

การฝึกอบรมกลยุทธ์การเรียนรู้คำศัพท์ภาษาอังกฤษสำหรับนักศึกษาจีน  
ที่เรียนภาษาอังกฤษเป็นภาษาต่างประเทศผ่านแอปพลิเคชันมือถือ<sup>1</sup>  
English Vocabulary Learning Strategy Training via  
Mobile Application for Chinese EFL Students

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บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนากลยุทธ์การเรียนรู้คำศัพท์ผ่านแอปพลิเคชันบนมือถือ และตรวจสอบผลกระทบต่อการเรียนภาษาอังกฤษเป็นภาษาต่างประเทศ การศึกษาดำเนินการในสามระยะ: ในระยะที่ 1 การฝึกอบรมกลยุทธ์การเรียนรู้คำศัพท์สร้างขึ้นจากปัญหาในการเรียนรู้คำศัพท์ของนักศึกษา สำรวจโดยใช้แบบสอบถาม การสัมภาษณ์แบบกึ่งโครงสร้าง และการทดสอบคำศัพท์จำนวนสองครั้ง ในระยะที่ 2 เป็นการฝึกอบรมกลยุทธ์การเรียนรู้คำศัพท์ใช้ระยะเวลา 9 สัปดาห์ผ่านแอปพลิเคชันบนมือถือ ซึ่งบูรณาการและนำไปใช้ในหลักสูตรภาษาอังกฤษเป็นวิชาบังคับ สำหรับนักศึกษาจีน ชั้นปีที่ 1 วิชาเอกภาษาอังกฤษ จำนวน 45 คน ในวิทยาลัยชั้นกัลุ่มน้อยทางชาติพันธุ์ ในระยะที่ 3 เป็นผลสัมฤทธิ์ทางการเรียนและความพึงพอใจของนักเรียนที่ได้จากการประเมินโดยแบบสอบถามคำศัพท์ การทดสอบคำศัพท์ 2 ครั้ง และแบบสอบถามความพึงพอใจ การวิเคราะห์ประสิทธิผลของการฝึกโดยใช้การทดสอบ T-test (paired sample t-tests and independent sample t-test) ผลการวิจัยแสดงให้เห็นการพัฒนาที่สำคัญในเรื่องความเชื่อในการเรียนรู้คำศัพท์ของนักศึกษา การใช้กลยุทธ์การเรียนรู้คำศัพท์ ด้านความว่างของคำศัพท์ และความลึกของคำศัพท์ นอกจากนี้ นักศึกษาบางส่วนแสดงเจตคติเชิงบวกต่อการฝึกอบรมครั้งนี้อีกด้วย การศึกษาครั้งนี้เน้นให้เห็นว่าการฝึกอบรมกลยุทธ์การเรียนรู้คำศัพท์ผ่านอุปกรณ์เคลื่อนที่ จากการพัฒนาให้เหมาะสมกับการใช้กลยุทธ์และความต้องการในการเรียนรู้ของนักศึกษา สามารถพัฒนาการเรียนการสอนภาษาอังกฤษในฐานะภาษาต่างประเทศได้

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## ABSTRACT

This research was to develop vocabulary learning strategies training through a mobile application and examine its effects on learning English as a foreign language (EFL). The study was conducted in three phases: In phase I, vocabulary learning strategies (VLS) training was constructed based on students' vocabulary learning problems, explored by a questionnaire, a semi-structured interview, and two vocabulary tests. In phase II, the 9-week VLS training via mobile application was integrated and implemented into a first-year Comprehensive English course for 45 freshly admitted Chinese English majors in an ethnic minority college. In phase III, students' academic achievement and satisfaction were evaluated by a vocabulary questionnaire, two vocabulary tests, and a satisfaction questionnaire. The effectiveness of the training was analyzed by using paired sample t-tests, effect size, and independent sample t-tests. The findings revealed significant improvements in the student's vocabulary learning beliefs (VLB), use of VLS, vocabulary breadth, and vocabulary depth. In addition, students expressed a positive attitude towards this training. This study highlights that mobile-assisted VLS training, customized to students' strategy use and learning needs, can enhance EFL instruction pedagogically.

