivation, learning engagement and vocabulary learning effectiveness. It also clarifies the theoretical and conceptual framework, contains hypotheses and states the literature gap.

2.2. Effect of Perceived Usefulness Of AI-Assisted Vocabulary Learning

Perceived usefulness refers to the extent to which learners believe that AI-assisted vocabulary learning tools help them improve vocabulary learning performance. In the context of EFL teaching, usefulness is not merely a technical convenience, whether a tool will help students to know word meaning, retain vocabulary, read the situation, get feedback and use the words in the proper context. The concept of perceived usefulness introduced by Davis (1989) was defined as a fundamental factor of technology acceptance, and this concept is still very applicable in language learning with AI assistance. Learners can find AI helpful in a vocabulary context when it provides instant definitions and bilingual explanations, example sentences, pronunciation tips, collocations and customised activities (Schmitt, 2019).

Figure 1: Structure and Interaction of the AI-Based Modules.



Source: (Liu, 2025)

The latest research confirms the usefulness as a contributor to AI-assisted language learning. As Kohnke et al. (2023) elaborate, generative AI can add responsive explanations and a conversational experience that can benefit language development. Huang et al. (2022) also report that chatbots can offer pedagogical affordances through providing learners with opportunities to interact, receive feedback and practice. According to Belda-Medina and Calvo-Ferrer (2022), chatbots can also be used as a conversational partner and assist learners in practising a language in an interactive setting. Figure 1 is an illustration of the AI-based modules interrelationship that will be used to assist in personalised language learning.

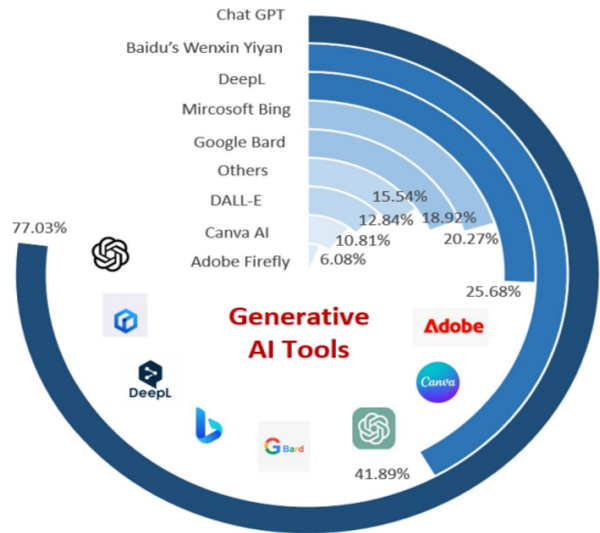
Empirical studies have also related the perceived usefulness to attitudes and intention to use AI tools by learners. Alsakaker (2025) observed that the overall perceptions of EFL learners towards AI were positive in vocabulary acquisition and that imagined usefulness was a subset of a more general process of acceptance. Belda-Medina and Kokošková (2024) additionally demonstrated that teacher students found ChatGPT favourable with regard to perceived usefulness and behavioural intention, but expressed apprehensions regarding accuracy and reliability. When students feel the AI-generated explanations of vocabulary to be inaccurate, superficial or not related to the course objectives, the impact on learning effectiveness can become less significant. As far as higher vocational Chinese students are concerned, practical learning needs can be influencing usefulness. Greater colleges of vocation usually focus on vocationally oriented English and applied communication. AI vocabulary tools can be potentially effective in cases where they relate the English vocabulary to the workplace environments, technical terminology and everyday speech. According to Xu (2023), English teaching in Chinese vocational education should be a response to the practical needs and growth in reading of the learners. Perceived usefulness is considered an independent variable in this study since it is assumed that learners who feel that AI tools will be useful in terms of teaching them useful vocabulary will state a sense of vocabulary learning strength.

2.3. Effect of Learning Motivation In AI-Assisted Vocabulary Learning

Learning motivation is a key affective factor in EFL vocabulary development. Vocabulary acquisition demands long term repetition, review and practice of retrieval as well as willingness to use new words. Lack of motivation can either lead learners to avoid vocabulary exercises or only use AI tools formally. Self-Determination Theory describes how one can be more motivated when environments in which they learn facilitate autonomy, competence and relatedness (Ryan & Deci, 2000). AI-based vocabulary education can promote autonomy through the option of students to select the time of learning, the style of practice and speed. It can assist competence by offering adaptive difficulty and instant feedback (Zhang, Hajianfard & Xia, 2026). The recent research on AI-related language learning indicates that interactive tools can enhance the interest and readiness of the learners to practise. Dizon and Tang (2020) discovered that autonomous second language learning could be assisted by intelligent personal assistants that would generate interaction opportunities. Chen, Yang and Lai (2023) demonstrated that college EFL learners viewed Google Assistant as a promising tool to help them learn a foreign language. Figure 2 shows the distribution of widely used generative AI tools among the learners of languages. ChatGPT is the most popular tool of generative AI with 77.03% of learners' usage rate.

Perceived relevance is also related to motivation. In case students think that AI-based vocabulary acquisition can help them reach academic or occupational and communication objectives, they might be more likely to continue. According to Liu and Du (2024), the motivation of learning English is the predictor of the English learning outcomes of Chinese university students, which suggests that motivation is still a significant factor of Chinese higher education. In a similar fashion, AI-based technologies are studied and learners express an appreciation of personalised and adaptive platforms as they feel like learning a language can be more manageable and responsive (Benek, 2025; Wahyuni, Putro & Efendi, 2024). Artificial intelligence can thus be used to encourage learners by making them less frustrated and more of them feel that they are making gains. Motivation, however, is not to be considered automatic. The initial appeal of AI tools could be related to the novelty, yet sustainable motivation will be pegged upon the impactful learning experience, reliable feedback and course goals correspondence. According to Kohnke et al. (2023), the successful application of generative AI demands digital skills and moral consciousness. If learners use AI tools only to translate or complete tasks quickly, motivation may become instrumental rather than developmental.

Figure 2: Distribution of Commonly Used Generative AI Tools.



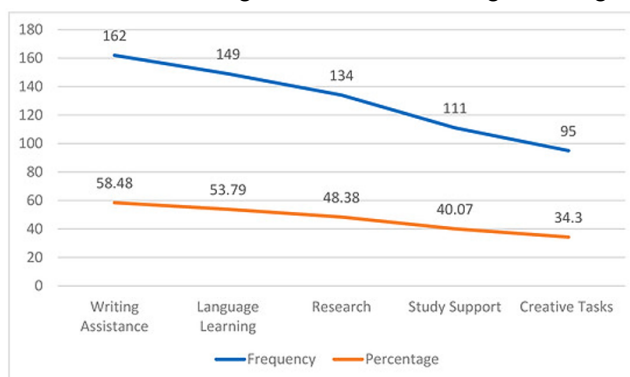
Source: (Fan, Deng & Liu, 2025)

2.4. Influence of Learning Engagement In AI-Assisted Vocabulary Learning

Learning engagement is the active involvement, attention, effort and persistence of the learners in the vocabulary learning tasks. The interaction during AI-assisted learning of vocabulary may involve working with AI tools, answering the questions, reading the feedback, practicing pronunciation, creating examples and using new words in sentences. Interaction is essential as developing vocabulary relies on frequent interactions with words and active processing. Schmitt (2019) points out that vocabulary learning cannot be achieved through exposure alone, exposure must be

meaningful, repeated and purposeful interaction between the learner and lexical items. Evidence in chatbot and AI language tools indicates that one of the most effective affordances of AI-assisted learning is engagement. Huang et al. (2022) distinguish social and pedagogical affordances of chatbots such as interaction and practising opportunities. According to Belda-Medina and Calvo-Ferrer (2022), conversational AI is capable of offering learners a convenient language practice partner. Cislowska and Pena-Acuna (2024) also state that the integration of chatbots in further language education is related to the development of skills, attitudes and emotions. Figure 3 shows the frequency and percentage distribution of various purposes of using AI tools when engaged in learning activities.

Figure 3: Generative AI as a Cognitive Co-Pilot in English Language Learning.



Source: (Zaim et al., 2025)

The figure indicates that the most common way of using AI tools is writing assistance with a frequency of 162 responses (58.48%), and language learning with the frequency of 149 responses (53.79%). Engagement applies especially in the Chinese higher vocational colleges since the students could be at different levels of their English proficiency and practical orientation to learning. Students might lack confidence in English and the conventional vocabulary teaching method might be based on memorisation, textbook lists and test-preparations. AI-based tools can enhance interaction with offering multimodal input, immediate examples and proactive help. Investigation of learning engagement in Chinese higher vocational students demonstrates that contextual and motivational components of engagement, such as teacher support, goals and learning conditions, impact engagement (Chen & Wang, 2024; Zhang & Hu, 2025). Provided that vocabulary learning is more interactive and less monotonous with AI tools, it could lead to greater behavioural and cognitive activity among students. However, the involvement can be different basing on digital literacy, access, learning habits and attitudes towards reliability (Chen, Daud & Omar, 2026). Benek (2025) discovered that students have positive perceptions of AI-driven language technologies, yet teachers also express some concerns, including ethical concerns, training and integration difficulties. Wahyuni et al. (2024) also mention that AI-informed English language learning studies are growing but still need more methodical studies of the contexts, tools and outcomes.

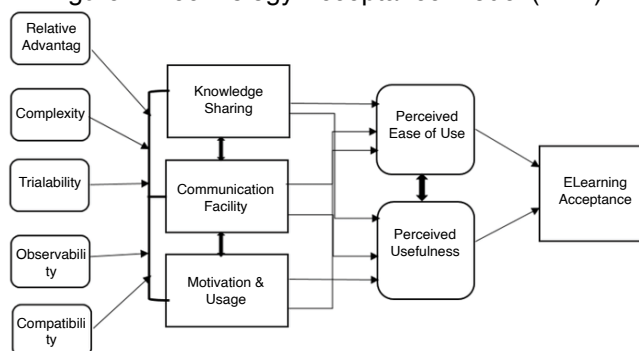
2.5. Theoretical Framework

This study is guided by two complementary theories: the Technology Acceptance Model (TAM) and Self-Determination Theory (SDT). TAM, which is of Davis (1989) proposes that the acceptance of technology by the users is explained by the perceived usefulness and ease of use. When students are convinced that AI tools enhance vocabulary comprehension, memorization, and application, they will consider the tools as useful learning resources. Perceived usefulness in this study is thus placed as a direct predictor of the vocabulary learning effectiveness.

2.5.1. Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) was extensively utilized in digital and AI-assisted education. More recent EFL research demonstrates that perceptions of usefulness aid in the explanation of acceptance of AI tools among learners, such as ChatGPT and AI-aided vocabulary applications (Alsakaker, 2025; Belda-Medina & Kokošková, 2024). Figure 4 demonstrates the variables that affect e-learning acceptance in the perceptions of ease of use and usefulness.

Figure 4: Technology Acceptance Model (TAM).