**KEYWORDS:** Vocabulary learning beliefs, Vocabulary learning strategies, Vocabulary breadth, Vocabulary depth, Vocabulary learning strategy training, Mobile application

### Introduction

Strategy training is very important in language learning. Oxford (1990) highlights that learning strategies can enhance language learning, making it easier, faster, and more enjoyable. Students' effective use of learning strategies not only improve learning efficiency but also foster independent learning, laying the foundation for lifelong education (Ministry of Education of the People's Republic of China, 2022). English Curriculum Standards for Compulsory Education (2022), English Curriculum Standards for Senior High School (2017) and College English Classroom Teaching Requirements (2007) all emphasize the importance of strategy teaching, requiring teachers to guide students in developing and improving students' learning strategies, ultimately enhancing their autonomous learning abilities.

English vocabulary learning strategies (VLS) are a crucial component of learning strategies and are included in vocabulary teaching objectives (Ma, 2016). In vocabulary teaching, focusing on important vocabulary and teaching vocabulary strategies are two main tasks identified by Nation and Webb (2011). Gu (1994) notes that successful learners use a rich variety of strategies, emphasizing the need for explicit VLS instruction. Ghazal (2007) also suggests teaching various VLS to improve vocabulary knowledge. VLS Training enhances vocabulary learning and overall language proficiency, making VLS training a crucial part of strategy instruction (Kuang, 2010).

Studies on VLS instruction in EFL settings have produced significant findings. First, VLS training has been observed to change students' VLB (Yao, 2015; Gao, 2013), broaden their strategy repertory and improve frequency of strategy use (Seffar, 2020; Yang & Liu, 2014) and enhance their perceptions of the usefulness (Lai, 2013) and awareness of strategy use (Gao, 2013). It also helps learners to be independent strategy users (Yamashita, 2008). Second, strategy training had a significant positive effect on the vocabulary learning of EFL students, promoting their vocabulary level (Seffar, 2020; Kesmez, 2021; Amirian & Noughabi, 2018). Third, instruction in VLS has positive effect on vocabulary size (Zhang, Lin & Zhang, 2017), word structure and dictionary strategies are especially useful in this context (Gu & Hu, 2003). Strategies for acquiring word forms and associations significantly predict both vocabulary depth and breadth (Zhang & Lu, 2015). Fan (2022) notes that inferencing strategies positively influence vocabulary depth and breadth, while repetition and social techniques negatively affect vocabulary breadth. Fourth, VLS training benefits vocabulary depth (Rahimi, 2014), with word-part strategies (Bubchaiya & Sukying, 2022; Wei, 2015) or morphological awareness instruction being especially impactful (Matwangsaeng & Sukying, 2023; Amirjalili & Jabbari, 2018; Alsaedi, 2017). Last, learners generally have positive attitudes towards VLS instruction (Amirian & Noughabi, 2018).

Besides, advancements in technology allow for learning anytime and anywhere by using mobile apps. Studies indicate mobile apps can enhance vocabulary learning. Wang and Shih (2015) report that students who use a mobile app significantly outperform than those who use traditional methods and have positive views on mobile-assisted learning. Shahbaz and Khan (2017) demonstrate that smartphone apps lead to greater vocabulary progress in post-test. Ajisoko (2020) finds Duolingo improves vocabulary scores, while Zhang (2022) shows BaiCiZhan and Bubeidanci considerably increase vocabulary retention. Mirzaei (2022) reports that web application effectively enhances vocabulary learning and strategy teaching and Huang, Barrett, Lo, and Tseng (2023) shows web-based applications improves lexical understanding. Tao and Modehiran (2023) confirms that

vocabulary instruction by using mobile applications enhances both receptive and productive vocabulary breadth and students express positive attitudes towards this approach. Wei (2023) highlights that quick feedback, curriculum alignment, interaction and emotional support contribute to high satisfaction with app-based self-assessment practice. Çoban Sural and Yaşar Sağlık (2024) recommend the use of mobile-assisted vocabulary activities to improve vocabulary knowledge.

However, in the field of VLS training, some questions are still unaddressed. First, studies taking first-year ethnic minority English majors as participants are few. Second, compared with foreign studies on VLS instruction, there is a lack of studies targeting word part instruction among Chinese EFL learners. Last, the area of mobile-assisted VLS training has more space for research in this digital era. Therefore, this study tries to bridge these gaps by taking Sichuan Minzu College as a case study, which is the only local ethnic college in Garzé Tibetan Autonomous Prefecture, southwest of China, and serves over 10,000 full-time students from different ethnic groups, including Han, Tibetan, Yi, Qiang, Tujia, and Miao.

### **Research Objectives**

1. To develop and implement a mobile app-based VLS training based on students' learning challenges.
2. To evaluate the effects of VLS training on students' VLB and VLS, vocabulary size and depth.
3. To investigate students' attitudes towards the mobile-assisted VLS training.

### **Research Questions**

In this study, the primary research question and sub-questions are presented as follows: can the mobile app-assisted VLS training effectively improve students' English vocabulary proficiency?

1. What are the characteristics of the constructed VLS training?
2. What are the effects of the constructed VLS training on VLB and VLS, vocabulary breadth and vocabulary depth?
3. What are the students' attitude towards the mobile-assisted VLS training?

### **Methodology**

#### **Research Design**

With all participants in a single experimental group, this study employed a quasi-experimental one-group pretest-posttest design (Fitz-Gibbon & Morris, 1987, p. 113).

### Research Method

A mixed method approach was adopted. Qualitatively, students' vocabulary learning difficulties and needs were analysed for key words. Quantitatively, students' VLB, VLS, vocabulary size and vocabulary depth were measured before and after nine weeks of mobile-based VLS training.

### Population and Participants

The population was 91 newly admitted English majors at an ethnic minority college. They all enrolled in Comprehensive English (1), which is a compulsory course open to English majors during the first semester, aiming to cultivate and improve students' comprehensive English ability. It spreads across 18 weeks with 3 hours of instruction each week. 45 students were calculated as an optimal sample size by using an online calculator with a 95% confidence level, 5% margin of error, 94% population proportion, and a population size of 91 (Calculator.net, 2024). The 45 students were selected through systematic random sampling. 9 students were chosen using a systematic sampling method for the semi-structured interview.

### Instruments

The study used two types of instruments: research instruments and instructional instruments.

Research Instruments included:

1. A VLS Questionnaire: It was adapted from Gu and Johnson (1996)'s Vocabulary Learning Questionnaire, version 3 (VLQ 3) by absorbing social strategy from Schmitt (1997)'s VLS taxonomy and affective strategies from Oxford (1990)'s Language Learning Strategies (LLS), mother-tongue strategies from Wen's LLS (1996) and latest vocabulary APP strategies. The questionnaire consisted of three parts: personal information, VLB (7 items) and various VLS (100 items). The pre-test had an Item-Objective Congruence (IOC) of 0.99 and a Cronbach's alpha of 0.930. For the post-test, the same items involving the trained strategies were reused, with an IOC of 0.99 and a Cronbach's alpha reliability of 0.917.

2. A set of Satisfaction Questionnaire: An 18-item, 5-point Likert scale questionnaire with an open question to seek students' opinions of the VLS training was constructed. Its IOC was 0.98 and the Cronbach's alpha reliability was 0.886.

3. A semi-structured interview: It was used to learn students' vocabulary learning difficulties and needs. Its validity was verified with an IOC of 1, and reliability was ensured by obtaining interviewees' informed consents and asking them questions in Chinese.

4. A Vocabulary Levels Test (VLT): Constructed by Schmitt, Schmitt, & Clapham (2001), it was employed to assess vocabulary size at 2000, 3000, and 5000-word levels from version 2 in the pre-test and at corresponding levels from version 1 in the post-test.

5. The Word Part Levels Test (WPLT): Designed by Webb and Sasao (2013), it was used to measure knowledge of English word parts. The easy level was used in the pre-test and the duplicated in the post-test.

Instructional Instruments consisted of:

1. VLS Teaching Materials: They contained a PowerPoint presentation and three teaching videos on word-structure strategies based on "Words and Morphology" from *Linguistics A Course Book* (5th Edition) (Hu, 2017).

2. Textbook Materials: They included 8 units of Text A with audio recordings and glossary with audio recordings which were downloaded from the HEEP Higher English Education Publishing website, and word formation exercises from the textbook *Contemporary College English(1)* (3ed Edition) (Yang, Li, & Ye, 2022).