Source: (Alhumaid et al., 2020)

In case of vocabulary learning, TAM applies since beliefs about the usefulness of tools can affect effort, the frequency of use and confidence in the AI-assisted learning of students. A tool might possess a high-technical level, yet its instructional value lies not only in the fact that the learners perceive it as the means of their self-vocabulary development. The current study only deals with perceived usefulness, but TAM is significant as it underlies the reasons why learners can decide to use AI-assisted vocabulary tools.

2.5.2. Self-Determination Theory (SDT)

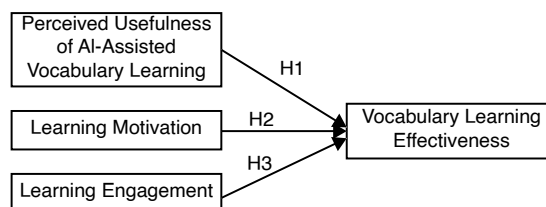
The second theory is Self-Determination Theory (SDT), which explains how motivation is shaped by autonomy, competence and relatedness (Deci & Ryan, 1985; Ryan & Deci, 2000). AI-assisted vocabulary learning can help develop autonomy by permitting the students to practice out of the classroom, selecting words or subjects and setting the pace. It can be used to promote competence through the delivery of immediate feedback, examples

and correction of errors. It may facilitate relatedness in the context where conversational AI gives an impression of being responsive and interactive. These psychological needs apply to this study since learning motivation and learning engagement are considered independent variables which can potentially affect the success of vocabulary learning. TAM and SDT form a solid ground to the research model.

TAM describes the cognitive assessment of the usefulness of AI, and SDT describes motivation and engagement-related effects. The synthesized framework proposes that AI-based vocabulary learning is effective when students believe that the tools are beneficial to them, get encouraged to practise and actively engage in learning activities. Thus, the research focuses on three predictors including perceived usefulness of AI-assisted vocabulary learning, learning motivation and learning engagement. Vocabulary learning effectiveness is a dependent variable.

2.6. Conceptual Framework

Figure 5: Conceptual Framework of the Study.



Source: Author

The conceptual framework proposes that three independent variables directly influence vocabulary learning effectiveness. Perceived usefulness indicates the beliefs of the students that AI tools can aid vocabulary learning. Learning motivation can be described as the willingness and excitement that is created by using AI-based vocabulary training. Active participation and interaction with vocabulary learning activities is indicated by learning engagement. The dependent variable is vocabulary learning effectiveness which is a perceived progress in knowing English vocabulary, remembering it and being able to use it.

2.7. Hypotheses

The hypotheses of this research are presented in table 1;

Table 1: Hypotheses of the Study.

Hypothesis	Statement	Expected Relationship
H1	Perceived usefulness of AI-assisted vocabulary learning has a significant positive influence on vocabulary learning effectiveness.	Positive and significant
H2	Learning motivation in AI-assisted vocabulary learning has a significant positive impact on vocabulary learning effectiveness.	Positive and significant
H3	Learning engagement in AI-assisted vocabulary learning has a significant positive effect on vocabulary learning effectiveness.	Positive and significant
Source: Author		

2.8. Literature Gap

The literature reviewed reveals that AI-based English language learning is rapidly growing, particularly when it comes to chatbots, generative AI, learner beliefs and technology acceptance. Nevertheless, there are still a number of gaps. First, a lot of the studies analyze general language learning as opposed to vocabulary learning effectiveness as a particular outcome. Second, research on the Chinese higher vocational colleges remains minimal, despite the fact that vocational EFL students have unique learning experiences and applied English demands. Third, motivation and engagement have been discussed distinctly, whereas perceived usefulness, yet the limited number of studies have failed to test their joint predictive power using a quantitative SPSS-based model. Lastly, Sichuan Provinces are not well represented by regional evidence. This paper fills these gaps by looking into the influence of perceived usefulness, learning motivation and learning engagement on vocabulary learning effectiveness among EFL students in Chinese higher vocational colleges.

3. Research Methodology

3.1. Introduction

This section explained the methodological procedures used to examine the impact of AI-assisted vocabulary learning on EFL students in Chinese higher vocational colleges. It outlined the study methodology, research design, population, sample size, sampling method, data collection tool, data analysis processes, and ethics.

3.2. Research Approach

The study adopted a quantitative research approach because the purpose was to measure relationships among variables and test hypotheses using numerical data. Quantitative designs were applicable in cases where researchers needed to study patterns, compare reactions, and find predictive relations using statistical analysis (Creswell & Creswell, 2018). The method suited the current research as it examined the influences of perceived usefulness, learning motivation, and learning engagement on the success of vocabulary learning.

3.3. Research Design

The research design used was the cross-sectional survey study design, in which the data were gathered at a specific period. The survey research method was suitable to gather standardised answers of a fairly large sample of respondents and analyse perceptions, attitudes and self-reported learning outcomes (Saunders, Lewis & Thornhill, 2019). This design helped to test statistical relationships among the variables that were chosen using SPSS.

3.4. Population of the Study

The target population consisted of EFL students enrolled in Chinese higher vocational colleges in Sichuan Province, China. The provincial setting of Sichuan was chosen since

the study was on vocational EFL users in this province as opposed to the entire Chinese college learners.

3.5. Sample Size and Sampling Technique

The sample size used is 250 students, which was believed to be sufficient in carrying out correlation and multiple regression analysis with three independent variables. The sampling method used was convenience sampling, which was based on institutional availability of English classes at higher vocational colleges. Despite the preference of probability sampling, convenience sampling has been a popular method in conducting educational survey research when the research targets participants that are available through extant classes and institutions (Cohen, Manion & Morrison, 2018; Taherdoost, 2016).