3. Affixes: 118 affixes from Webb and Sasao (2013) were organized into eight weekly tasks based on difficulty levels.

4. Chaoxing Platform & Application: It was a mobile learning platform to deliver VLS training materials. This platform allowed teachers to create a Small Private Online Course (SPOC) named VLS Training. The chapters, learning tasks, and learning mode were set for students to access through Chaoxing Application. Materials and the IOC form were evaluated by three experts before the training, with an IOC of about 1.00.

#### **Data Collection and Procedures**

The study was conducted in three phases:

Phase I: Constructing a VLS Training based on students' vocabulary learning challenges.

During regular class time on the 5th week, students' vocabulary learning challenges were investigated and pinpointed by starting with the VLS questionnaire for half an hour, followed by VLT2 for 25 minutes and WPLT for 20 minutes, and ending with the interview for 1 hour. Accordingly, a VLS training was developed.

Phase II: Implementing the VLS Training via mobile application.

The training was conducted from the 9th to the 17th weeks. During the first week, the teacher instructed students to download Chaoxing APP and to join the course. Then, the teacher introduced the significance of each strategy and demonstrated how to use it to obtain vocabulary information. Next, students practiced it in class. After class they logged in Chaoxing APP and applied the strategy to learn new words, to do word formation exercises and to finish affix tasks weekly online.

### Phase III: Evaluating the effectiveness of VLS Training.

Carried out in the last class during the 18th week, the evaluation began with VLT1, and then WPLT (Easy), followed by VLS questionnaire, and concluded with a satisfaction questionnaire.

#### Data Analysis

Hyper Research 4.5.2 was used to analyze keywords of qualitative data, and for quantitative data, students' strategy uses were interpreted based on Oxford's rating scale of usage frequency (1990, p.300), SPSS 26 was used for descriptive analysis, paired and independent sample t-tests since only the same one group was involved in the experiment and G\*Power 3.1.7 was employed for calculating effect size.

#### 1. Result of VLB, VLS, vocabulary difficulties and needs in phase I

In VLB, the participants most believed that vocabulary should be memorized and agreed that vocabulary should be acquired in context and through positive affective reinforcement. Followed by the belief that vocabulary should be studied and used. The least accepted beliefs were that vocabulary should be learned through interacting with other people, through the mother-tongue and through vocabulary APPs. In VLS, among first-level categories, social strategies were mostly not used while others were sometimes used. In the second-level categories, dictionary strategies and contextual guessing were frequently used, while the rest were sometimes used. In the third-level categories, dictionary strategies for comprehension, dependence on using the mother-tongue, self-plan, self-initiation, oral repetition and wider context were frequently used. In contrast, visual encoding, semantic encoding, strategies for discovering the new word meaning, and strategies for consolidating a learnt word were mostly not used. Other strategies from extended dictionary strategies to activation strategies were sometimes used by students. Students' top three difficulties were frequently forgetting memorized words, struggling with recalling words with long spellings, having trouble differentiating between words with similar spellings, memorizing words with different meanings, pronouncing English words correctly, remembering word meanings, and using learned words. What students needed most was instruction on prefixes and suffixes, followed by guidance on effective memorization methods, word formation methods and word usage.

## 2. Constructing the Mobile-Assisted VLS Training

The VLS training targeted at word-structure strategies and was supplemented by social strategies, activation strategies, mother-tongue avoidance strategies, word lists strategies, note-taking strategies and dictionary strategies. The selection of the above 7 VLSs, with three from the least used and four from relatively frequently used in each level category, based on the mean value and ranking in the pre-test, their vocabulary learning difficulties, their learning needs and their learning stage. The contents in the training were prepared by referring to word-structure strategies, activation strategies, note-taking strategies, using word lists and dictionary strategies from Gu and Johnson (1996)'s VLQ3, social strategies from Schmitt (1997)'s VLS taxonomy and mother tongue avoidance strategies from Wen (1996)'s LLS, as well as vocabulary requirement and teaching contents of Comprehensive English (1). The Chaoxing application-aided training had nine chapters, each for one week. The first chapter focused on introduction of VLS and word-structure strategies, including one teaching PPT and three short videos. Chapter 2 through 9 were correlated with eight units from the textbook of Contemporary College English (1) (3rd ed.), among which five textbook units were required to be taught in class and the rest were for self-study.