3.6. Data Collection Instrument

The collection of the primary data was done through the structured questionnaire. The tool was divided into two parts. The initial part collected demographic data, such as gender, studying year, and the frequency of AI tools use to learn English vocabulary. This second part had four measures, which included perceived usefulness of AI-assisted vocabulary learning, learning motivation, learning engagement, and vocabulary learning effectiveness. Five statements were included in each construct, which culminates in 20 Likert-scale items. Measures of responses were taken based on a five-point Likert scale (1 = strongly disagree 5 = strongly agree). Likert-scale questionnaires were identified as a fit to assess perceptions and attitudes in educational studies when they were under clear written statements and defined by the theoretical constructs (Creswell & Creswell, 2018; Pallant, 2020).

3.7. Data Screening

The data set underwent a screening of missing values, coding errors, and outliers before statistical analysis was performed. This procedure facilitated the accuracy, completeness and suitability of the data to further statistical operations. Any missing or discordant responses were discussed and resolved and then inferential analyses conducted.

3.8. Data Analysis Method

SPSS was used for data analysis because it is widely applied in social science and educational research for descriptive and inferential statistical analyses (Field, 2018; Pallant, 2020). Demographic characteristics and the average scores of every variable were summarised with the help of descriptive statistics. Cronbach alpha was used to determine reliability, and a coefficient of more than .70 was regarded as an acceptable measure of internal consistency (Hair et al., 2019). The relationship between the study variables was analyzed using Pearson correlation analysis to determine the strength and direction of the relationship between the variables. The two data sets were then subjected to multiple regression analysis that was used to test the impact of perceived usefulness, learning motivation, and learning engagement on vocabulary learning effectiveness. The regression analysis was suitable since the research had a single dependent variable, which is continuous, and numerous independent variables (Hair et al., 2019; Kline, 2023).

3.9. Ethical Considerations

Ethical principles were maintained throughout the research process. The respondents were told the study was being conducted to help the researcher, it was voluntary, confidential, and they had the right to drop out at any point. The questionnaire did not gather any personally identifiable data.

3.10. Common Method Bias Control

Various steps were taken to reduce common method bias. The questionnaire was written in clear terms, neutral instructions, and there were distinct demographic and the study variables sections. An assurance that, there were no right or wrong answers also helped in relieving the pressure on participants to give the right answers and made answers honest.

3.11. Summary

Overall, the selected methodology was appropriate because it aligned directly with the study's objectives, research questions, and hypotheses. It allowed to measure the perceptions of students and find out whether perceived usefulness, learning motivation and learning engagement had a significant predictive power on vocabulary learning efficacy among EFL students in higher vocational colleges in Sichuan Province.

4. Findings and Analysis

4.1. Overview

This section provides statistical analysis of survey data on AI-assisted English vocabulary learning based on 250 respondents. The four variables analyzed include the perceived usefulness of AI-assisted vocabulary learning, motivations to learn, engagement in learning and the results in vocabulary learning. The three variables were used as independent variables, and the vocabulary learning effectiveness was used as the dependent variable. The section presents the frequency, reliability, correlation and regression findings and below each analysis, there is a clear interpretation such that the statistical findings are directly related to the research objectives.

4.2. Demographic Profile of Respondents

The frequency analysis was performed to summarize the data in terms of gender, year of study, and frequency of using AI tools to learn English vocabulary. These results characterize the profile of the sample and indicate whether the respondents were sufficiently exposed to AI tools to give valuable answers.

4.2.1. Gender

Table 2 shows the gender distribution of the 250 respondents. The majority of the respondents were male (N=123) or 49.2% of the sample. The numbers of women respondents were nearly the same, 117 people, that is, 46.8 percent. An even smaller percentage of 10 respondents (4.0) chose the other alternative, prefer not to say.

There were no missing responses to this demographic question as the valid percent and percent values are equal. The gender sample can be considered relatively equal between male and female students. Such a balance enhances the descriptive nature of the data since the results are not highly dominated by either gender group.

Table 2: Gender Distribution of Respondents.

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	117	46.8	46.8	46.8
	Male	123	49.2	49.2	96.0
	Prefer not to say	10	4.0	4.0	100.0
	Total	250	100.0	100.0	
Source: Author					

4.2.2. Year of Study

Table 3 presents the academic year of the respondents. Second-year students made the largest group of 83 respondents which is 33.2% of the sample. The second-largest population proportion was the third-year student with 74 respondents making 29.6. First-year students were represented by 70 respondents or 28.0. The smallest group was that of students in the fourth year or more and they amounted to 23 respondents or 9.2. The number of valid responses was 250, which indicates that none of the respondents did not respond to this item. Findings indicate that the participants who were in the first three years of their study are the majority, especially the second and the third years. This can be applied to the study as students in these stages are most likely to encounter frequent academic exposure to English learning activities and online learning devices. This under-representation of fourth-year or higher students could indicate that older students were less accessible or engaged in the survey.

Table 3: Year of Study of Respondents.

Year of Study		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	First Year	70	28.0	28.0	28.0
	Fourth Year or Above	23	9.2	9.2	37.2
	Second Year	83	33.2	33.2	70.4
	Third Year	74	29.6	29.6	100.0
	Total	250	100.0	100.0	
Source: Author					

4.2.3. Frequency of Using AI Tools

Table 4 presents the frequency of using AI tools in learning English vocabulary by respondents. The most frequent users of AI tools were the largest category (90 respondents), which is 36.0 per cent of the sample. Another 62 respondents, or half of that number, used AI tools very frequently. They were sometimes used by another 58 respondents (23.2). The percentages of those who have hardly ever used AI tools include only 24 respondents, and the percentage of those who have never used them amounts to 16 respondents. When the often and very often categories are combined, it

is possible to conclude that 60.8% of the respondents used AI tools to learn vocabulary frequently. The results reveal that the respondents already extensively use AI tools to learn English vocabulary. This was because over fifty percent of the sample reported use of such devices frequently or very frequently, with the respondents therefore being adequately experienced to meaningfully rate AI-assisted learning.

Table 4: Frequency of Using AI Tools for English Vocabulary Learning.

Frequency of Using AI Tools for English Vocabulary Learning					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	16	6.4	6.4	6.4
	Often	90	36.0	36.0	42.4
	Rarely	24	9.6	9.6	52.0
	Sometimes	58	23.2	23.2	75.2
	Very Often	62	24.8	24.8	100.0
Total		250	100.0	100.0	
Source: Author					

4.3. Reliability Analysis

Reliability analysis was conducted using Cronbach's alpha to assess the internal consistency of each measurement scale. The variables were measured using five items and the findings are shown below.

Table 5: Reliability Statistics.

Scale: Perceived Usefulness of AI-Assisted Vocabulary Learning	
Reliability Statistics	
Cronbach's Alpha	N of Items
.939	5
Scale: Learning Motivation	
Reliability Statistics	
Cronbach's Alpha	N of Items
.939	5
Scale: Learning Engagement	
Reliability Statistics	
Cronbach's Alpha	N of Items
.944	5
Scale: Vocabulary Learning Effectiveness	
Reliability Statistics	
Cronbach's Alpha	N of Items
.946	5
Source: Author	

The reliability results show strong reliability results for all four scales. The Cronbach alpha value was determined as 0.939 with perceived usefulness of AI-assisted vocabulary learning as the independent variable and 0.939 with learning motivation as the independent variable. The alpha value of learning engagement was a bit higher at .944. The vocabulary learning effectiveness was the most reliable variable as it had the highest value of Cronbach alpha, which was .946. The five items were used to measure each construct and the alpha of all the items was greater than .90. Results of reliability indicate that there is excellent internal

consistency in all the measurement scales. This implies that, the items in the questionnaires that were assigned to each construct were well correlated and gauged the variables they were supposed to gauge. High reliability of the perceived usefulness is an indication that students were consistent when giving responses to statements on AI-tool usefulness and value. On the same note, the learning motivation and learning engagement revealed high reliability demonstrating that the items measured coherent motivational and engagement-related patterns. The largest alpha of vocabulary learning effectiveness denotes that the dependent variable was strongly measured. Therefore, the data were suitable for further correlation and regression analysis because the main constructs were statistically reliable.

4.4. Correlation Analysis

Correlation analysis was used to test the nature and the direction of relationships between perceived usefulness, learning motivation, learning engagement, and vocabulary learning effectiveness. Values of Pearson correlation nearer to +1 are more positive relationships.

Table 6: Pearson Correlation Matrix.

Correlation Analysis				
Correlations				
		Perceived Usefulness of AI-Assisted Vocabulary Learning	Learning Motivation	Learning Engagement
Perceived Usefulness of AI-Assisted Vocabulary Learning	Pearson Correlation	1	.956**	.947**
	Sig. (2-tailed)		.000	.000
	N	250	250	250
Learning Motivation	Pearson Correlation	.956**	1	.940**
	Sig. (2-tailed)	.000		.000
	N	250	250	250
Learning Engagement	Pearson Correlation	.947**	.940**	1
	Sig. (2-tailed)	.000	.000	
	N	250	250	250
Vocabulary Learning Effectiveness	Pearson Correlation	.939**	.939**	.947**
	Sig. (2-tailed)	.000	.000	.000
	N	250	250	250
Correlations				
		Vocabulary Learning Effectiveness		
Perceived Usefulness of AI-Assisted Vocabulary Learning	Pearson Correlation	.939**		
	Sig. (2-tailed)	.000		
	N	250		
Learning Motivation	Pearson Correlation	.939**		
	Sig. (2-tailed)	.000		
	N	250		
Learning Engagement	Pearson Correlation	.947**		
	Sig. (2-tailed)	.000		
	N	250		
Vocabulary Learning Effectiveness	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	250		
**. Correlation is significant at the 0.01 level (2-tailed).				
Source: Author				

Table 6 indicates that all the variables were positively and significantly correlated at the 0.01 level. Learning motivation ($r = .956$), learning engagement ($r = .947$) and vocabulary learning effectiveness ($r = .939$) had strong correlations with perceived usefulness of AI. Learning engagement ($r = .940$) and vocabulary learning effectiveness ($r = .939$) also had a close relationship with learning motivation. The strongest correlation was between learning engagement and the effectiveness of vocabulary learning ($r = .947$). All significant values were also sent out as .000 in the SPSS output, and it is assumed that this is below the $p = .001$. The findings of the correlation allow getting a solid reason that students who find AI tools useful are also more likely to report an increase in motivation, engagement, and effectiveness of vocabulary learning. Learning engagement was correlated with vocabulary learning effectiveness most strongly, indicating that engagement in the learning activities might be of particular importance to enhance vocabulary learning. The high correlation between perceived usefulness and motivation also suggests that students can be more motivated as they think that AI tools can facilitate their learning objectives. Nevertheless, the extremely high correlation of variables of the independent ones also reveals the overlap of concepts. This implies that usefulness, motivation, and engagement have a strong relationship within the AI-assisted learning process. So, even though the results prove positive correlations between all variables studied, the regression outcomes need to be viewed with caution since all highly correlated predictors may be exhibiting similar explanatory power.

4.5. Regression Analysis

The impact of perceived usefulness, learning motivation, and learning engagement on vocabulary learning effectiveness was analyzed using multiple regression. The analysis has also determined the most significant predictor, which was entered together with the other variables.

4.5.1. Model Summary

Table 7: Model Summary.