### Results

The following results were presented according to the research objectives and questions:

#### 1. Vocabulary Learning Strategies (VLS) Training via Mobile Application

Typical characteristics of the VLS Training are as follows: first, it adopted mobile-assisted VLS instruction, enabling students to learn and interact with teachers and peers through Chaoxing APP anytime, anywhere. Second, it was a customized SPOC, designed to train students in seven types of strategies by various exercises and activities. Third, it employed online-offline blended teaching and learning approach, following the Comprehensive English (1) which mainly adopted an online-offline blending instruction approach after COVID-19. In this training, after the teacher taught one strategy by demonstration in class, students practiced applying it to complete learning one chapter and one affix task online, and reported their strategies use each week in class. At the same time, the teacher scored their exercises, commented on affix tasks online, and offered students feedback on their strategy report and their online performance in class. Fourth, word-structure strategies were supported by morphological knowledge from English Linguistics like morpheme, affix, root, and major word formation processes. Last, it was integrated and implemented into Comprehensive English course (1), because one

of its teaching objectives was that students should accumulate 3,000-3,500 words, including the learnt 2,000-2,500 basic words with their collocations as well as common roots, affixes and word formations.

## 2. Effect of the Mobile-assisted VLS Training on Students' Vocabulary Achievement

### 1) Effect of the VLS training on Students' VLB and VLS

Table 1 Results of comparing students' VLB & VLS in the pre-test and post-test

Test	N	Mean	S. D.	Paired differences	S.D.	t	p	Effect size (Cohen's d)
Mean								
(VLB) Pretest	45	3.65	.51	.24	.62	2.56	.014*	.38
(VLB)	45	3.89	.48					
Posttest								
(VLS) Pretest	45	2.98	.59	.31	.33	3.788	.002*	.95
(VLS)	45	3.29	.53					
Posttest								

\*Statistically significant difference if  $p < 0.05$

Table 1 shows that after receiving the training, students' average posttest scores in VLB rose from 3.65 to 3.89, significantly at  $p = .014$ . In VLS, students' average posttest scores increased from 2.98 to 3.29, indicating a significant improvement ( $p = .002$ ). For VLB, the effect size was .38, showing a small to medium effect (Cohen, 1988), interpreted that the average students scored higher at 66% after receiving the VLST, with a 16-percentile rank improvement (Coe, 2002). For VLS, the effect size was calculated at .95, a large effect size (Cohen, 1988), indicating that the mean of the treated group was at the 84th percentile of the untreated group (Becker, 2000) which reflected a 44-percentile rank improvement.

### 2) Effect of the VLS Training on Students' Vocabulary Breadth

Table 2 Results of comparing students' vocabulary size in the pre-test and post-test

Test	N	Mean	S.D.	Paired difference	S.D.	Mean t	p	Effect size (Cohen's d)
Mean								
(2000)	45	24.22	3.48	2.22	3.22	4.63	.001*	.69
Pretest								
(2000)	45	26.44	2.90					
Posttest								

Test	N	Mean	S.D.	Paired difference	S.D. Mean	t	p	Effect size
				s	Mean			
(3000)	45	18.16	4.33	5.27	3.93	9.00	.001*	1.34
Pretest								
(3000)	45	23.42	4.14					
Posttest								
(5000)	45	6.78	3.68	12.02	4.70	17.15	.001*	2.56
Pretest								
(5000)	45	18.80	5.00					
Posttest								

\*Statistically significant difference if  $p < 0.05$

Table 2 revealed that at 2000-word level, students got average posttest scores of 26.44 out of 30, significantly higher than the pretest score of 24.22 ( $p = 0.001$ ). At 3000-word level, the average posttest score was 23.42 out of 30, a significant increase from the pretest score of 18.16 ( $p = 0.001$ ). At 5000-word level, the average posttest score was 18.80 out of 30, significantly higher than the average pretest scores of 6.78 ( $p=0.001$ ). At 2000-word level, the effect size was calculated at 0.69, as a medium effect, interpreted those students ranked in the 76<sup>th</sup> percentile (Becker, 2000) after the VLST intervention, indicating a 26-percentile improvement. At 3000-word level, the effect size was 1.34, a very large effect (Cohen, 1988), placing the treated group in the 90th percentile (Becker, 2000), which reflected a 40-percentile gain at least. At 5000-word level, the effect size was 2.56, a very huge effect (Cohen, 1988), indicating that the mean of the treated group was at the 97.7th percentile of the untreated group (Becker, 2000), showing a 47.7-percentile improvement (Cohen, 1988).