Model Summary ^b							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.959 ^a	.921	.920	.265808558103706	.921	950.431	3
Model Summary ^b							
Model	Change Statistics						
	df2		Sig. F Change				
1	246		.000		1.923		
a. Predictors: (Constant), Learning Engagement, Learning Motivation, Perceived Usefulness of AI-Assisted Vocabulary Learning							
b. Dependent Variable: Vocabulary Learning Effectiveness							
Source: Author							

Table 7 presents the overall model summary. The multiple correlation coefficient was $R = .959$ indicating a very strong association between the joint independent variables and vocabulary learning effectiveness. The value of the R Squared was 0.921 i.e. perceived usefulness, motivation to learn, and engagement in learning explained 92.1

percent of the variance in the vocabulary learning effectiveness. Adjusted R Square was found to be 0.920 which is nearly the same as the R square value and shows that the model did not change significantly after the number of predictors was adjusted. The standard error of the estimate was 0.2658, whereas the Durbin-Watson is 1.923. The summary of the model shows that the combination of the three independent variables can explain a very high percentage of the effectiveness of vocabulary learning. The value of R Square is very high in any social science study and signifies that the perceptions of learners regarding AI usefulness, motivation and engagement is very effective in their vocabulary learning results. The similarity of R square and adjusted R square is because the model is not over-fitted with irrelevant predictors. The Durbin Watson value is near 2 which indicates that there is no serious concern of autocorrelation of residuals. In general, the model is very powerful in its explanations and can be used to assess the impact of the chosen predictors.

4.5.2. ANOVA Results

The table 8 shows the ANOVA results of the regression model. The regression sum of squares was 201.456 with residual sum of squares being 17.381. This model gave a F-value of 950.431 and its degrees of freedom were 3 and 246. The value of significance was .000 which is understood to be $p < .001$. This proves that the regression model as a whole was significant. The outcome of the ANOVA supports the fact that the regression model is significant in predicting the effectiveness of vocabulary learning. Practically, it implies that the perceived usefulness combined with the motivation to learn and engagement in learning gives a statistically significant explanation of the vocabulary learning outcomes of the students. The F-value is large meaning that the variance explained is significantly large compared to the unexplained variance. Thus, the independent variables cannot be assumed as a random or weak factor but they create a powerful predictive model in understanding the effectiveness of the AI-assisted learning of vocabulary among the surveyed students.

Table 8: ANOVA.

ANOVA ^a						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	201.456	3	67.152	950.431	.000 ^b
	Residual	17.381	246	.071		
	Total	218.837	249			
a. Dependent Variable: Vocabulary Learning Effectiveness						
b. Predictors: (Constant), Learning Engagement, Learning Motivation, Perceived Usefulness of AI-Assisted Vocabulary Learning						
Source: Author						

4.5.3. Regression Coefficients

Table 9 shows the regression coefficients. The constant was not significant, $B = .030$, $t = .372$, $p = .710$. The perceived usefulness of AI-assisted vocabulary learning positively and significantly influenced vocabulary learning efficacy, $B = .237$, $\beta = .231$, $t = 3.314$, $p = .001$. Learning motivation also had a positive and significant effect, $B = .289$, $\beta = .284$, $t = 4.311$, $p < .001$. Learning engagement had the

strongest positive effect, $B = .464$, $\beta = .462$, $t = 7.698$, $p < .001$. The confidence intervals of all three predictors were positive and none of them crossed their zero. The coefficient results indicate that all the three independent variables are significant in the vocabulary learning effectiveness. The positive perceived usefulness coefficient indicates that students who believe that AI tools are useful, convenient and helpful in learning vocabulary have the perception of learning more effectively. The positive value of the coefficient of learning motivation shows that motivated students have better chances of having a stronger vocabulary improvement. Learning engagement is however, the strongest predictor as it has the highest value of standardization of β . This implies that the real engagement in learning activities which are aided by AI systems, including vocabulary practice, communication with AI responses, and maintaining attention during the learning process, have the biggest impact on the effectiveness of learning. The findings also indicate that motivation and usefulness have an effect, but the effect is highest when the students are actively involved in the learning procedure.

Table 9: Regression Coefficients.

Coefficients ^a					
Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	.030	.081		.372
	Perceived Usefulness of AI-Assisted Vocabulary Learning	.237	.072	.231	3.314
	Learning Motivation	.289	.067	.284	4.311
	Learning Engagement	.464	.060	.462	7.698
Coefficients ^a					
Model			95.0% Confidence Interval for B		
			Lower Bound	Upper Bound	
1	(Constant)		-.129	.189	
	Perceived Usefulness of AI-Assisted Vocabulary Learning		.096	.378	
	Learning Motivation		.157	.422	
	Learning Engagement		.346	.583	
a. Dependent Variable: Vocabulary Learning Effectiveness					
Source: Author					

4.5.4. Residual Statistics

Table 10: Residual Statistics.

Residuals Statistics ^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.289652466773987	4.879769802093506	4.2311999999999997	.899477111307954	250
Residual	-.634350180625916	.609497010707855	.0000000000000002	.264202449392988	250
Std. Predicted Value	-3.270	.721	.000	1.000	250
Std. Residual	-2.386	2.293	.000	.994	250
a. Dependent Variable: Vocabulary Learning Effectiveness					
Source: Author					

Table 10 shows the statistics of the residual of the regression model. The predicted values ranged from 1.2897 to 4.8798, with a mean of 4.2312. The values of the residuals

were between -.6344 to .6095 with a mean being very near to zero. The range of standardized residual was between -2.386 and 2.293 with mean of 0.000 and standard deviation of 0.994. The residual analysis was based on 250 as the sample. The residual statistics indicate that the regression model was consistently effective throughout the data. The average error value was nearly equal to zero, which refutes the idea that the model over- or under- predicted the learning of vocabulary. The standardized residuals were in an acceptable range of -3 to +3 indicating that there were no extreme outliers that were serious and which influenced the model. This helps in the stability of the regression results. The standard deviation of the residuals is also relatively small which indicates that the values predicted were close to the observed values. Thus, the remaining values reinforce the belief in the correctness of the regression model.

4.6. Hypotheses Testing

In accordance with the regression coefficients, all the three suggested relationships were approved. The level of significance of each predictor was less than .05 and the direction of both coefficients was positive. Thus, the usefulness of AI-supported vocabulary learning as perceived, motivation to learn vocabulary and engagement in vocabulary learning were all verified as important predictors of vocabulary learning outcomes.

Results of hypotheses testing indicate that variables used in the study work in the desired direction. Students who believe that AI tools are helpful tend to make use of them more in vocabulary learning. Better vocabulary results are also more probable in students who are better motivated. Above all, the most effective vocabulary learning is demonstrated by actively engaged students. These results suggest that AI-assisted vocabulary learning cannot be perceived as just an issue of technology. It is also a process that is learner-focused where usefulness, motivation, and engagement collaborate to enhance learning outcomes.

Table 11: Summary of Hypotheses Testing.

Hypothesis	Statement	Result
H1	Perceived usefulness of AI-assisted vocabulary learning has a positive effect on vocabulary learning effectiveness.	Supported
H2	Learning motivation has a positive effect on vocabulary learning effectiveness.	Supported
H3	Learning engagement has a positive effect on vocabulary learning effectiveness.	Supported
Source: Author		

4.7. Discussion of Major Findings

The major findings show that AI-assisted vocabulary learning is strongly linked with students' perceptions and learning behaviour. The common occurrence of AI among respondents indicates that the tool has already become a vocabulary learning tool. The results of reliability allow reinforcing confidence in the used questionnaire, whereas correlation results indicate that the usefulness, motivation, engagement, and effectiveness are positively correlated. The most significant predictor was the learning engagement, which indicated that AI technology does not ensure improved vocabulary results in isolation. Students will need to be engaged in AI-based activities, feedback, and practice opportunities. The fact that the correlations between the independent

variables are high also indicates that usefulness, motivation, and engagement may overlap in some way and as such, the results can be perceived as related learning variables and not totally independent effects.

4.8. Section Summary

This section analyzed data from 250 respondents. The findings demonstrated equal gender representation, frequent use of AI-tools, high scale reliability, high positive correlation, and a high significant regression model. The effectiveness in vocabulary learning was predicted by perceived usefulness, learning motivation, and learning engagement; however, the strongest predictor was learning engagement.

5. Discussion

The results of findings and analysis sections revealed that the majority of respondents directly experienced AI-assisted vocabulary learning since 60.8% also used AI tools frequently or very frequently. This indicates that AI tools are already becoming part of EFL students' vocabulary learning practices in Chinese higher vocational colleges. This observation aligns with Kohnke et al. (2023), who reported that language learning can be enhanced by using generative AI tools to provide interactive explanations, practice opportunities and scaffolding to the learner. Equally, Huang et al. (2022) indicated that language learning supported by chatbots provides pedagogical and social affordances which motivate learners to be more active in the practice of language. Hence, the fact that AI-tools usage in this research is high indicates that vocational EFL learners are not the passive consumers of technological tools themselves but tend to incorporate AI tools into their vocabulary learning practices more often.

The reliability indicated that all four constructs had good internal consistency with a Cronbach alpha of 0.939-0.946. That is, perceived usefulness, learning motivation, learning engagement and vocabulary learning effectiveness were statistically reliable. These findings lend support to the validity of the study since the questionnaire consistently assessed the constructs of interest. According to Pallant (2020), reliability is crucial in quantitative studies since internally consistent scales enhance the degree of confidence in statistical interpretation. Hair et al. (2019) also determined that alpha of Cronbach above .70 is acceptable and alpha above .90 is very strong. The high reliability scores in this research, therefore, prove that the measurement tool was competent in investigating AI-aided vocabulary learning among EFL students.

The correlation analysis revealed that there were strong positive correlation relationships between all study variables, whereas vocabulary learning effectiveness had a strong positive relationship with perceived usefulness, learning motivation and learning engagement. The best correlation was made with learning engagement that displayed that more actively engaged students in vocabulary learning activities by AI reported higher learning results. This observation confirms the point made by Schmitt (2019) that vocabulary is built up through repetition, meaning, and purposeful engagement of lexical items, as opposed to memorisation. According to Belda-Medina and Calvo-Ferrer (2022), AI chatbots may also be conversational partners, allowing learners to have more vocabulary practising. In this way, the obtained correlation data indicate that AI-mediated vocabulary learning can be effectively achieved when students actively and regularly utilize AI tools.

The regression analysis affirmed that the perceived usefulness had a positive and significant impact on the usefulness in vocabulary learning with $B = .237$ and $p = .001$. This demonstrates the fact that, of the students who perceived AI tools as helpful in learning vocabulary, a greater number of students reported having improved vocabulary learning. The observation is consistent with the Technology Acceptance Model by Davis (1989) which adds that the perceived usefulness is a major factor contributing towards technology acceptance and usage. Alsakaker (2025), further indicated that positive attitudes of EFL learners towards AI as a vocabulary trainer are related to their assumption that AI tools enhance the efficiency of learning. Perceived usefulness, in this study, might have prompted the students to use AI tools to get definitions, examples, feedback, pronunciation and the contextual use of words. Thus, usefulness will continue to play a significant role in the reasoning behind AI tools facilitating vocabulary learning.