### 3) Effect of the VLS Training on Students' Vocabulary Depth

Table 3 Results of comparing students' vocabulary depth in the pre-test and post-test

Test	N	Mean	S. D.	Paired	S.D. Mean	t	p	Effect (Cohen's d)
				differences				
				Mean				
(Form) Pre	45	30.53	4.75	9.11	4.58	13.33	.001*	1.99
(Form) Post	45	39.64	.65					
(Meaning) Pre	45	26.13	2.89	7.07	2.93	16.16	.001*	2.4

Test	N	Mean	S. D.	Paired	S.D.	t	p	Effect
				Mean	Mean			(Cohen's d)
(Meaning)	45	33.20	.99					
Post								
(Use) Pre	45	11.44	1.25	1.33	1.314	6.81	.001*	1.0
(Use) Post	45	12.78	.47					

\*Statistically significant difference if  $p < 0.05$

From Table 3, the students made significant improvement in all sections after receiving the VLST. In Form Section, the average posttest score was 39.64 out of 40, significantly higher than the average pretest scores of 30.53 ( $p=0.001$ ). In Meaning Section, the average posttest score was 33.20 out of 34, a significant increase from the average pretest scores of 26.13 ( $p=0.001$ ). In Use Section, the posttest average was 12.78 out of 13, up from the pretest average of 11.44 ( $p=0.001$ ). In Form Section, the effect size was 1.99, meaning a huge effect size (Cohen, 1988), showing that on average, students moved from the 50th to the 97.7th percentile after VLST (Becker, 2000). In Meaning Section, the effect size was 2.4, a very huge effect size (Cohen, 1988), indicating that students moved forward to the 99th percentile from the 50th (Becker, 2000). In Use Section, the effect size was 1.0, a large effect size (Cohen, 1988), revealing a significant advance to the 84th percentile, which showed a 34-percentile rank increase at least.

### 3. Students' Attitudes Towards the Mobile-assisted VLS Training

**Table 4** Results of comparing the mean score of the mobile-assisted VLS training and the set criteria of 3.5

Criteria = 3.5					
n	Mean	S.D.	Df	t-value	Sig (1-tailed)
45	4.23	.39	44	12.499	.0005*

\* Statistically significant difference if  $p < 0.05$

The one-sample t-test was used to compare the mean score of the mobile-assisted VLS training with the set criteria of 3.5. Table 4 showed that the mean score of the training was significantly higher than the set criteria ( $4.23 > 3.50$ ,  $t = 12.499_{44}$ ) at  $p = 0.05$ . This indicated that the majority of the students were satisfied with or had positive attitude toward the VLS training as a whole at high level (Srisa-ard & Nilkaew, 1992).

## Conclusion

This study implemented a nine-week mobile-assisted VLS training based on students' vocabulary learning challenges and needs. The study found that 1) During this training, in VLS, students finished learning word-structure strategies and other 6 complementing strategies. They reported their strategy use in class for nine weeks. In vocabulary size, students applied these strategies to learn new words one chapter one week online and covered eight chapters. In vocabulary depth, they completed eight word-formation exercises and eight affix tasks. Mistakes in the affix tasks included finding wrong example words, misunderstanding affix meaning, misidentifying grammatical category and spelling mistake, among which the most common was finding incorrect example words, 2) statistically and practically, the mobile-assisted VLS training significantly improved students' use of the trained seven types of VLS strategies, vocabulary breadth, especially 3000-word level and 5000-word level and vocabulary depth, in particular the Form and Meaning Section of word-part knowledge, and 3) students were satisfied with the VLS training at high level.

## Discussion

A discussion follows the important findings mentioned above:

1. Results showed that the mobile-assisted training had strong effect sizes starting from students' VLS use to the effect on students' achievement in vocabulary breadth and depth.

This could be due to the following reasons: first, the custom-built VLS training effectively shaped students' VLB and expanded their VLS use, agreed with Gu & Hu (2003) 's, Amirian & Noughabi (2018)'s and Gu (2019)'s study which reported positive impacts of strategy instruction on strategy use and vocabulary learning (Seffar, 2020; Lai, 2013; Ma, 2012). Second, the VLS training facilitated students' VLS application, leading to an improved vocabulary size, supported by Gu & Johnson (1996) and Gu & Hu (2003), who found that strategy use, especially with dictionaries and word formation, positively impacted vocabulary size. Findings from Dessalew & Mohammed (2024) and Amirian & Noughabi (2018) all confirmed that explicit VLS instruction significantly increased learners' vocabulary size. Last, the VLS training targeting at word structure strategies significantly enhanced students' vocabulary depth, particularly word-part knowledge or morphological awareness, consistent with Bubchaiya & Sukying (2022) and Wei (2015) who found word part strategy effective for developing vocabulary, and also with Matwangsaeng & Sukying (2023), Amirjalili & Jabbari (2018) and Alsaeedi (2017) who reported explicit morphology instruction improved morphological awareness and

vocabulary knowledge. Besides, Dessalew & Mohammed (2024) and Rahimi (2014) also observed that VLS training significantly improved vocabulary depth.

2. The results also showed that students had a positive attitude toward the training.

The reasons may be as follows: first, due to the COVID-19 pandemic, all the courses transitioned from traditional face-to face instruction to an online format by using mobile platforms, thus students already had had experience in mobile learning and most of them used Chaoxing App because it was one of the 22 learning platforms recommended in the first batch by Ministry of Education in China, which paved a good road for this training. Second, the mobile app-assisted VLS training was an effective approach for Chinese first-year EFL learners. This was consistent with Tao & Modehiran (2023), and Wang & Shih (2015) who observed that students had favorable opinions on mobile-aided vocabulary instruction and learning and also with Huang et al. (2023), Zhang (2022), Mirzaei (2022), Ajisoko (2020), and Shahbaz and Khan (2017), who all found mobile or web application efficient to enhance students' vocabulary learning. Third, the tailored VLS Training addressed the gap between students' current vocabulary knowledge and the curriculum and syllabus requirement, aligning with Wei (2023)'s findings. Last, the mobile APP provided quick feedback and allowed interaction between teachers and students, thus maintaining or strengthening their emotional and cognitive connection. This supported Wei's (2023) findings too.

3. However, though there was a significant change in VLB, the effect size was small, students still favored memorization. This differed from Yao (2015) and Gao (2013) who observed a shift from rote learning toward contextual learning after the training.

The following reasons may account for it: first, students' belief in memorization to learn vocabulary may be deep-rooted and hard to change. If they had depended on memorization for learning English for a very long time, a short training session might not be sufficient to alter their beliefs significantly. This was supported by Chen (2009) and Ma (2012) who observed that mechanical memorization was given more weight in Chinese education. Second, the length or intensity of the training was insufficient to significantly alter their VLB, thus longer or more intensive interventions were needed, as suggested by Dörnyei & Ushioda (2021). Last, cultural view toward education and learning may play a role. In certain cultures, the perception of rote memorization was highly valued and considered effective in learning (Biggs, 1996), as was supported by Fu (2021) and Li (2004)'s finding which concluded that traditional Chinese culture emphasized rote memorization.

## Recommendations

The effective use of mobile apps for explicit VLS instruction offers a promising approach in EFL classroom for future research. However, according to students' suggestions in the questionnaire, it is recommended to extend the teaching duration from 1 to 1.5-2 class periods by giving enough time to each member instead of two representatives from each group to report their strategy using each week in the classroom. It is also recommended to design some multiple-choice questions instead of fill-in-the-blank, translation, analysis, and short answer questions for the online exercises on Chaoxing platform, because multiple-choice questions can be scored automatically and more friendly for students to answer and for the teacher to check. Future research should explore the relationship between mobile-assisted VLS training and vocabulary development with a bigger sample size from broader scope and evaluate the sustained effectiveness of mobile-based VLS training through longitudinal follow-up studies, because it takes time for students to develop their VLB and integrate VLS into their own learning process to improve their vocabulary learning.

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