The results of the regression analysis indicated that learning motivation and learning engagement were also significant predictors of vocabulary learning effectiveness though the strongest predictor was learning engagement with $\beta = .462$. This implies that motivation is significant, but the real active engagement in the AI-supported vocabulary learning activities has the most significant impact on vocabulary. This observation is confirmed by the fact that Ryan and Deci (2000) Self-Determination Theory said that, motivation can be enhanced when the learners feel a sense of autonomy, competence and relatedness. Dizon and Tang (2020) also claimed that autonomous second language learning can be facilitated through intelligent personal assistant, which can be used to generate new practice opportunities. On the same note, Chen et al. (2023) articulated that AI-based tools are capable of enabling EFL learners to practice the language outside of the classroom. Thus, the research proves that AI tools are the most effective in case students are motivated and engaged in learning activities.

6. Conclusion and Recommendations

This study examined the impact of AI-assisted vocabulary learning on EFL students in Chinese higher vocational colleges. In particular, it examined the relationship between perceived usefulness, learning motivation and learning engagement with vocabulary learning effectiveness. This research was a quantitative survey-based design and included 250 EFL students studying in Chinese higher vocational colleges in Sichuan Province. Frequency analysis, reliability analysis, Pearson and multiple regression analysis were carried out using SPSS. According to the findings of the demographics, the sample was fairly homogeneous in terms of gender, with 49.2% of males and 46.8% of females responding. The majority of the respondents were first-, second- and third-year students, indicating that the information reflected primarily students who were actively engaged in English learning as part of their vocational studies. It was also found that AI tools were widely used to learn English vocabulary because 60.8% of students have been using these tools frequently or very frequently. This proves the point that the AI-based vocabulary learning is already applicable in the vocational EFL environment. Result of reliability analysis showed that all measurement scales were very reliable. The Cronbach alpha of perceived usefulness and learning motivation were both equal to .939, the Cronbach alpha of learning engagement was equal to .944, and the Cronbach alpha of vocabulary

learning effectiveness was equal to .946. These values show that the items of the questionnaire were internally consistent and could be subjected to additional statistical analysis. Thus, the proposed study instrument was a reliable source of evaluating the proposed relationships.

As the results of the correlation revealed, all the independent variables strongly and positively correlated with the vocabulary learning effectiveness. Vocabulary learning effectiveness correlated with perceived usefulness ($r = .939$) and learning motivation ($r = .939$) and the greatest correlation with learning engagement was $r = .947$. These results prove that students who think AI tools are helpful and are motivated and active tend to report more positive results of vocabulary learning. The regression analysis also proved that the three hypotheses were all supported. The effects of perceived usefulness on vocabulary learning effectiveness were significantly positive, the effects of learning motivation on vocabulary learning effectiveness were significantly positive, and the effect of learning engagement was the most significant. The explanatory power was very strong as the regression model accounted for 92.1 of the variation in vocabulary learning effectiveness. On the whole, the research proves that AI-mediated vocabulary learning may help EFL students to develop their vocabulary positively, yet its effectiveness will only be determined by the presence of AI tools. It will also be dependent upon the ability of students to find the tools useful, get motivated to use them and be active in vocabulary learning activities.

6.1. Recommendations

6.1.1. Integration of AI Vocabulary Tools in Teaching: First, English teachers in higher vocational colleges should integrate AI-assisted vocabulary tools into classroom and self-study activities. AI can be used by teachers to explain vocabulary, use examples, practice pronunciation and the contextual use of words.

6.1.2. Critical and Purposeful Use of AI Tools: Second, AI tools should be taught to students, using them in a critical, purposeful manner. They cannot solely rely on AI to provide a fast translation but they must apply it to acquire deeper understanding about the vocabulary, sentence structure and practice.

6.1.3. Workshops on digital literacy and AI learning: Third, vocational colleges are supposed to offer guidance workshops on the use of AI to learn English. This type of workshop can enhance the digital literacy of students and make them consider the proper and ethical use of AI tools.

6.1.4. Relationship with Vocational and Workplace English: Fourth, the designers of the curriculum must relate AI vocabulary learning to vocational and workplace English. This can render vocabulary learning more useful and applicable to subsequent careers by students.

6.1.5. Vocabulary Activities with AI based on Engagement: Fifth, teachers are supposed to create engagement-based activities with the help of AI tools. They could be AI-assisted vocabulary quizzes, chatbots, individual word lists and reflective vocabulary diaries to promote more active engagement.

6.2. Limitations

There are a number of limitations in this study. To begin with, the sample was restricted to 250 EFL students of Chinese higher vocational colleges in Sichuan

Province, thus, the results might not be a reflection of all Chinese vocational students. Second, the study was based on convenience sampling, which can be a limitation of generalisability. Third, the data were gathered using self-reported questionnaires, and thus the responses could be biased to what the students perceive about vocabulary tests, and not necessarily their performance regarding vocabulary tests. Lastly, the cross-sectional design was only able to measure responses at a single time and did not allow studying long-term changes in vocabulary learning effectiveness.

6.3. Future Directions

Future research should include larger and more diverse samples from different provinces and types of higher education institutions in China. It is also possible to study the issue in the future, but integrating methods through questionnaires, interviews and vocabulary tests can be used to get more profound evidence. We recommend longitudinal research to investigate whether there will be sustained improvement in vocabulary over time through AI-assisted vocabulary learning. Other researchers in the future might also use a comparison of various AI tools, including chatbots, translation tools, adaptive vocabulary apps and generative AI platforms to determine the most effective tools in EFL vocabulary learning.

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